2008 CENTRAL VERMONT REGIONAL TRANSPORTATION PLAN APPENDIX

TABLE OF CONTENTS

A. SAFETY ANALYSIS

INTRODUCTION

As part of the 2008 update to the Safety Analysis, the Central Vermont Regional Planning Commission's (CVRPC's) Transportation Advisory Committee (TAC) identified four High Crash Locations (HCLs) to be analyzed in detail. These four HCLs, identified in the 2001-2005 VTrans High Crash Location Report[1], were examined by Resource Systems Group in order to develop specific recommendations for improvement. The four locations chosen were:

- Montpelier - VT 12/Main Street – US 2/State Street – East State Street
- Barre Town - VT 14 – Pine Hill Road
- Barre City - VT 62 – Berlin Street
- Northfield- VT 12 – VT 64/Lovers Lane

For each of these intersections, collision diagrams were developed based on a review of VTrans crash records between 2001 and 2005. These diagrams are useful in identifying trends in types of crashes and may help to identify factors which contribute to the high number of crashes at that location. Site visits to each location were made in order to measure site distances, photograph the area, determine intersection geometry and control, observe traffic operations, and identify potential deficiencies which may contribute to crash patterns. The findings of these analyses are presented below, along with recommendations for potential safety improvements.

Location #1: Montpelier- VT 12/Main Street – US 2/State Street – East State Street

The geometry of the Main–State intersection in downtown Montpelier is shown in Figure 1. The eastbound State Street and westbound East State Street approaches are offset from one another. The intersection is signalized and includes an exclusive pedestrian phase (i.e. there is a short period of time when all four approaches have red lights and pedestrians are allowed to cross the intersection). There are crosswalks across each approach and pedestrian signals with actuators at both ends of each crosswalk. There are also mid-block crosswalks adjacent to the intersection. Each approach has a "No Turn on Red" sign, further protecting pedestrians from vehicles which would otherwise turn right during the exclusive pedestrian phase. The northbound VT 12/Main Street approach has a protected/permitted left turn lane. Because this intersection is controlled with a traffic signal, sight distances were not measured. There are on-street parking spaces on at least one side of each approach, although the first space is set back at a distance from the intersection so that there are no spaces immediately on the corner. The intersection topography is flat. Figure 2 shows the intersection from the southwest corner.

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[1] VTrans Policy and Planning Division Highway Research, *2001-2005 High Crash Location Report: Sections and Intersections* May 2007.

Figure 1: Geometry of Main-State Streets in Montpelier

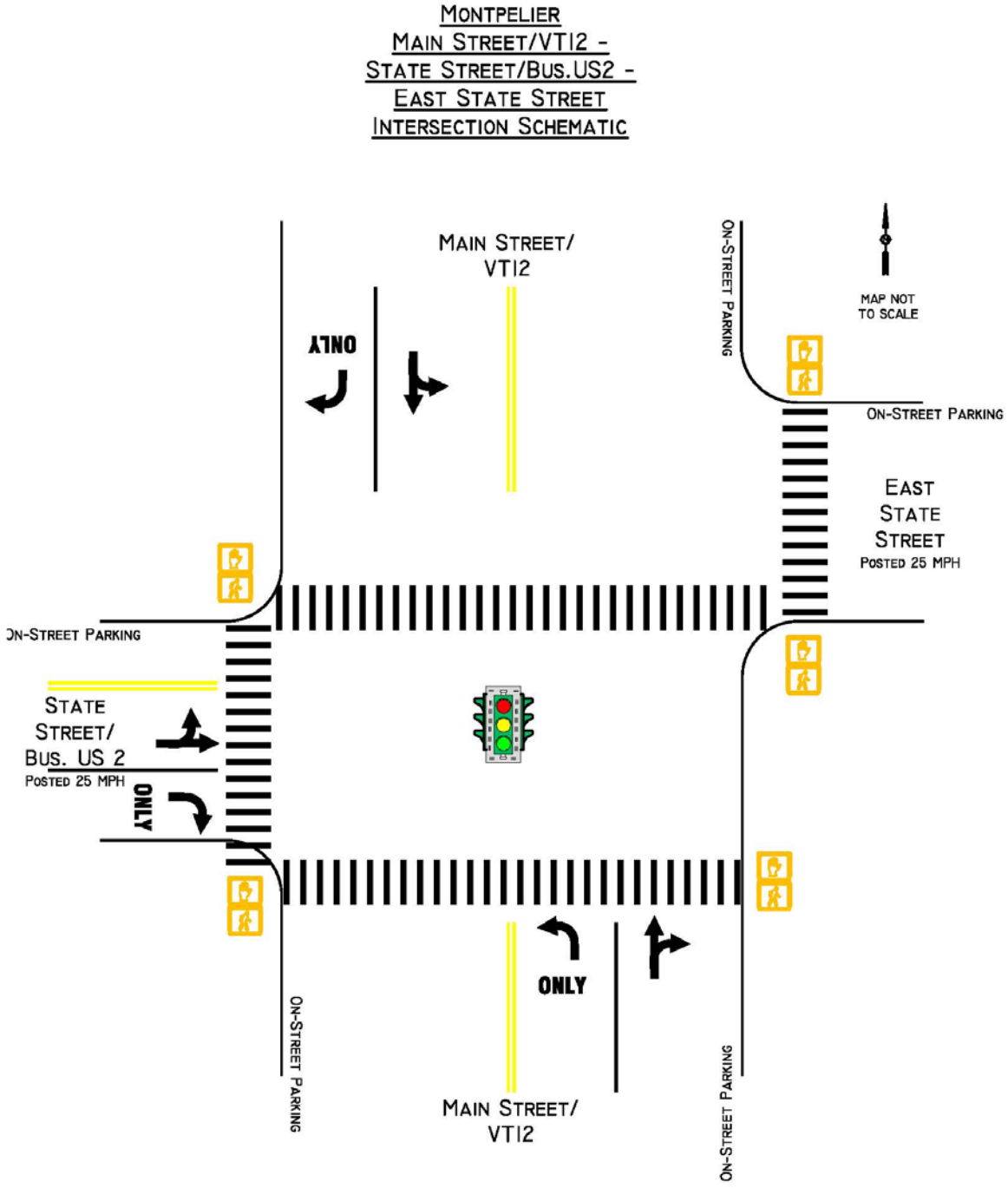
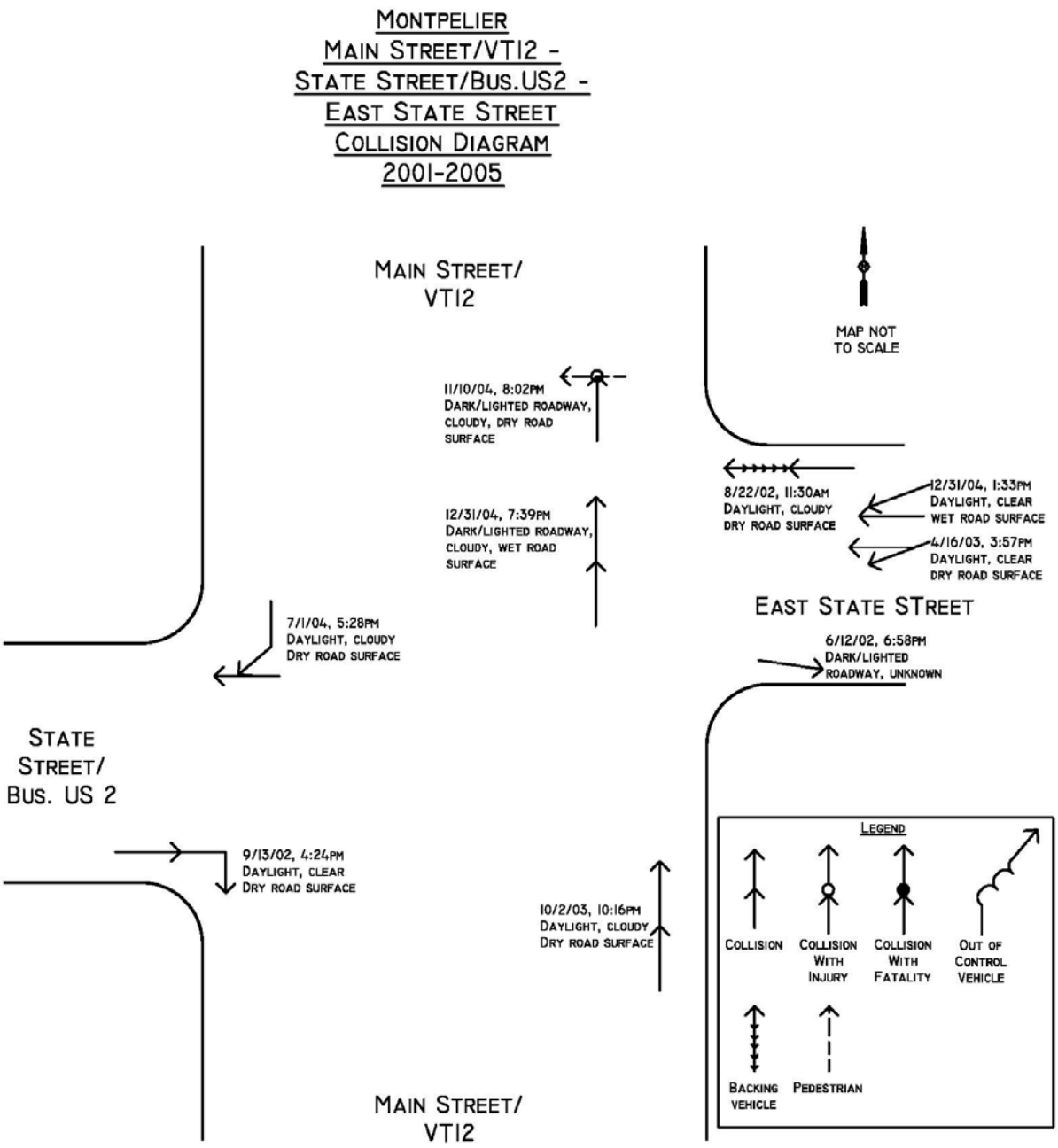


Figure 2: Main-State Street intersection in Montpelier from eastbound State Street approach

A collision diagram is provided in Figure 3 to summarize VTrans crash reports for the nine crashes that occurred between 2001 and 2005 at this intersection. Each arrow depicts the movement that the vehicle was making at the time of the crash. Four of the crashes (44%) involved parked cars or vehicles entering or exiting one of the parallel on-street parking spaces. Two of the crash reports completed by responding police officers indicated that a vehicle had stopped to allow pedestrians to cross the street and was then rear-ended.

Figure 3: Collision Diagram for Main-State Streets 2001-2005 (crash data source: VTrans)



Possible Mitigation

1. Restrict on-street parking 40 feet from the stop bars at this intersection. This would eliminate approximately 1 space on each approach, but would reduce potential conflicts between vehicles making parking movements and vehicles headed through the intersection.
2. Consider mounting traffic signals on mast arms to improve their visibility and help reduce conflicts.
3. Install in-pavement crosswalk treatments (e.g. stamped asphalt) to further delineate pedestrian crossing locations.

Location #2: Barre Town- VT 14 – Pine Hill Road

The geometry of the VT 14 – Pine Hill Road intersection in Barre Town is shown in Figure 4. VT 14 runs north-south in the area and climbs a hill as it travels north, as shown in Figure 5. Immediately north of the intersection, VT 14 curves to the west. Pine Hill Road is controlled with a stop sign. Gauthier Drive is on the east side of VT 14 and is offset from the Pine Hill Road approach. There are no turn lanes at the intersection.

Figure 4: Geometry of VT14-Pine Hill Road intersection in Barre Town

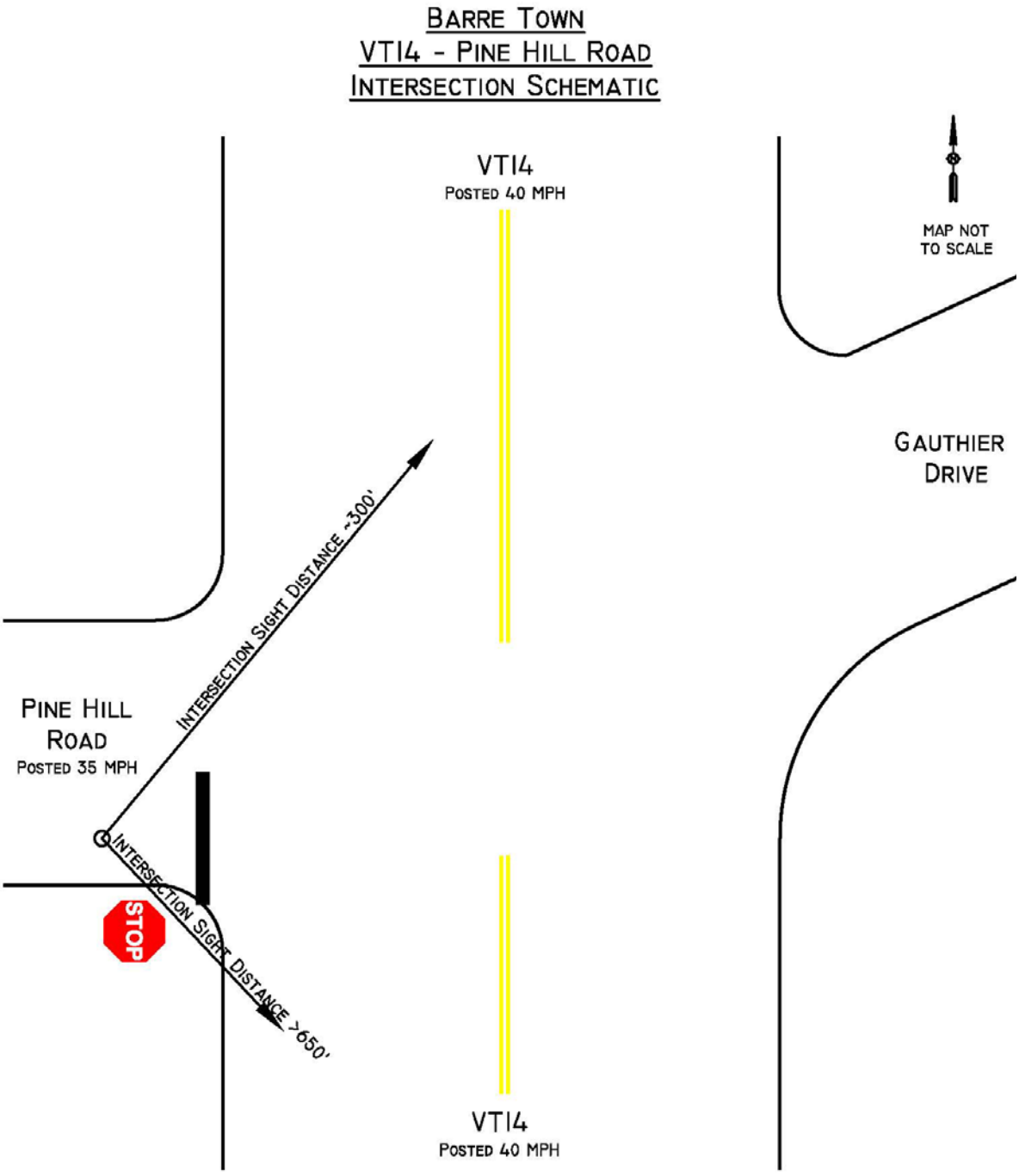


Figure 5: Looking north along VT 14

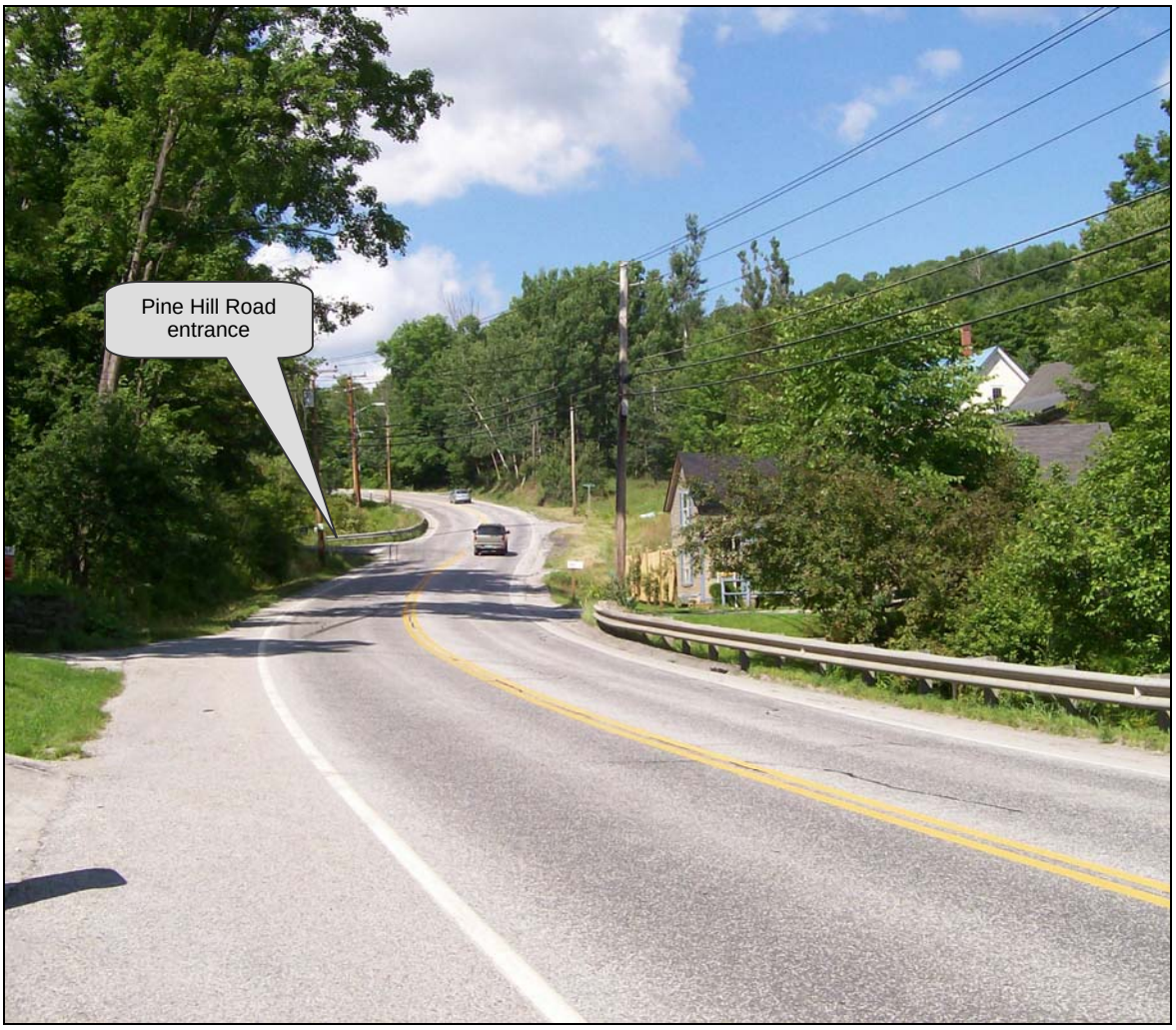
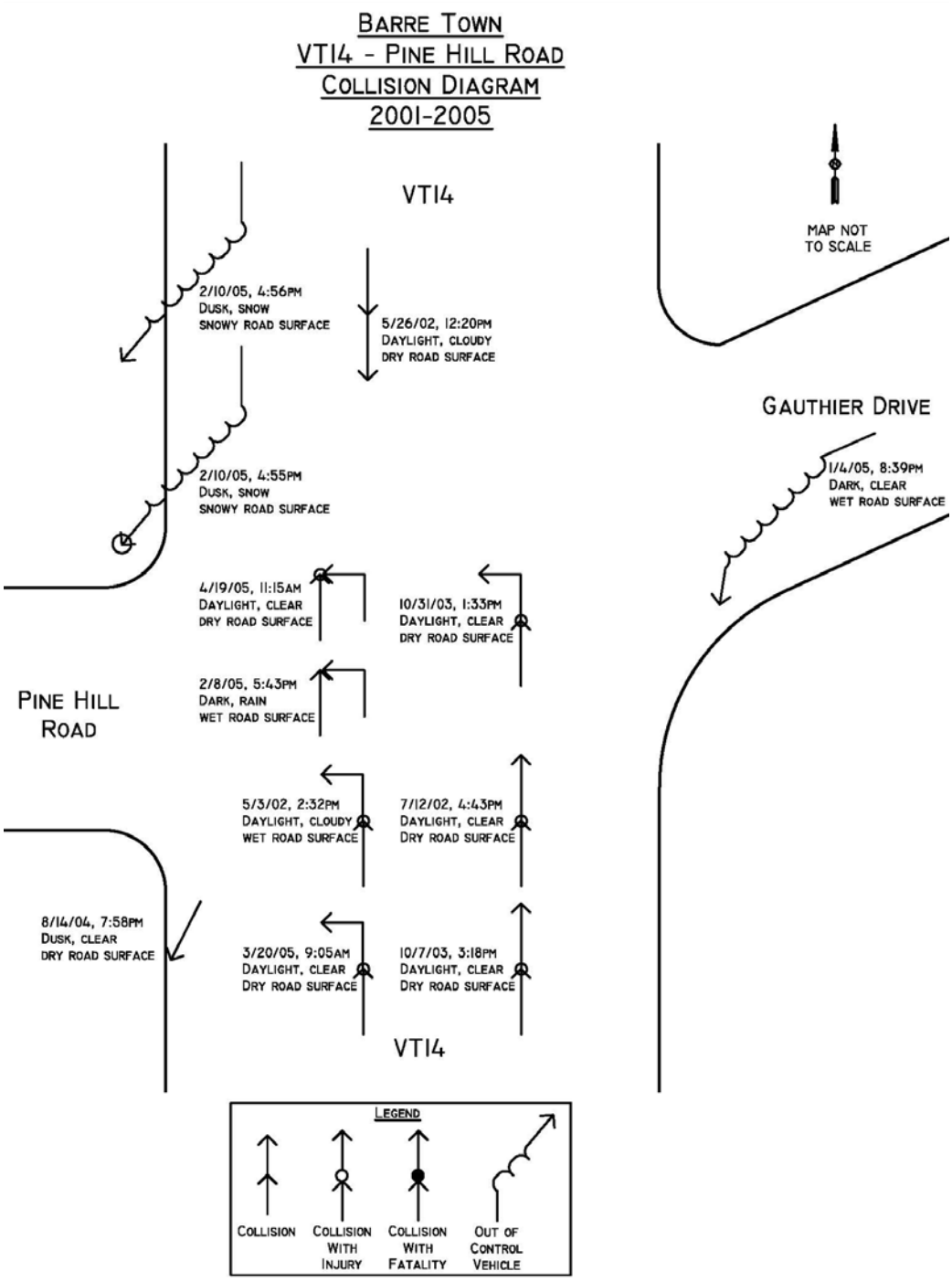


Figure 6 summarizes VTrans crash reports for the twelve crashes that occurred between 2001 and 2005. The collision diagram indicates a pattern of northbound rear-end crashes (42% of all crashes) which mostly involve vehicles turning left onto Pine Hill Road. This pattern suggests that drivers were caught off guard by the turning vehicle in front of them, perhaps because they did not realize they were approaching an intersection, they were following too closely, and/or they were driving distractedly or too fast.

Figure 6: Collision Diagram for VT14-Pine Hill Road 2001-2005 (crash data source: VTrans)



Intersection sight distances were measured in the field and the results are shown in Figure 4 and Table 1. VT 14, the major road, has a posted speed limit of 40 mph in the vicinity of this intersection.

To be slightly conservative, a design speed of 50 mph was assumed for the AASHTO[1] recommended sight distances. Table 1 indicates that the sight distance looking north onto VT 14 from Pine Hill Road does not meet the minimum intersection sight distances recommended by AASHTO. Figure 7 shows approximately what the sight distance looks like from the perspective of a vehicle on Pine Hill Road looking north onto VT 14. The curve on VT 14 immediately north of the intersection (combined with the embankment and overgrowth of brush) diminishes the sight distance available from Pine Hill Road, and also decreases the visibility of vehicles entering VT 14 from Pine Hill Road, as shown in Figure 8.

Table 1 also shows that the sight distance looking south from Pine Hill Road exceeds the AASHTO recommended minimum distance.

Table 1: Recommended and measured sight distances at VT 14 –Pine Hill Road for 50 mph design speed

Approach	AASHTO Recommended Intersection Sight Distance	AASHTO Recommended Stopping Sight Distance	Field Measured Intersection Sight Distance
Pine Hill Road (stop-controlled)	555'	425'	300' looking north
			Over 650' looking south

[1] The American Association of State Highway and Transportation Officials' (AASHTO) 2004 "A Policy on Geometric Design of Highways and Streets" is a standard reference for sight distances. Values in Table 1 are from pages 661 and 675. Per AASHTO guidelines, sight distances were measured from approximately 14.5' behind the stop bar on the minor road.

Figure 7: Perspective from Pine Hill Road (from approximately 15' behind the stop bar) looking north onto VT 14 for oncoming traffic

Figure 8: On VT 14 looking south towards Pine Hill Road from 300' north of intersection

Possible Mitigation

1. Cut back brush and/or embankment on northwest corner of intersection to obtain sufficient sight distances to the north.
2. Analyze intersection traffic volumes to determine whether northbound left-turn lane satisfies applicable warrant(s).
3. Install flashing beacon light to warn drivers that they are approaching an intersection.
4. Add "Watch for Turning Traffic," "Hidden Drive," or an intersection warning sign south of the intersection:

MUTCD Warning Sign W1-10

MUTCD Warning Sign W2-2

5. Reconstruct intersection to straighten vertical and horizontal curvatures on VT 14.
6. Add a Horizontal Alignment/Advisory Speed Sign south of the intersection:

MUTCD Warning Sign W1-2a

7. Lengthen the culvert under the Pine Hill Road approach to improve the corner radius for eastbound right-turning trucks. Otherwise, the trucks may encroach into the northbound VT 14 travel lane while turning.

Location #3: Barre City-VT 62 Berlin Street

The VT 62 – Berlin Street intersection is shown in Figure 9. VT 62 is a divided highway with two lanes in each direction. The eastbound and westbound VT 62 approaches both have left-turn only/through/through-right lane geometries. Both northbound and southbound Berlin Street approaches are technically one lane, although the road widths accommodate two vehicles side by side and vehicles were observed using the approach as if it were a two-lane geometry with left-through and right-only lanes. There are 6' wide medians on both Berlin Street approaches and 2' medians on both VT 62 approaches. The intersection is controlled with a traffic signal, so sight distances were not measured. There is a crosswalk across the eastbound approach of VT 62 and pedestrian actuators and signals on each end of the crosswalk. The southbound Berlin Street approach slopes slightly upward from the intersection as shown in Figure 10; all other approaches are relatively flat.

Eastbound and westbound left-turn movements are protected during the green arrow phase but are not permitted during the subsequent green ball phase. The traffic signal includes an exclusive pedestrian phase and there are "No Turn on Red" signs for the eastbound and southbound approaches.

Figure 9: Geometry of VT62-Berlin Street intersection in Barre City

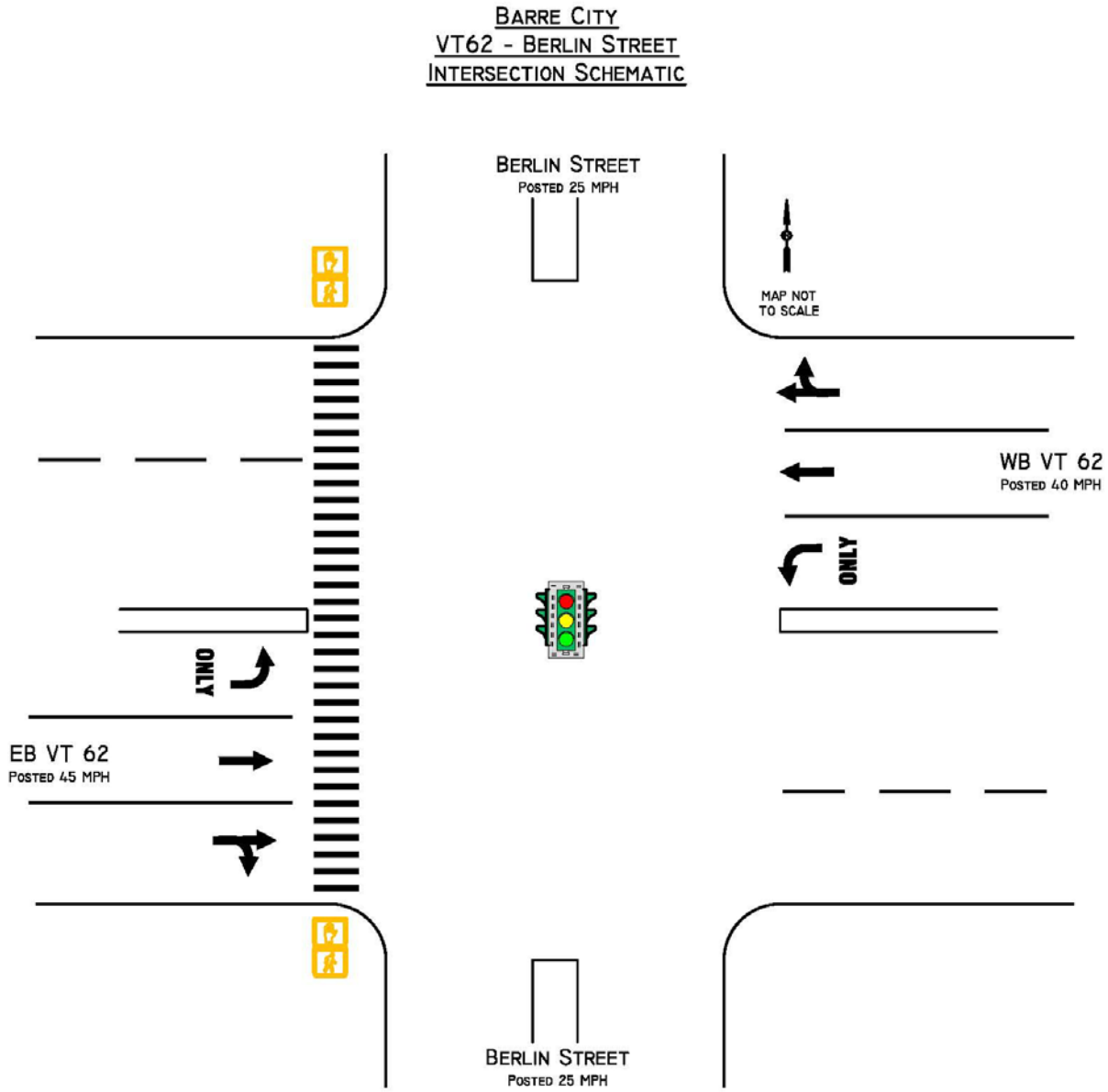
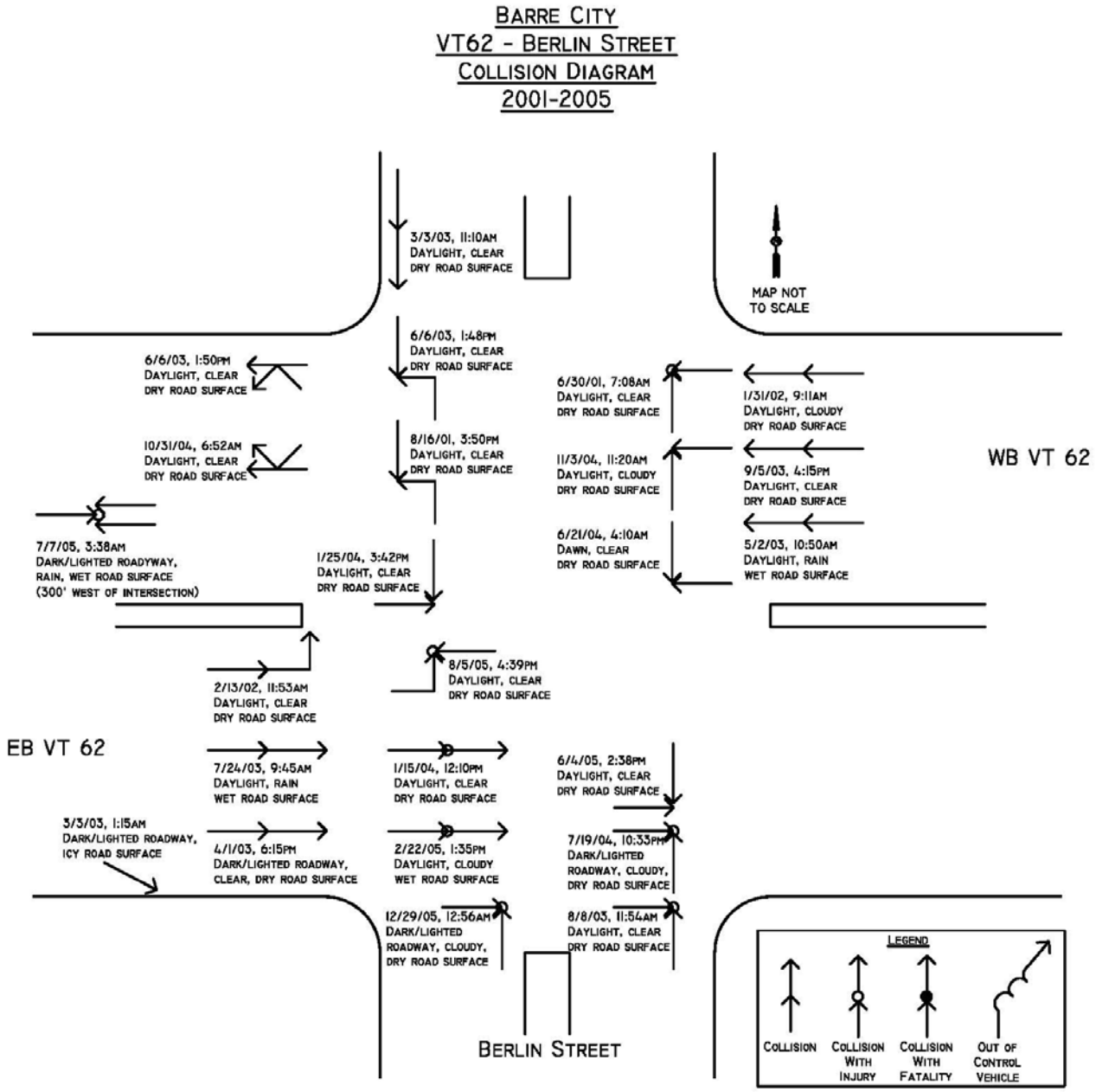


Figure 10: Northern Berlin Street approach, looking southbound

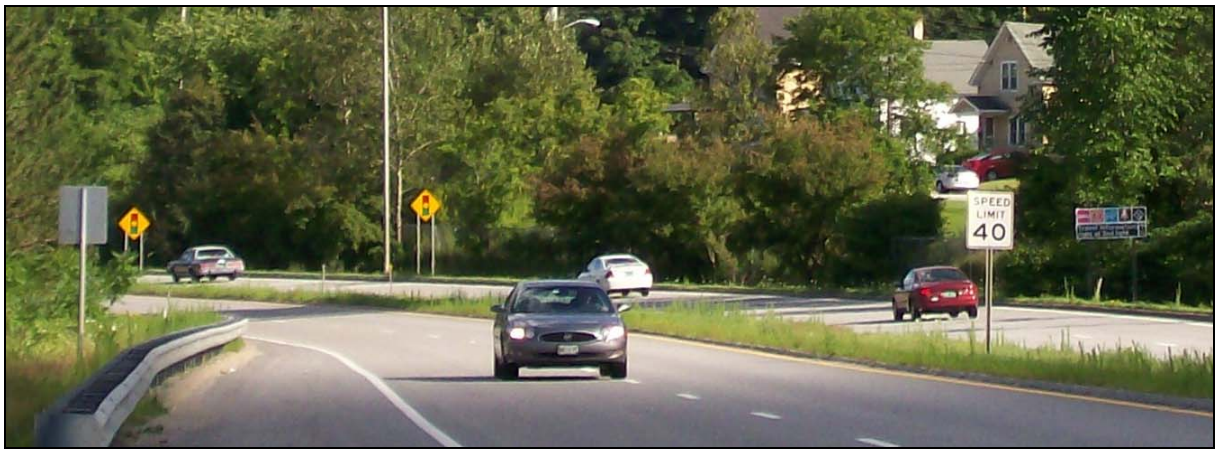
Figure 11 summarizes VTrans crash reports for the 24 crashes that occurred between 2001 and 2005. The collision diagram indicates a pattern of rear-end crashes and broadside crashes. Many of the crash reports completed by responding police officers indicated that the driver at fault seemed to be medicated or otherwise distracted, which may be a result of this intersection being en-route to the regional hospital.

Figure 11: Collision Diagram for VT62-Berlin Street 2001-2005 (crash data source: VTrans)



Another possible explanation that was considered was that since the intersection is the first one in several miles on eastbound VT 62, perhaps drivers on the divided highway felt that they were on an interstate-like roadway and were not expecting an intersection. However, there appears to be adequate signage on VT 62 notifying drivers that they are approaching an intersection as shown in Figure 12.

Figure 12: VT 62 eastbound approaching Berlin Street intersection.



Possible Mitigation

1. Install flashing beacons to alert drivers on eastbound VT 62 prior to the intersection that they are approaching a signalized intersection.
2. Reduce speed limits to 35 mph on VT 62 on both approaches to intersection.
3. Install flashing beacons on top of "Signal Ahead" signs.
4. Install strobe in red traffic signal and/or rumble strips on eastbound VT 62 approach to ensure motorists know they are approaching a signal.

Location #4: Northfield- VT 12 – VT 64/Lovers Lane

The VT 12 – VT 64/Lovers Lane intersection is located at the end of a nearly three-mile segment of VT 64 that has a significant downgrade. Signs caution trucks against using this portion of VT 64 and a runaway truck ramp is positioned on VT 64 approximately ¼ mile east of the intersection. The Northfield Department of Public Works notes that there have been five tractor trailer crashes at this intersection since 1985.

As shown in Figure 13, the intersection includes a slip lane (controlled by a yield sign) on the westbound VT 64 approach for vehicles turning right onto VT 12 northbound. There is a Mobil gas station and convenience store on VT 12 with a driveway approximately 120 feet north of the Lovers Lane approach. The intersection is stop-controlled on the minor legs of Lovers Lane and VT 64 (for the left-turn and through movements). In addition to the through lanes on VT 12, there are left-turn and right-turn lanes onto VT 64.

Figure 13: Geometry of VT64-VT12/Lovers Lane intersection in Northfield

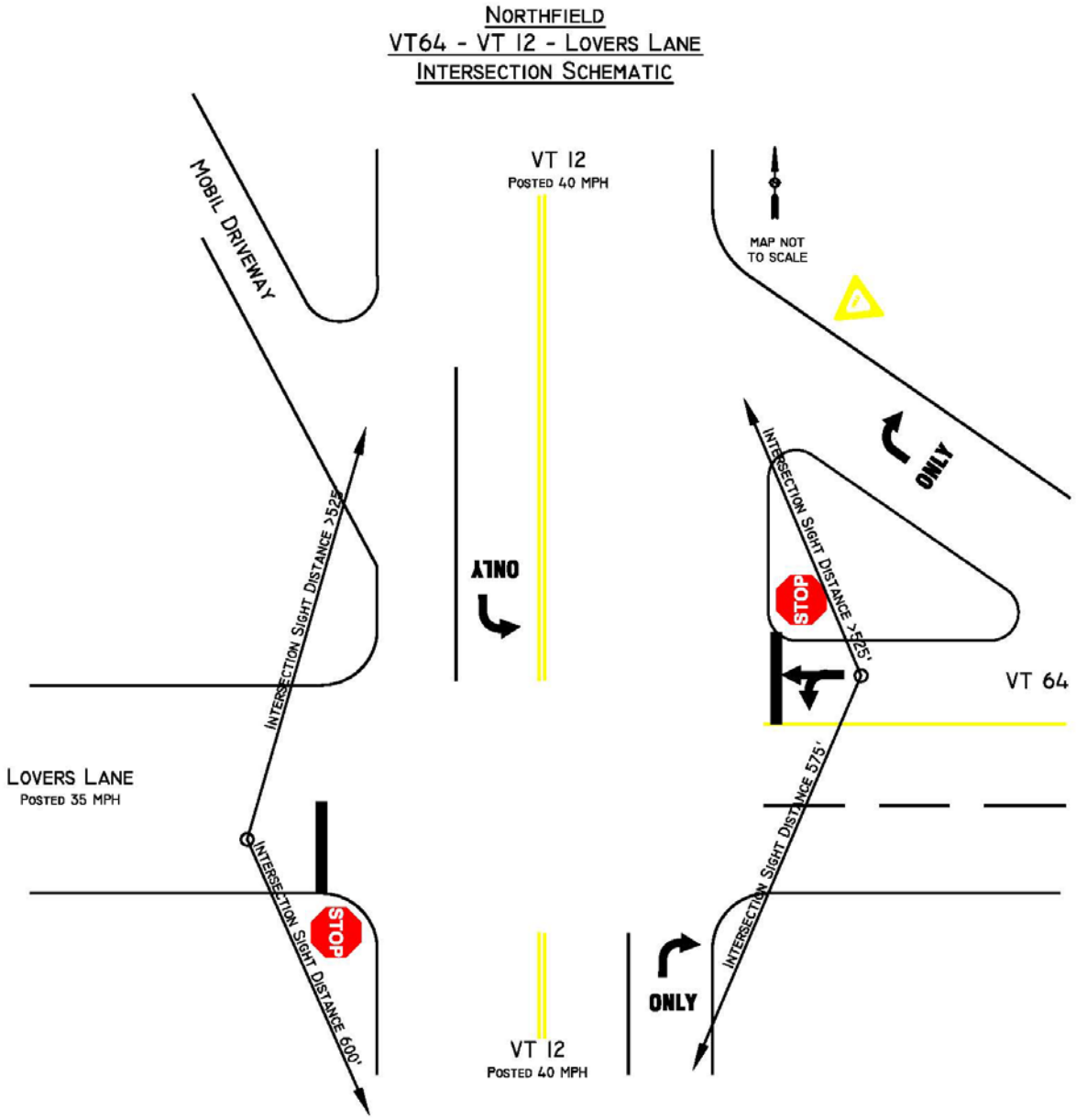
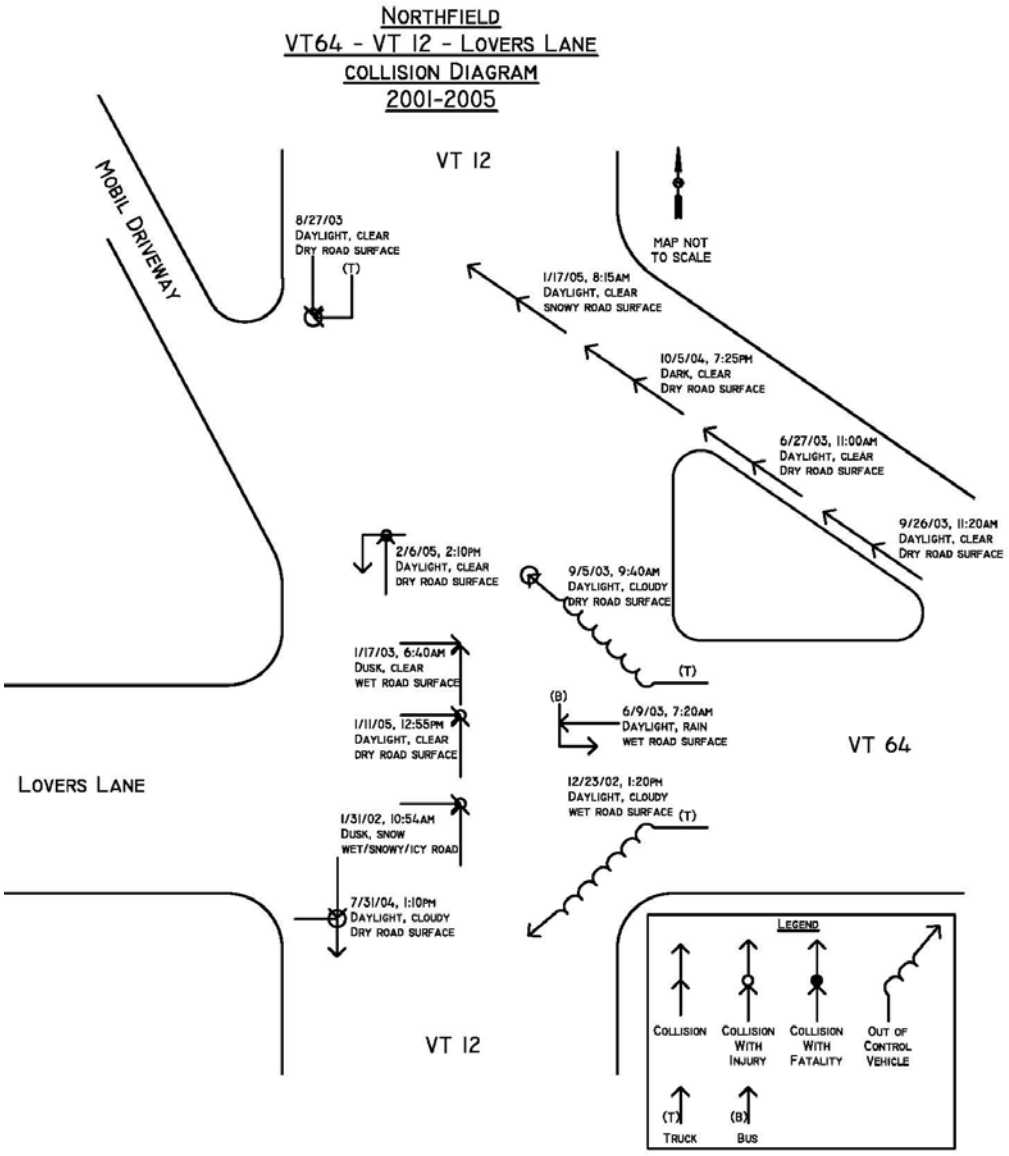


Figure 14 summarizes VTrans crash reports for the 13 crashes that occurred between 2001 and 2005. The collision diagram indicates a pattern of rear-end crashes for vehicles using the yield-controlled lane from westbound VT 64 onto northbound VT 12 (31% of all crashes). There is also a pattern of eastbound (Lovers Lane) vehicles conflicting with northbound VT 12 traffic (23% of all crashes).

Figure 14: Collision Diagram for VT64-VT12/Lovers Lane 2001-2005 (crash data source: VTrans)



Sight distances were measured in the field and the results are shown in Figure 13 and Table 2. VT 12, the major road, has a posted speed limit of 40 mph in the vicinity of this intersection. To be slightly conservative, a design speed of 50 mph was assumed for the AASHTO[1] recommended sight

[1] The American Association of State Highway and Transportation Officials' 2004 "A Policy on Geometric Design of Highways and Streets" is a standard reference for sight distances. Values in Table 2 are from pages 661 and 672. Per AASHTO guidelines, sight distances were measured from approximately 14.5' behind the stop bars on the minor roads.

distances. Table 2 indicates that the sight distance for the yield-controlled lane from westbound VT 64 does not meet the minimum recommended by AASHTO.

Figure 15 shows what the sight distance looks like from the perspective of a vehicle on the westbound VT 64 approach looking south on VT 12.

VT 12 slopes down as it travels south. In addition to the horizontal sight distance deficiency, the vertical curve of VT 12 south of the intersection may diminish sight distances and decrease the visibility of vehicles approaching the crest of the road.

Table 2: Recommended and measured sight distances at VT 12 – VT 64/Lovers Lane for 50 mph design speed

Approach	**AASHTO Recommended Intersection Sight Distance**	**Field Measured Sight Distance**
Westbound VT 64 (stop-controlled for through and left-turn movements, yield-controlled for right-turn movements)	590' for yield-controlled lanes	575' looking south*
	555' for stop-controlled lanes	Over 525' looking north*
Eastbound Lovers Lane (stop-controlled)	555'	600' looking south
		Over 525' looking north
*Both distances measured from stop-controlled lane.		

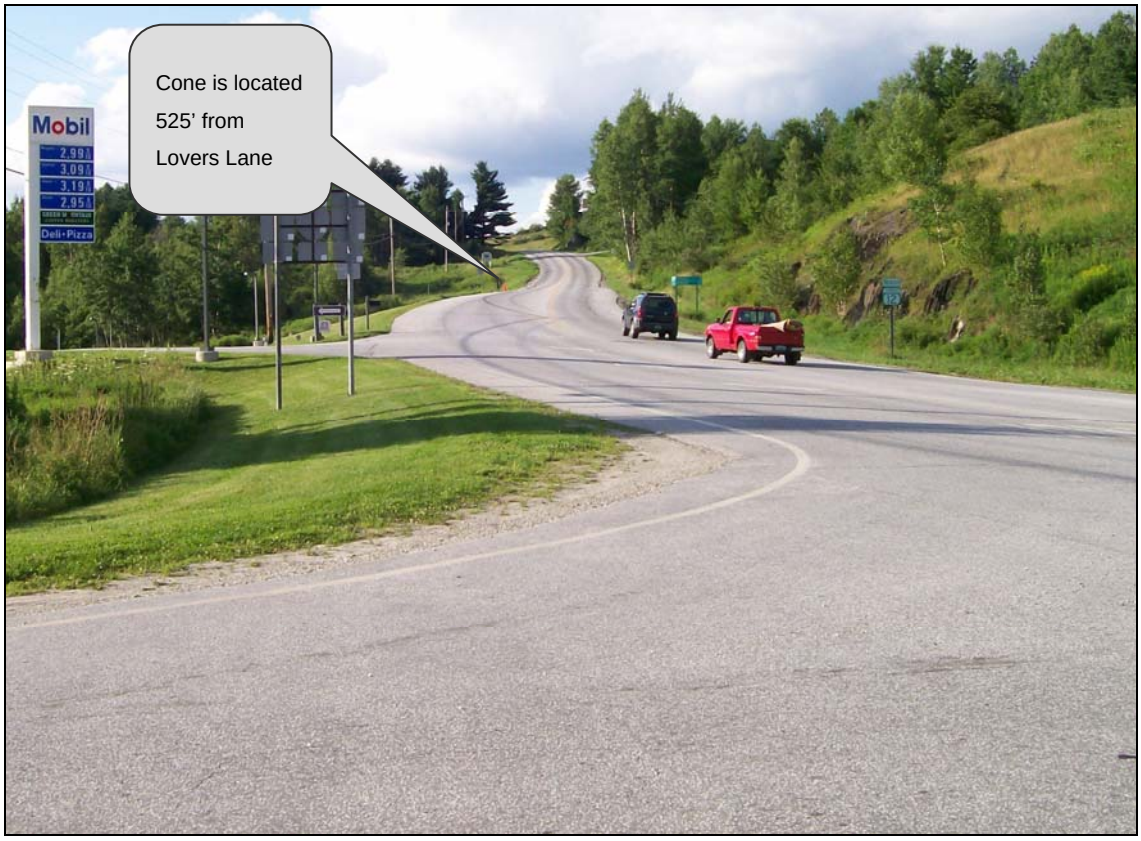
Figure 15: Perspective from westbound VT 64 looking south onto VT 12 for oncoming traffic.

The sight distance deficiency looking to the south from the minor legs of the intersection appears to contribute to the crash trends at this site. For example, vehicles approaching on VT 12 from the south are not visible to vehicles in the westbound VT 64 slip lane until the last second. Upon noticing the approaching vehicle, the first vehicle in the slip lane then slows down and is rear-ended.

During the field visit, drivers were observed using the slip lane at high speeds and merely glancing in the direction of possible northbound VT 12 vehicles with which they could have a conflict.

While the sight distances looking north for both the eastbound and westbound approaches were measured for a minimum of 525' (Table 2), Figure 16 shows that the AASHTO recommended minimum distance is exceeded.

Figure 16: Perspective from Lovers Lane looking north onto VT 12 for oncoming traffic.



Possible Mitigation

1. Cut back brush and/or embankment on southeast and northeast corners of intersection to establish adequate sight distance.
2. Reconstruct the westbound right-turn slip lane to reduce the curve radius to encourage slower yielding maneuver speeds.
3. Reconstruct the intersection to improve the vertical curve on northbound VT 12 as it approaches from the south.
4. Consider a stop sign rather than a yield at the westbound right-turn lane.

5. Enhance grade warnings for trucks. Consider adding flashing beacons to existing signs and rumble-strips in pavement ahead of run-away truck ramp. Provide signs on I-89 warning trucks to use an alternative to Exit 5.

Summary of Recommended Mitigation

Location #1: Montpelier- VT 12/Main Street – US 2/State Street – East State Street

Short Term:

1. Restrict on-street parking 40 feet from the stop bars at this intersection. This would eliminate approximately 1 space on each approach, but would reduce potential conflicts between vehicles making parking movements and vehicles headed through the intersection.
2. Install in-pavement crosswalk treatments (e.g. stamped asphalt) to further delineate pedestrian crossing locations.

Mid Term:

1. Consider mounting traffic signals on mast arms to improve their visibility and help reduce conflicts.

Location #2: Barre Town- VT 14 – Pine Hill Road

Short Term:

1. Cut back brush and/or embankment on northwest corner of intersection to obtain sufficient sight distances to the north.
2. Add "Watch for Turning Traffic," "Hidden Drive," or an intersection warning sign south of the intersection:

MUTCD Warning Sign W1-10

MUTCD Warning Sign W2-2

3. Add a Horizontal Alignment/Advisory Speed Sign south of the intersection:

MUTCD Warning Sign W1-2a

Mid Term:

1. Analyze intersection traffic volumes to determine whether northbound left-turn lane satisfies applicable warrant(s).
2. Install flashing beacon light to warn drivers that they are approaching an intersection.

Long Term:

1. Reconstruct intersection to straighten vertical and horizontal curvatures on VT 14.

Location #3: Barre City- VT 62 – Berlin Street

Short Term:

1. Reduce speed limits to 35 mph on VT 62 on both approaches to intersection.

Mid Term:

1. Install flashing beacons to alert drivers on eastbound VT 62 prior to the intersection that they are approaching a signalized intersection.
2. Install flashing beacons on top of "Signal Ahead" signs.
3. Install strobe in red traffic signal on eastbound VT 62 approach to ensure motorists know they are approaching a signal.

Location #4: Northfield- VT 12 – VT 64/Lovers Lane

Short Term:

1. Cut back brush and/or embankment on southeast and northeast corners of intersection to establish adequate sight distance.
2. Enhance grade warnings for trucks. Consider adding flashing beacons to existing signs and rumble-strips in pavement ahead of run-away truck ramp. Provide signs on I-89 warning trucks to use an alternative to Exit 5.
3. Consider additional truck warning signs coming down VT 64.

4. Check speeds of through traffic on VT 12. Vehicles may be traveling too fast.

Mid Term:

1. Consider a stop sign rather than a yield at the westbound right-turn lane.

Long Term:

1. Reconstruct the westbound right-turn slip lane to reduce the curve radius to encourage slower yielding maneuver speeds. Consider replacing the slip lane with a standard right-turn lane.

   Reconstruct the intersection to improve the vertical curve on northbound VT 12 as it approaches from the south.

B. INTERSTATE EXIT PLANNING

INTRODUCTION

This section reviews the interstate interchanges in Central Vermont as part of the 2008 update to the Central Vermont Regional Transportation Plan and contains the following sub-sections:

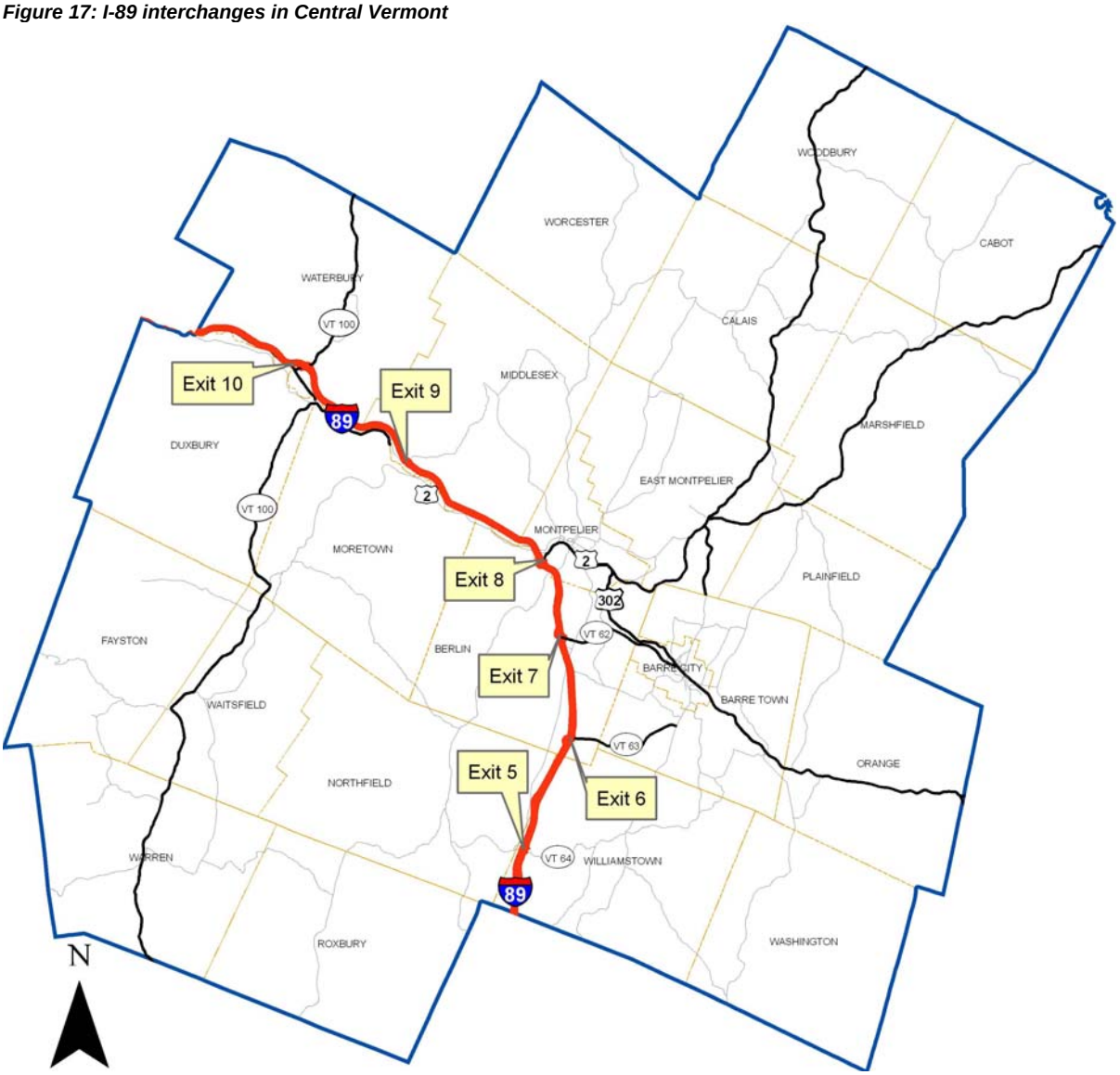
- Descriptions of Central Vermont's Interchanges
- General Overview of Interchange Types
- Summary of Relevant Studies
- Summary of Relevant Projects in the Statewide Transportation Improvement Plan
- *The Vermont Interstate Interchange Planning and Development Design Guidelines*
- Planning Strategies for Central Vermont
- Development Tools
- Design Guidelines for Central Vermont's Interchanges
- Summary

In 2004, the Vermont Department of Housing and Community Affairs completed the *Vermont Interstate Interchange Planning and Development Design Guidelines* to offer planning strategies, development tools, and design guidelines for improving the interchange areas. This resource is a critical tool and portions are replicated in this section to help identify strategies specific to the Central Vermont interchanges.

CENTRAL VERMONT'S INTERCHANGES

There are five interchanges on I-89 in the Central Vermont region as shown in Figure 17. The character of each interchange is as unique as the area it serves.

Figure 17: I-89 interchanges in Central Vermont



Exit 10-Waterbury

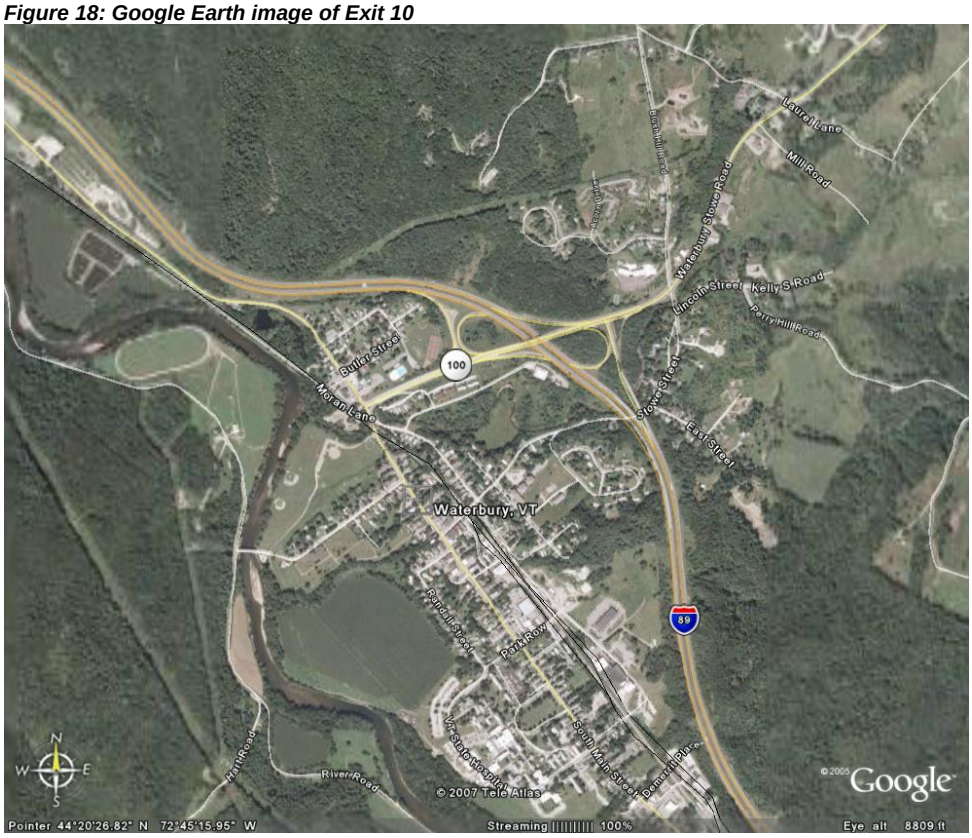
As shown in Figure 18, Waterbury Village is quite close to Exit 10. In the 2003 Waterbury Municipal Plan, the Exit 10 area is considered part of Waterbury Village and the area surrounding the interchange is mostly zoned Village Residential. The 2007 CVRPC Northwest Buildout Study[1] notes

[1] Available at http://www.transportation-landuse.org/pages/links/cvrpc.htm.

that as the northernmost town on I-89 in Central Vermont, Waterbury feels "strong secondary growth impacts from Chittenden County."

Exit 10 provides access to Stowe, which is a popular tourist destination. Many people who use Exit 10 bypass Waterbury Village altogether as they travel northeast on VT 100 towards Stowe. This potential demand for traveler services may be very tempting for developers.

Figure 18: Google Earth image of Exit 10



The VT 100 Access Management Plan (completed in 2004) examined the VT 100 corridor between Waterbury and Morrisville to identify areas of access management deficiencies and recommend potential improvements. The section of VT 100 north of Blush Hill Road was identified as an area of highly concentrated access management deficiencies and specific recommendations were developed for a number of access points in this section (see Figure 19). Some of these recommendations have since been implemented with the construction of the new Shaw's shopping center. Additionally, the CVRPC has recently begun a VT Byway Corridor Management Plan for the section of VT 100 north of I-89 in Waterbury and Stowe.

Figure 19: Access Management Recommendations for VT 100 North of Blush Hill Road

The *Vermont Interstate Interchange Planning and Development Design Guidelines* used Exit 10 as an example of an interchange located on a regional arterial highway with the potential for strip development. The following is an excerpt from the Design Guidelines.

Exit 10 in Waterbury is intersected by a regional transportation corridor. Rte. 100 is the only thoroughfare between the interstate and the fast-growing Stowe/Morrisville area. Traffic volumes along Rte. 100 are high and growing steadily. The segment of Rte. 100 just north of the interchange (shown below) lies within two commercial zoning districts, one of which extends north to the Stowe town line. Despite the physical constraints presented by a sloping site, incremental strip development has occurred here in past years, altering the traditional pattern of open land punctuated by dense development at the crossroads.

Under a current trend scenario, retail development continues to appear along the highway, hugging the road for direct access and visibility. Several curb cuts are added, slowing traffic with additional turning movements. The high traffic numbers, and potential customers, justify the higher costs associated with building on these difficult sites. Extensive cutting is necessary to carve space out of the wooded hillside on the western side of the road and filling is required to create level space close to the road on the east side. A traffic-generating large-scale market increases the congestion. The auto-oriented pattern prevents pedestrian trips between businesses.

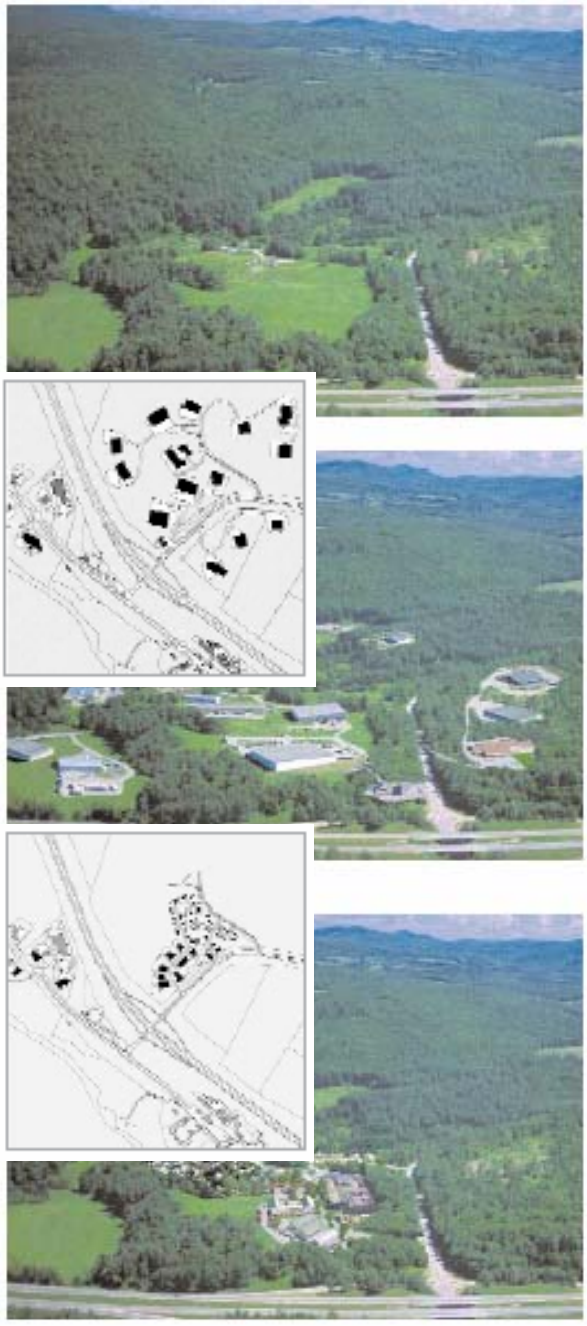
In an alternative scenario, development is located in fewer areas of the site but at a higher density. A broader range of uses and an interconnected street network could mitigate some of the traffic problems associated with development. With the construction of a slower parallel road business traffic could be separated from through traffic. Curb cuts would be consolidated into two locations on Rte. 100. Industrial and/or office buildings could sit comfortably in this setting. Aligned in a tighter pattern along the new street, they would be able to share circulation and loading space. The large parking lot could accommodate the turning requirements of trucks. Given the short distances and traditional street profile, pedestrians would be able to walk comfortably from building to building. Moving development away from the highway would also relocate it to a more level spot, suitable for building.

Exit 9-Middlesex-Moretown

Exit 9 is technically in Middlesex, although it is very close to the Middlesex-Moretown town line. The emerging village center of Middlesex Village is located nearby and to the south of the interchange. The 2007 Middlesex Town Plan notes that the area around the interchange is designated as Village and Industrial-Commercial districts. As shown in Figure 20, the area is largely undeveloped with the village to the southeast of the interchange and an industrial park to the north of the interchange.

Figure 20: Google Earth image of Exit 9

The *Vermont Interstate Interchange Planning and Development Design Guidelines* used Exit 9 as an example of an interchange located next to a New or Emerging Growth Center. The following is an excerpt from the Design Guidelines.



Nearby Middlesex Village has very little space to grow, but the area northwest of I-89, Exit 9 (shown in the upper left) offers gently sloping terrain, an ample supply of groundwater and good soils for on-site septic disposal. Travelers on I-89 catch glimpses of the open fields to the left as they approach the interchange from the north.

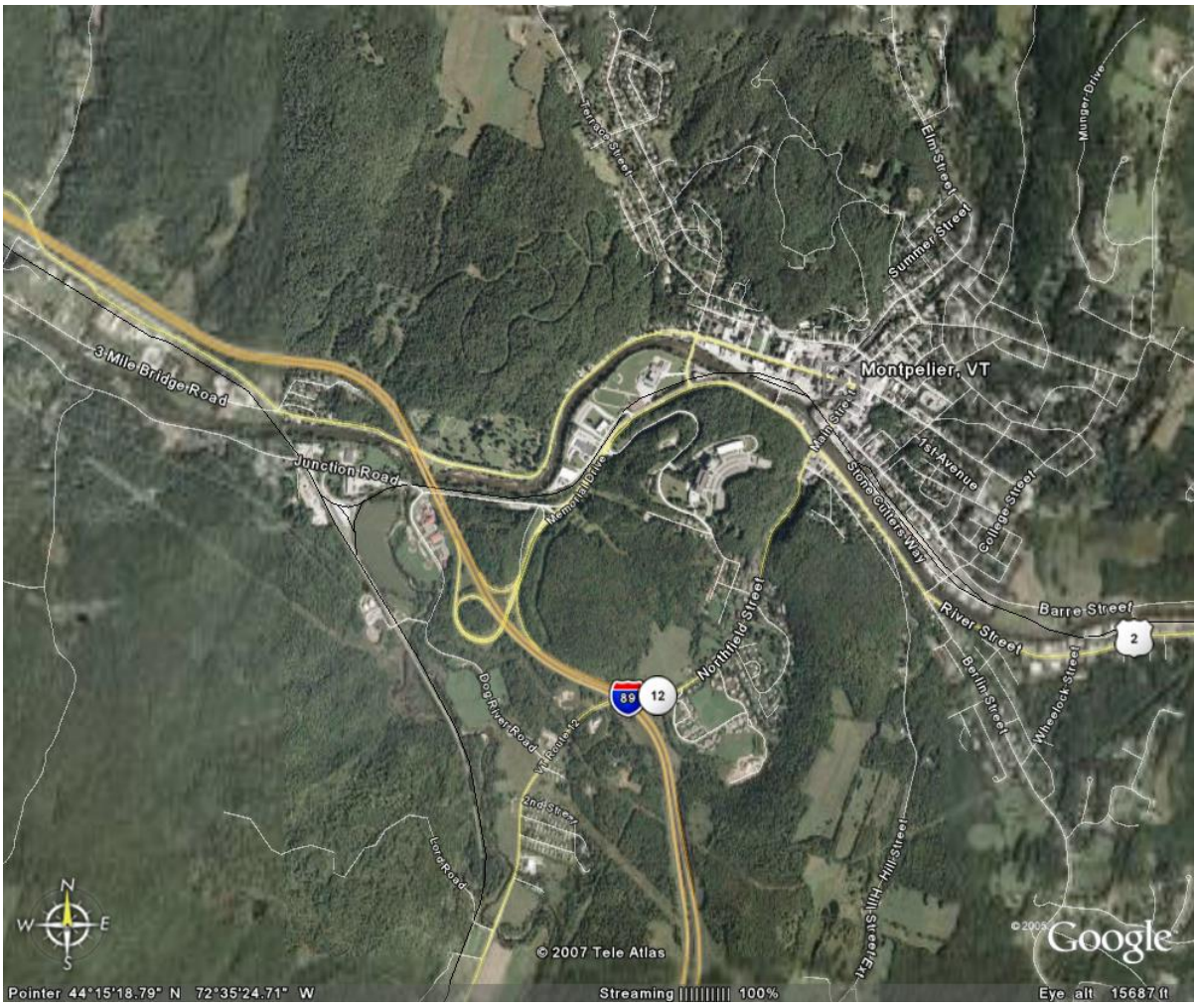
Until recently Middlesex's land use regulations defined this entire area as a 600 acre industrial zone. The large size of the district would provide no incentive to site buildings and driveways efficiently. Development could extend across the site, leaving no open fields. The large, one-story, single-use buildings (warehouses and truck facilities) shown here are typical of structures built recently at interchanges around the state. The pattern is auto-dependent with a road layout that is costly to build and maintain.

Middlesex is considering revisions to the town's zoning to establish a smaller commercial district and a wider mix of uses. Although less land is developed, the more compact pattern provides a substantial amount of space for a combination of light industrial, office and residential uses. While large industrial buildings are appropriate in some new growth center settings, this particular community is considering limits to the size of new structures. The image reflects Middlesex s interim rules limiting building size to 15,000 square feet. The smaller building size, tighter layout, and interconnected street network create a more village scale development.

Exit 8- Montpelier

Exit 8 provides access to Montpelier and is the point at which US 2 leaves I-89 and heads east towards St. Johnsbury. (From this point through the Green Mountains to Burlington, US 2 runs roughly parallel to I-89.) The 2006 City of Montpelier Zoning Map shows the eastern portion of Exit 8 zoned for Office Park and the western portion zoned Industrial. The interchange does not provide direct access to the area west of the interstate. Figure 21 shows that downtown Montpelier is located approximately 1.5 miles to the northeast of the interchange.

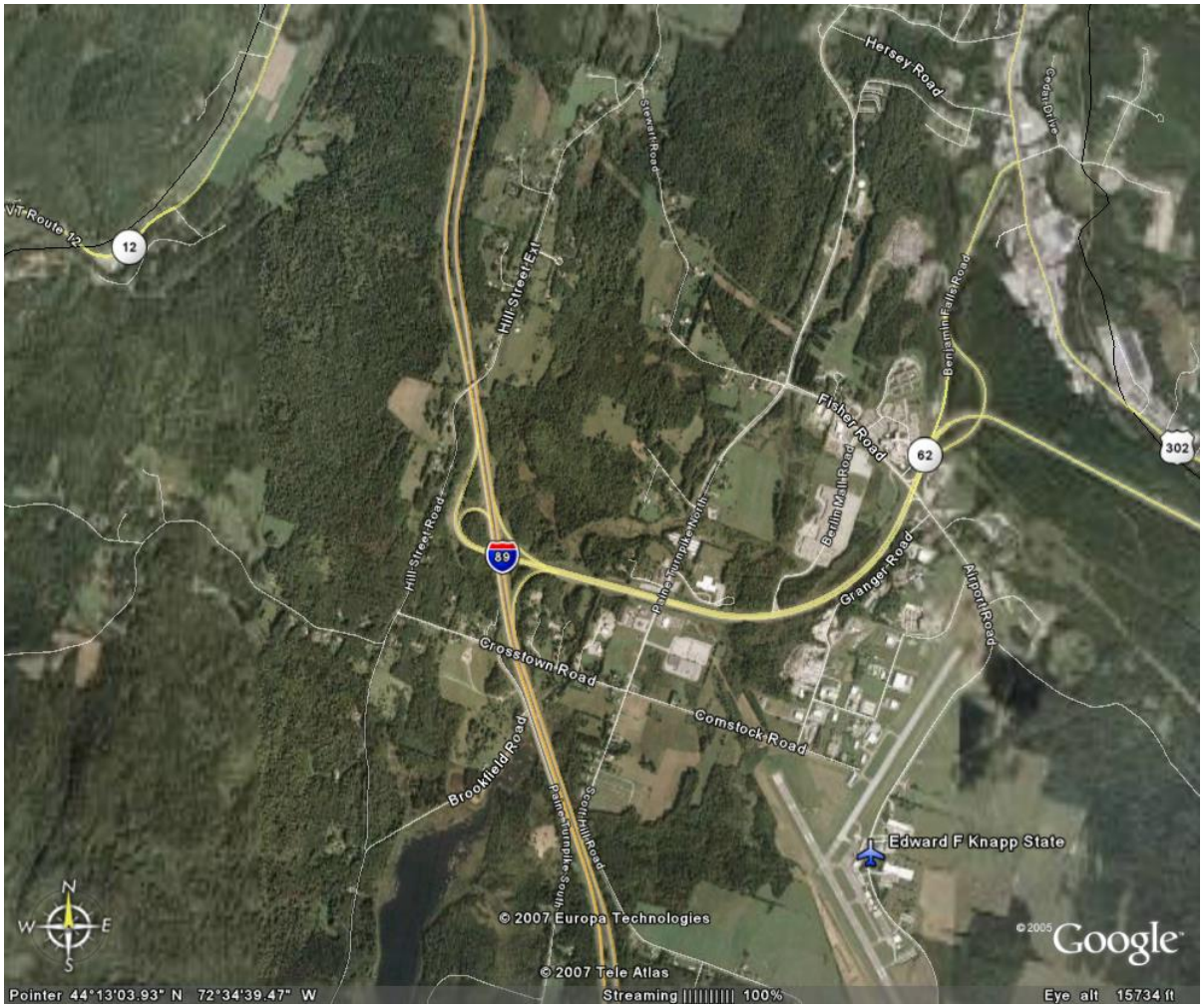
Figure 21: Google Earth image of Exit 8



Exit 7- Barre-Berlin

The area around the Exit 7 interchange has been the subject of much study lately as it is adjacent to the planned Berlin Town Center (the area around the Berlin Mall, bound by VT 62, Fisher Road, and Paine Turnpike), major shopping and employers, and the VT 62 and US 302/Barre-Montpelier Road corridors. The interchange studies are summarized in the next section. Figure 22 provides an overview of the interchange and the surrounding area.

Figure 22: Google Earth image of Exit 7



Exit 6-Berlin

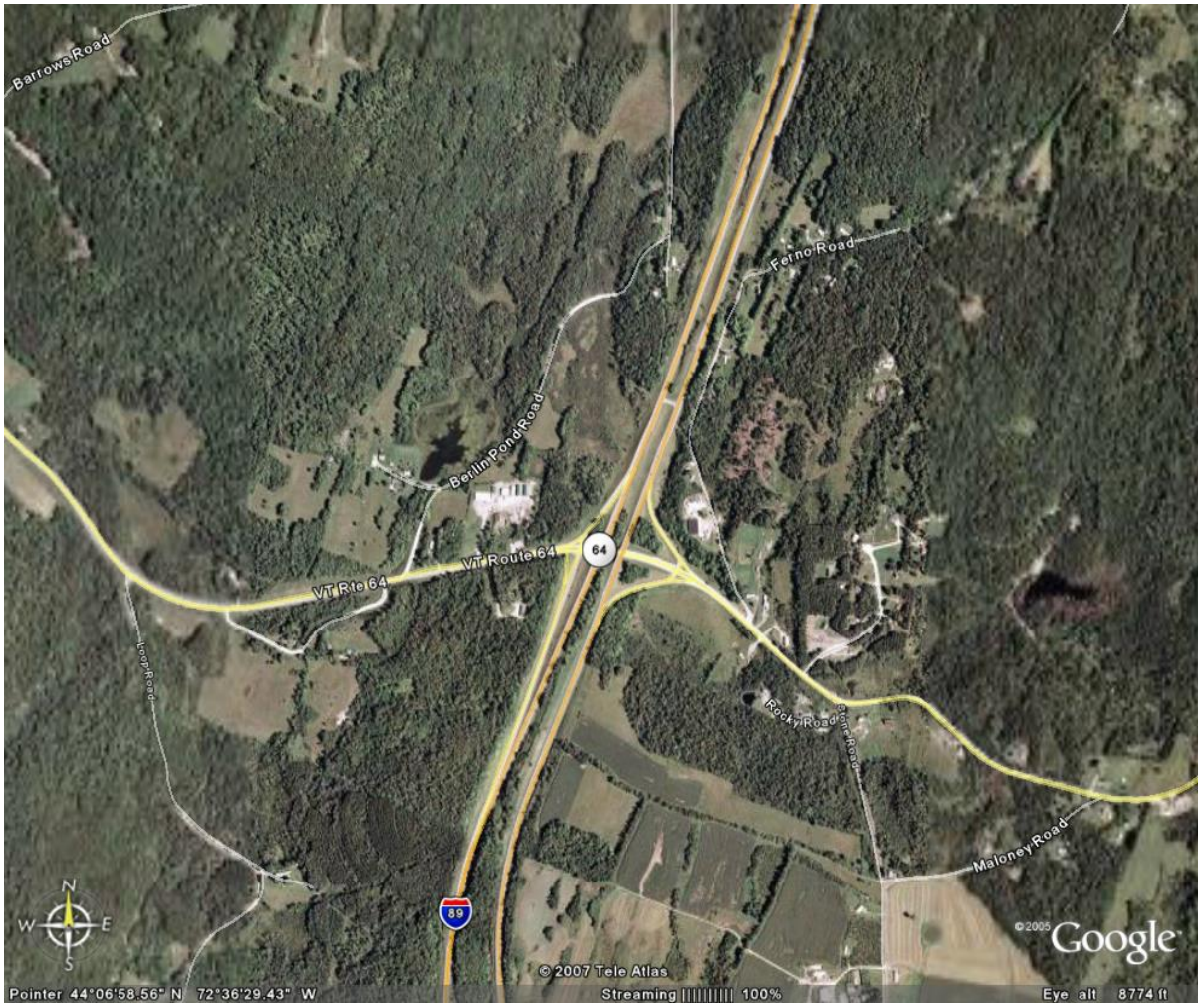
The "other" Berlin interchange has not been studied as thoroughly, although a build-out analysis for Exit 6 was performed in 2003. Figure 23 shows that the area is much more rural than Exit 7. The 2003 Berlin Future Land Use map identifies the area to the east of I-89 as Commercial and the area to the west, which does not have direct access to the interstate as Highland Conservation.

Figure 23: Google Earth image of Exit 6

Exit 5- Northfield-Williamstown

Exit 5 is located in Williamstown and is adjacent to the Northfield town line. Williamstown does not have zoning, but its 2005 Town Plan discourages large scale commercial and industrial development. Figure 24 shows that the area is quite rural, much like Exit 6. The interchange provides access to VT 64, which is not recommended for large trucks due to its significant downgrades. This restriction may affect development around the interchange.

Figure 24: Google Earth image of Exit 5



OVERVIEW OF INTERCHANGE TYPES

The *Vermont Interstate Interchange Planning and Development Design Guidelines*[1] identifies six categories (listed in Table 3) to describe the types of interchanges that are most commonly found in Vermont. Each category represents different growth contexts and development conditions. The Design Guidelines explain that "Types A, B, and C are found in areas near existing settlement, where a higher level of growth is appropriate. Types D and E are in outlying areas where growth should be more limited in scope. Type F is a special category interchanges with little or no access to the surrounding land."

Table 3: Design Guideline Categories

Category	Description
A. Nearby Village or Downtown	A village or downtown is located within 1.5 miles of the interchange. There is undeveloped land between the Type A interchange and the village/downtown. Development in this context presents the opportunity to expand the village fabric in an interconnected, compact pattern at an urban or village density. Some examples of this type are St. Albans (I-89, Exit 19), Montpelier, Sharon, Putney, Weathersfield, Norwich, Fairlee, Barton, Orleans, St. Johnsbury (I-91, Exit 20), Derby Line, and Barnet.
B. New or Emerging Growth Center	A village or downtown is located near the Type B interchange but cannot be expanded in a contiguous pattern because of development constraints. A satellite growth center, with a mix of uses that complement rather than compete with the traditional center can be developed on land near the interstate. This category is a subset of the village/downtown type. It is difficult to identify which interchanges fit this type without a more detailed analysis of building constraints and opportunities at each site. Middlesex, however, is one example. Some interchanges that appear to fit the type A profile might actually fall into this category after closer review at the local level.
C. Regional Arterial Highway/Potential Strip Development	The intersecting highway functions both as a regional corridor and connector to a town center in the Type C interchange. There is a significant volume of traffic and increasing amount of commercial strip development along the highway. This category includes the more highly developed interchanges such as Williston, South Burlington, Colchester (I-89, Exit 16), Berlin (I-89, Exit 7), White River Junction, and Brattleboro (I-91, Exits 1 and 3), where new infill development can inject a wider variety of uses and more a walkable pattern. Also included in this type are less developed interchanges that are now emerging as strip highways: St. Albans (I-89, Exits 19 and 20), Royalton, Bradford, Derby (I-91, Exit 28), and Waterbury. In these cases new development could be designed to modify the linear pattern, by being limited to specific areas or nodes and surrounded by open land. In both cases access to the highway needs to be carefully managed in order to protect the transportation function.
D. Connector Road	For the Type D interchange, the intersecting highway or access road carries primarily local

[1] Developed by the Vermont Department of Housing and Community Affairs, 2004.

	traffic or traffic headed to a downtown more than 1.5 miles away. Growth pressure is less intense and the existing settlement, which takes a linear form, is sparse. To encourage the historic settlement pattern and channel most new commercial uses to the town center, limits would be needed on new commercial uses at the interchange. Uses demanding proximity to the interchange can be sited to protect visual and natural resources. Hartford, Randolph, Rockingham, Weathersfield, and Richmond are some other examples of Type D interchanges.
E. Rural, Interstate-Related	Existing development in the rural Type E locations is primarily limited to interstate-related uses such as traveler services, and transportation and trucking facilities. Since they do not need to be visible from the road, buildings are distributed in a dispersed rather than a linear pattern. In order to continue this pattern of use, new growth would need to be limited in scope and carefully sited. Examples of Type E interchanges include Williamstown, Springfield, Berlin (I-89, Exit 6), Westminster, Hartland, Lyndon (I-91, Exit 24), and Newbury.
F. Limited Access Highways	Lack of access to land on intersecting highways prevents development at these interchanges, which are most often located at the intersection of two controlled access roads. Examples include Hartford (I-91, Exit 10), Derby (I-91, Exit 27), and St. Johnsbury (I-91, Exits 19 and 21).

Table 4 shows which type of interchange each of the interstate exits in Central Vermont is according to the Interchange Planning and Design Guidelines.

Table 4: Classification of Central Vermont's Interchanges

Exit 10-Waterbury	C. Regional Arterial Highway/Potential Strip Development
Exit 9-Middlesex/Moretown	B. New or Emerging Growth Center
Exit 8-Montpelier	A. Nearby Village or Downtown
Exit 7-Berlin/Barre	C. Regional Arterial Highway/Potential Strip Development
Exit 6-Berlin	E. Rural, Interstate-Related
Exit 5-Northfield/ Williamstown	E. Rural, Interstate-Related

SUMMARY OF RELEVANT STUDIES

Since 2000, a number of studies have been completed for Central Vermont's interchange areas. Several of the studies focus on Exits 6 & 7 and identify the vision for a new village center in Berlin, potential land uses, and related impacts. Table 5 summarizes the findings and recommendations of relevant interchange studies.

Table 5: Summary of findings from relevant studies

Study	Findings/Recommendations
Planning Concepts for A New Town Center and The Barre-Montpelier Road Corridor; prepared for the Town of Berlin by ORW & Burnt Rock, May 2000	• Study envisions new town center at Four Corners of Berlin at Paine Turnpike & Comstock Road. • Study provided alternative designs that focus on making the Barre-Montpelier Road (US 302) a multi-modal corridor. • Significant truck volume exists on Route 302. • Locals avoid the Barre–Montpelier Road by taking Berlin Street to Paine Turnpike or Fisher Road by the Berlin Hospital to get to downtown Barre. <u>Recommendations:</u> • Make VT 62 a divided boulevard between Paine Turnpike and Fisher Road, including new pedestrian crossings. • Roundabouts at VT 62-Paine Turnpike, VT 62-Fisher Road, and US 302-VT 62. • Study proposed new development guidelines for future commercial or mixed use development along the corridor. • Encourage uses that will attract economic development to Berlin so that it will stop being a bedroom community. • Revise current zoning to allow higher densities, mixed uses, and street and parking standards. • Encourage private development to build neighborhoods, coordinated streets and pedestrian ways, and open spaces. • Establish long-term working relationship between town and private land owners to balance private development with public improvements.
VT Route 62 and US 302/Barre-Montpelier Road Corridor Study, prepared for the CVRPC, by DuBois & King, December 2001	• Study recommended improvement alternatives, including access management, pedestrian walkways, street trees and lighting, landscape buffers, intersection upgrades, and transit facilities. • Intersection-specific recommendations: **Intersection** — **Recommendation** Barre-Montpelier Rd – Berlin State Hwy — • Signal upgrade Barre-Montpelier Rd – Central VT Shopping Center — • Signal upgrade Barre-Montpelier – Harry's/McDonald's — • Signal upgrade Barre-Montpelier – Ames Plaza — • Signal upgrade VT Route 62 – Paine Turnpike — • Roundabout VT Route 62- Berlin Mall — • Roundabout VT Route 62 – Fisher Road — • Roundabout

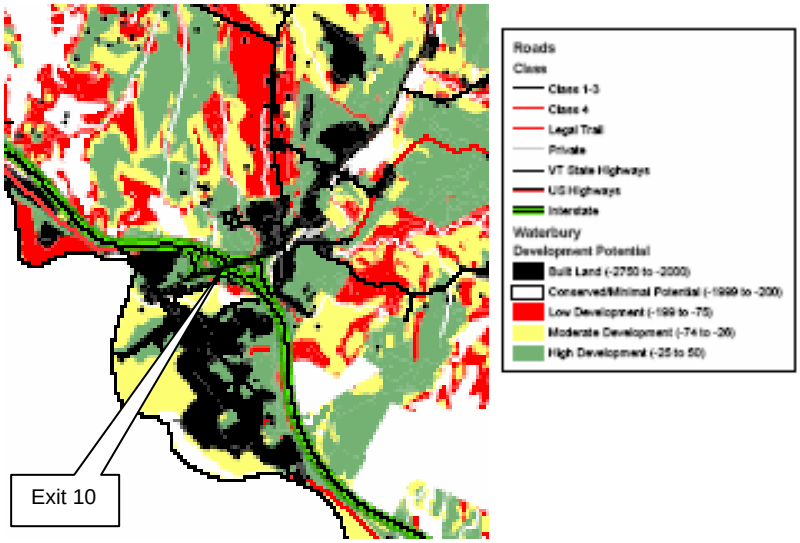
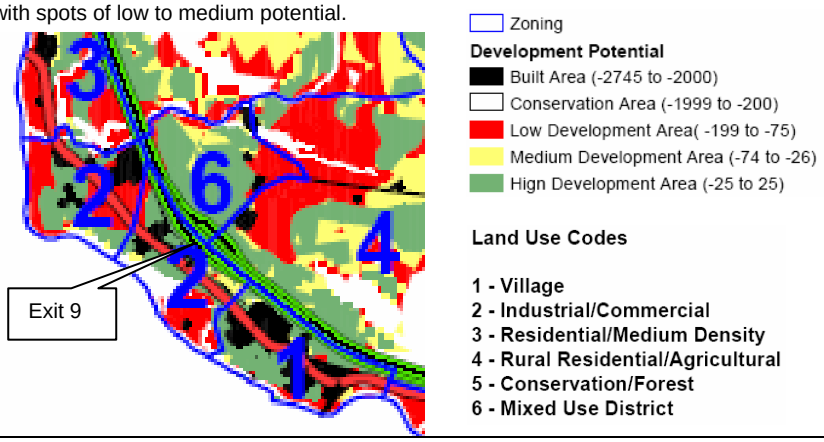
Table 5-continued

<table>
<tr><td>Middlesex Community Design Charrette Report, by UVM November 2003</td><td colspan="2">• Interchange aspect of the charrette acknowledged that interchange should not compete with mixed-use development in the village core.
• Next steps include determining market potential for senior housing, rural residential, and mix of home businesses, commercial condominiums, rural small scale hi-tech industrial, hi-tech/low-tech eco-businesses.
• Next steps include developing design guidelines for Atwood and Colby properties.</td></tr>
<tr><td rowspan="11">Berlin Interchanges Build-Out Analyses, prepared for the Town of Berlin by WSA, December 2003</td><td colspan="2">• Exit 7 existing conditions build-out analysis showed potential for additional 460 residential units (single family) and 705,000 square feet of commercial development.
• Exit 6 existing conditions build-out analysis showed potential for additional 100 residential units (single family) and 15 commercial units.
• Study estimated impacts of different alternatives:</td></tr>
<tr><td>(from Table A.4-1)</td><td>Exit 7
(vehicle-trips per day)</td></tr>
<tr><td>Existing Conditions Build-Out</td><td>36,300</td></tr>
<tr><td>Berlin Four Corners Build-Out</td><td>41,050</td></tr>
<tr><td>Berlin Mall Village Build-Out (preferred alternative)</td><td>35,300</td></tr>
<tr><td>(from Table A.4-2)</td><td>Exit 6
(vehicle-trips per day)</td></tr>
<tr><td>Existing Conditions Build-Out</td><td>7,600</td></tr>
<tr><td>Expanded Commercial Build-Out (preferred)</td><td>803</td></tr>
<tr><td>Residential-Only Build-Out</td><td>9,833</td></tr>
<tr><td colspan="2">Among the study's recommendations:
• create special zoning districts
• require interconnections
• expand the limits of the Exit 6 commercial district
• encourage pedestrian and bicycle traffic
• minimize cul-de-sacs
• encourage shared driveways
• create a pedestrian path system to link the proposed Village Residential District with the Berlin Elementary School
• implement the recommendations of the Route 62 Corridor Study
• create a 4th approach to the south of the existing Route 62-Berlin Mall Access Drive</td></tr>
</table>

Table 5-continued

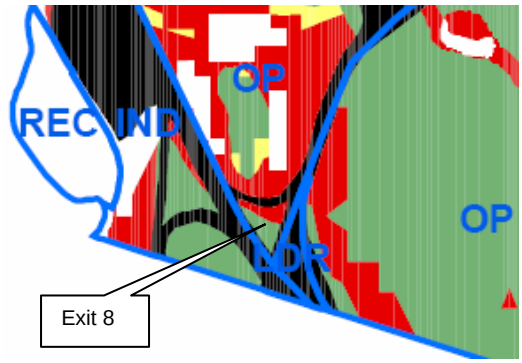
<table>
<tr><td>VT 100 Access Management Study, prepared for Lamoille County Planning Commission and CVRPC by RSG, September 2004</td><td>Findings/Recommendations:
• The potential need for a four-lane cross section along VT 100 between I-89 to south of Colbyville.
• Construct the New Town Road between Stowe Street and Guptil Road in Waterbury.
• Construct the Route 100 Alternate Truck Route.
• The VTrans Access Management Category should be revised from “3” to “2” along VT 100 and VT 15 near their future intersections with the Alternate Truck Route.
• A critical issue that was identified in the public outreach efforts was the importance of bicycle travel for residents and tourists along VT 100. Any roadway design changes should incorporate the recommendations of the "Vermont Pedestrian and Bicycle Facility Panning and Design Manual" published in April, 2003.
• To provide efficient connections between the local road system and VT 100, and VT 100 and the state and national highway routes, a mix of turn lanes at unsignalized intersections, traffic signals, and roundabouts is recommended to address the projected congestion and existing safety problems identified in the corridor through 2025.</td></tr>
<tr><td>The Berlin Mall Village Center Study, prepared for the Town of Berlin by WSA, March 2005</td><td>• Envisions town center around the Berlin Mall, connecting with the hospital and elementary school. Study area is north and west of VT 62, south of Fisher Road, and east of Paine Turnpike.
• Recommends roundabouts at VT 62-Berlin Mall and VT 62-Fisher Road.
• Land use is retail, office, and residential in multi-story structures located close to road to be at pedestrian scale.
• All residential areas would be multi-family, not single family, with density of at least ten units per acre.
• Six proposed access points to Village Center: three on Paine Turnpike, two on Fisher Road and one on VT 62.
• Village Plan includes extending Berlin Mall Access Road east across VT 62.
• Study estimated impacts of different alternatives (from Table 1 in study):
<table>
<tr><td></td><td>Berlin Mall Village Build-Out</td><td>Existing Zoning Build-Out</td></tr>
<tr><td>Total # of Dwelling Units</td><td>533</td><td>0</td></tr>
<tr><td>Total Floor Area</td><td>541,235 SF</td><td>1,275,000 SF</td></tr>
<tr><td>Additional Office Vehicle Trips</td><td>1,240 vehicle-trips per day</td><td>5,925 vehicle-trips per day</td></tr>
<tr><td>Additional Retail Vehicle Trips</td><td>4,350 vehicle-trips per day</td><td>0 vehicle-trips per day</td></tr>
<tr><td>Additional Residential Vehicle Trips</td><td>5,330 vehicle-trips per day</td><td>0 vehicle-trips per day</td></tr>
<tr><td>Total Additional Vehicle Trips</td><td>14,840 vehicle-trips per day</td><td>21,250 vehicle-trips per day</td></tr>
</table></td></tr>
</table>

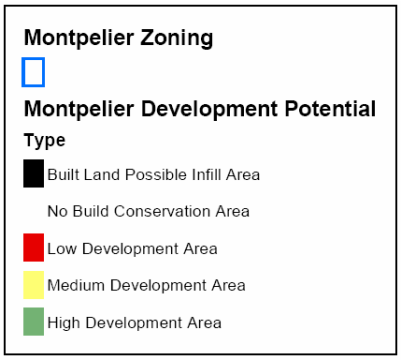
Table 5-continued

The CVRPC Northwest Study, prepared as part of *The Northwest Project* by the CVRPC, Spring 2007	Study provides Development Potential and Buildout Analyses for municipalities along the I-89 corridor in Central Vermont. Findings: ***Waterbury****:* Exit 10 is already fairly developed as shown in the excerpted portion of the Development Potential Map below, but there is still high development potential in places, particularly east of the interstate.  ***Middlesex***: Interchange area is zoned Industrial/Commercial, Mixed Use District, and Rural Residential/Agricultural as shown in the excerpted portion of the Development Potential Map below. The potential for development in Moretown in the vicinity of the interchange is mostly high, with spots of low to medium potential. 

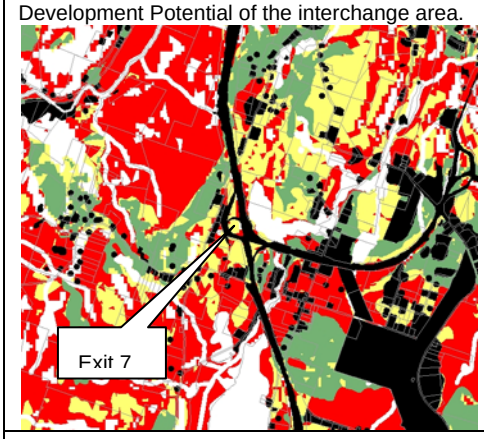
The CVRPC Northwest Study, prepared as part of *The Northwest Project* by the CVRPC, Spring 2007

***Montpelier**:* Interchange area surrounded by Office Park, Industrial, and Low-Density Residential zones. Development potential (as shown below) ranges from high to low.

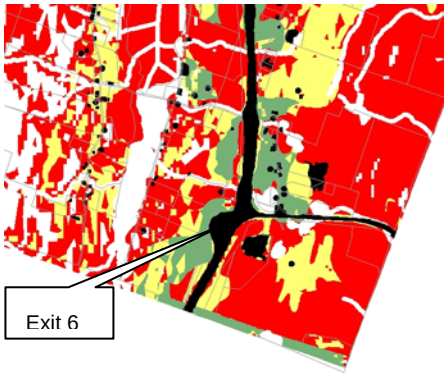




***Berlin Exit 7*:** Exit 7 is adjacent to the future Berlin Town Center at the Mall as shown below in the Development Potential of the interchange area.



***Berlin Exit 6*:** The northwest, northeast, and southwest quadrants of Exit 6 are zoned Highland Conservation, while the southeast quadrant is zoned Commercial. There is little anticipated development compared to Exit 7.



SUMMARY OF STATEWIDE TRANSPORTATION IMPROVEMENT PLAN (STIP)

Table 6 lists projects identified in the 2008-2011 STIP which involve or are in the vicinity of the interstate interchanges in Central Vermont. Of particular note is the rehabilitation of the interstate bridge over VT 12 in Berlin and the installation of traffic signals at the off-ramps at Exit 10.

Table 6: Summary of 2008-2011 Draft STIP projects on or near I-89 in Central Vermont

Location/Route	Project	Description
Middlesex-Moretown	State Bridge BRS 0284(14)	Bridge replacement (listed on page 15 of STIP)
Berlin/I 89	IM 089-1(20)	Project is for rehabilitation of BR40 N&S on I-89 in Berlin, over VT 12.
Waterbury/VT 100-I-89 Ramp	NHG SGNL (27)	Installation of traffic signals at the VT100/I-89 ramp "G" intersection in Waterbury.
Montpelier/US 2	NH 2604	Resurface US 2 (Class I TH) in Montpelier, beginning approximately at the Bailey Street bridge and extending easterly 2.748 miles to the Montpelier-Berlin town line.
Waterbury/US 2	STP 2607	Resurfacing US 2 in Waterbury Village (Class I), beginning 3.517 miles east of the Bolton-Waterbury town line and extending easterly 1.378 miles.
Williamstown-Barre Town/VT 14	AC STP 2210(1)S	Project is for resurfacing VT 14 in Williamstown and Barre Town, beginning approximately 3.8 miles north of the Brookfield-Williamstown town line and extending northerly 4.739 miles to the VT 14/VT 63 intersection.
Williamstown-VT 64	BRS 0204(4)	Replacement of BR10 in the town of Williamstown over Brook No. 2.

PLANNING STRATEGIES FOR CENTRAL VERMONT

Based on the information provided in the Interchange Design Guidelines, we have identified strategies that can be applied to the interchanges in Central Vermont. Since each of the interchanges has a unique character, different strategies are appropriate for each. Table 7 summarizes the current level of planning for each interchange and recommended strategies.

Public outreach is an essential part of any planning strategy. A regional perspective should be included by coordinating with the CVRPC, and towns should take advantage of state resources.

Table 7: Current Planning and Recommended Strategies for Central Vermont's Interchanges

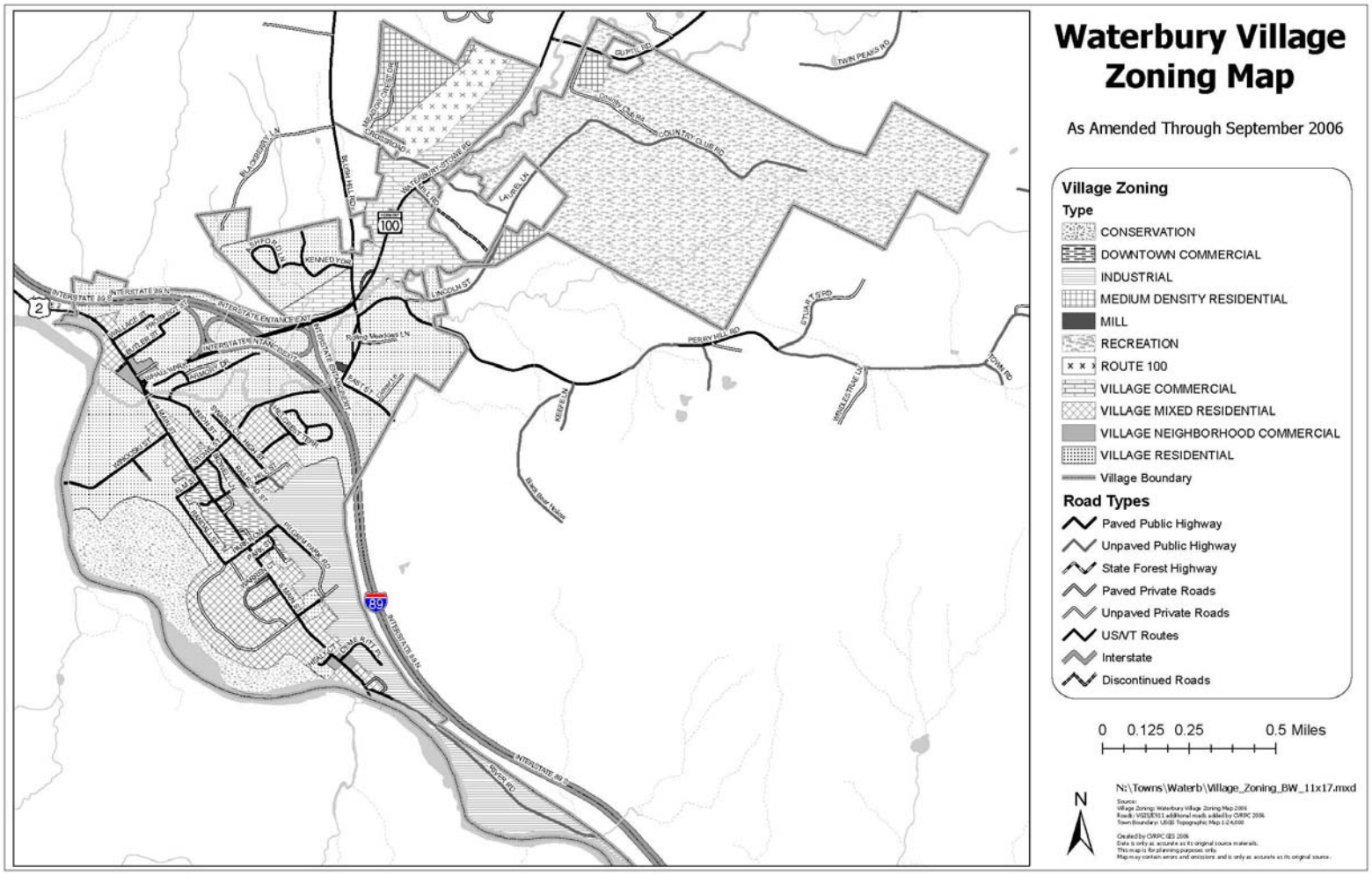
Exit 10-Waterbury	The 2003 Waterbury Municipal Plan directs future growth to Waterbury Village and Waterbury Center Village. The interchange area is considered part of Waterbury Village and the surrounding area is mostly zoned Village Residential. As shown in Figure 25, the zones are small so districts may not be necessary. ***Recommended strategy****: Develop an Interchange Area Plan for Exit 10 or a more specific Waterbury Village Plan that includes Exit 10.*
Exit 9-Middlesex/ Moretown	The 2007 Middlesex Town Plan includes a Middlesex Village/Exit 9 Land Use and Development Plan in Chapter 10. This section promotes the revitalization of Middlesex Village and expansion of its mixed use, dense development pattern. In addition, the Middlesex Town Plan identifies various districts that have been established around Exit 9: Village (immediately south of I-89) and Industrial Commercial (immediately north of I-89). Within these districts, Historic Village and Village-West sub-areas have been defined. The Town Plan identifies unacceptable uses for the interchange area so that they do not threaten village development or the surrounding character and scenery. Examples of such uses are traveler services, large retail stores, and warehouses. The Plan directs major commercial activity towards the historic village area, and recommends establishing a new mixed use district immediately north of the interchange and a large portion of that land to be a conservation district. ***Recommended strategy****: Focus efforts on developing mixed-use district to the north of the interchange and Middlesex Village. Coordinate future plans with Moretown since the town line is adjacent to the interchange.*
Exit 8-Montpelier	The 2006 City of Montpelier Zoning Map shows that the eastern portion of Exit 8 is zoned for Office Park and is within the Design Control District. The western portion is zoned Industrial. The 2000 Montpelier Master Plan does not mention Exit 8 in Chapter 5-Transportation & Circulation or in Chapter 11-Land Use & Development. ***Recommended strategy****: Specific planning around the interchange should take place. Future plans should be coordinated with Berlin since the town line is close to the interchange.*
Exit 7-Berlin/Barre	Build-out analysis was prepared in 2003. Future land use and zoning maps[1] show area as Commercial, Light Industry, and Town Center. While there are Rural Residential areas immediately around the interchange, they are not accessible from VT 62. ***Recommended strategy****: As Village Center plans progress, continue to monitor potential effects on interchange area traffic operations.*
Exit 6-Berlin	The Berlin Future Land Use map[2] shows the area to the east of I-89 as commercial and the area to the west as highland conservation. The 2005 Berlin Town Plan also notes that the southeast quadrant of Exit 6 is designated commercial. ***Recommended strategy****: Develop an Interchange Plan.*

[1] Available at http://www.berlinvt.org/berlinfutrelnaduse.jpg.

[2] Ibid.

Exit 5-Northfield/ Williamstown	Chapter 10-Land Use of the 2005 Town Plan recommends seeking "a municipal planning grant to study the Interstate Interchange areas to get a better understanding of the long-term needs/impacts of possible development" and conforming to the Interstate Interchange Design Guidelines Manual, noting that ongoing traffic studies will be necessary to update designs and accommodate growth. Williamstown does not have zoning, but the town plan makes special note of the interchange area and discourages large scale commercial and industrial development which could threaten Williamstown Village. ***Recommended strategy**: Develop an Interchange Plan; coordinate planning with Northfield since the town line is close to the interchange. Investigate developing a basic zoning ordinance to help guide development in town.*

Figure 25: Waterbury Village Zoning Map (source: Town of Waterbury



DEVELOPMENT TOOLS

Municipalities and the CVRPC can implement plans for interchange areas using both regulatory and non-regulatory development tools. The *Vermont Interstate Interchange Planning and Development Design Guidelines* has developed a list of available tools and they are provided here in Table 8 and Table 9.

Table 8: Municipal Interchange Development Tools (Regulatory) (source: Vermont Interstate Interchange Design Guidelines)

Zoning Bylaws	Regulate the type and density of development. Administered by the ZA, PC and ZBA, or DRB.
Zoning Districts	Standards defining allowed uses and densities of development (lot, setback, frontage, coverage requirements). Examples: Interchange, Mixed Use, Industrial/Office, Traveler Service, Conservation districts
Overlay Districts	Designated areas in which additional standards (e.g., design standards) will be applied to supplement or substitute for the standards of the underlying zoning district. May overlay one or more underlying zoning districts. Examples: Design Review, Scenic, Gateway, Corridor districts.
Site Plan Review	Standards that may apply to all allowed uses except for single and two-family dwellings, including site layout and design, access, traffic and pedestrian circulation, landscaping and screening, and other standards as specified in the bylaws (e.g., building orientation, parking areas, lighting). Administered by the PC or DRB; no warned public hearing is required.
Conditional Use Review	Standards applying to listed "conditional uses," to evaluate and avoid or mitigate project impacts on the capacity of existing or planned community facilities, the character of the area, traffic on roads and highways in the vicinity, other municipal regulations, the use of renewable energy resources, and other resources or facilities as specified in the bylaws (e.g., the design and location of structures and service areas, signs, landscaping). Administered by the ZBA or DRB; a warned public hearing is required.
Design Review	Standards applying to site layout and building design (typically within a design review district); planning study required to identify design issues and criteria. Administered by the PC or DRB; a design review board may serve in an advisory capacity to the PC, DRB and applicants.
Parking Standards	Standards for the number of required parking spaces by district and/or use type; may also include standards for parking area design, layout and screening, loading and service areas. May be administered by the ZA, and/or in association with site plan or conditional use review.
Access Management Standards	Standards for limiting the number of access points per lot, frontage distance or use by district or road type; may also include access location and design standards, and reference other state and town access permits.
Sign Standards	Standards for the location, height, sign area, design and illumination of on-premise signs. May also be adopted as a separate ordinance.
Use Standards	Standards that apply to specific types of use, to more specifically regulate their siting, layout and design (e.g., gas stations, industrial/office parks).
Subdivision Bylaws	Regulate the pattern of development and supporting infrastructure. Administered by the PC or DRB; hearing required for final plat approval.

Resource Protection Standards	Standards that limit the subdivision of, or otherwise protect, significant natural, cultural and/or scenic features (e.g., through the designation and siting of building envelopes on lots).
Settlement Pattern Standards	Standards that encourage or require compatible lot and road layouts. Examples: traditional neighborhood, transit oriented, or conservation/open space subdivision designs.
Infrastructure Standards	Standards for the provision and design of supporting infrastructure and utilities (e.g., context sensitive road and pedestrian design, water/sewer line extensions). Should be consistent with other municipal infrastructure standards, official map.
Master Planning	May include master plan, phasing requirements for larger projects, especially in relation to an adopted municipal capital budget and improvement program.
Planned Development [PUDs, PRDs]	Standards for planned unit development (PUD) or planned residential development (PRD), adopted under zoning and administered in association with subdivision review, which allow density modifications to promote clustered development and protect open space. Administered by the PC or DRB.
	KEY: ZA- Zoning Administrator; ZBA- Zoning Board of Adjustment; PC- Planning Commission; DRB- Development Review Board

Table 9: Municipal Interchange Development Tools (Non-Regulatory) (source: Vermont Interstate Interchange Design Guidelines)

A municipality may use the following non-regulatory tools, alone or in conjunction with local bylaws, with the purpose of implementing a municipal plan and the state land use goals.	
Capital Budget and Program	A municipality may adopt a five-year capital program, updated annually and divided into annual capital budgets, to provide for maintaining current and acquiring future capital improvements.
Tax Increment Financing	Pursuant to 24 VSA 53, subchapter 5 (§1891 - 1900), a municipality may issue bonds to pay for new infrastructure, such as roads, water and sewer lines, in a defined growth center, and apply the incremental tax revenues to pay off those bonds for up to 10 years.
Development Agreements	When it furthers the objectives of the municipal plan and is not possible under current regulations, a municipality may adopt a process, with standards and criteria for its application, to negotiate an agreement for review of a particular parcel that establishes the rights and obligations of all parties.
Transfer, Purchase or Acceptance of Development Rights	A municipality may specify sending and receiving areas in order to transfer, purchase or accept the donation of development rights, to further the conservation or development objectives of a plan.
Supplemental Plans to the town plan, which may ultimately become incorporated into the town plan may include:	Official Map. A municipality may adopt an official map which identifies future municipal utility and facility improvements, such as road or path rights-of-ways, parkland, utility rights-of-way and other public improvements to provide the opportunity for the community to purchase land identified for public improvements prior to development for other use. Access Management Plan. A municipality may adopt an access management plan to manage traffic and access onto public roads from adjacent property. Downtown, Village Center or New Town Center Plan. A municipality may adopt a plan for the development and revitalization of downtown and village centers, or to plan for a new town center.

	Open Space Plan. A municipality may adopt a plan to assess critical natural resources and to guide public and private conservation strategies.
Conservation Commission	A municipality may form a conservation commission to work on conservation and natural resource planning issues.

DESIGN GUIDELINES FOR CENTRAL VERMONT INTERCHANGES

The beginning of this section on Central Vermont's interchanges identified the type of interchange each of the I-89 exits in Central Vermont is. Classifying each interchange identifies the context and stage of development which the area is in so that communities can plan around any momentum that has been built or redirect growth towards a stated vision. To accomplish this, design guidelines specific to each type of interchange have been developed by the State. Table 10 summarizes the design guidelines to be used at each interchange according to its category, as well as guidelines that should be used at all interchanges regardless of type. See the *Vermont Interstate Interchange Planning and Development Design Guidelines* for more detail.

Table 10: Design guidelines for each interchange (from the Vermont Interstate Interchange Design Guidelines)

Municipality	Exit	Interchange Category	Access Management	Site Development	Site Layout	Building Design	Lighting	Signs	Landscaping
Waterbury	10	C	• Provide adequate distance between the interstate and nearby curb cuts • Accommodate bicycles • Provide for public transit • Plan for public parking	• Combine stormwater facilities to serve several properties • Preserve existing vegetation wherever possible	• Replicate the traditional patterns of the surrounding settlements • Relate buildings to the street • Line streets with sidewalks • Anticipate future growth needs	• Orient buildings with gable-end to the street • Address the street • Use traditional proportions to create buildings that have a village scale			
Middlesex	9	B							
Montpelier	8	A							
Berlin	7	C							
Berlin	6	E	• Provide adequate distance between the interstate and nearby curb cuts • Discourage direct parking access • Provide adequate distance between curb cuts		• Replicate agricultural patterns • Group traveler services together • Protect the working landscape	• Choose colors carefully			• Screen development from view of the interstate • Use native plant types that relate to the surrounding vegetation
Williamstown	5	E							

Municipality	Exit	Interchange Category	Access Management	Site Development	Site Layout	Building Design	Lighting	Signs	Landscaping
For All Interchange Types			• Limit curb cuts • Consolidate existing curb cuts • Share parking and access • Develop secondary or service roads • Design for pedestrian connections • Install medians where appropriate • Provide adequate distance between signalized intersections	• Preserve the natural topography of the landscape by limiting clearing and grade disturbance • Preserve existing vegetation wherever possible • Provide for wildlife crossing points • Buffer development from water resources • Make stormwater management an attractive feature of the site	• Use space efficiently • Locate parking lots to the side or rear of buildings • Minimize paved surfaces • Preserve scenic views	• Design unique buildings that fit the context • Use local materials whenever possible that are of high quality and durable, and provide visual interest (e.g. wood, brick veneer, or metals) • Make buildings energy efficient • Use massing	• Avoid over lighting • Minimize glare through the use of properly installed and appropriate lighting fixtures • Address security concerns • Use appropriate lamp types • Discourage illumination of building facades	• Place signs in a location that is not visible from interstate travel lanes • Avoid sign clutter • Avoid signs that overwhelm the setting • Avoid using gas station canopies as signage • Light signs from above	• Except in urban or village settings, screen development from view of the interstate using deciduous vegetation, dense evergreen plantings, berms, walls and fences • Select plant materials that fit the context of the site • Avoid invasive exotic plant species • Landscape parking lots • Create a gateway with trees

C. EMERGING CONCEPTS

INTRODUCTION

The 2003 Regional Transportation Plan for Central Vermont highlighted technologies and concepts that were gaining attention in the transportation field at that time. Ideas such as Intelligent Transportation Systems (ITS), use of the internet for teleshopping or telecommuting, and deployment of alternative fuels and vehicles were discussed. These concepts are now familiar elements in many transportation systems throughout the nation.

In light of recognized trends such as the aging population, transportation funding issues and uncertain energy supplies, it is worthwhile to update this section of the Regional Transportation Plan. This section identifies innovations that are being explored to address existing and future issues that may impact transportation in the Central Vermont region. The concepts include:

1. Senior mobility
2. Carsharing
3. Advanced Transit Technologies
4. Intelligent Transportation Systems
5. Telecommunications Access
6. The Don't Block the Box Campaign
7. In-Ground Warning Light Systems
8. Alternative Fuels.

ITN AMERICA®: DIGNIFIED TRANSPORTATION FOR SENIORS

It is estimated that the segment of the population over age 65 in Vermont will nearly double by 2030.[1] ITN America® is a transportation model that provides senior citizens an alternative to driving so that they can maintain their mobility even when it becomes unsafe for them to drive. The ITN, or Independent Transportation Network, program has been compared to a conventional taxi service: the difference is that program developers focused on creating an alternative that was comparable to driving oneself. Developers found that it was important that members "not have to ask for favors, use public tax dollars, worry about having cash for every trip, travel in crowds, or make their way to a central pick-up point."[2] Drivers kindly assist members literally from door-to-door, helping with

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[1] Working Paper #4, Vermont Long Range Transportation Business Plan Draft.

[2] "Out of the Driver's Seat, But Still Steering the Course: Helping America's Seniors Arrive Without Driving" in *Ignition*, Issue 11, Summer 2006. Available at: http://onlinepubs.trb.org/onlinepubs/ignition/ignition_11.pdf.

packages and offering "arm-through-arm" support. Figure 26 summarizes the service, which has operated in Portland, Maine, for 11 years and serves approximately 15,000 seniors each year.

The program is independent of taxpayer subsidies for operating and capital expenses, and Senator Collins from Maine has proposed a bill to implement the concept on a national scale through a five year, $25 million grant program. Pilot programs are currently underway in Santa Monica, CA, Charleston, SC, Orlando, FL, and Princeton, NJ.

One way for seniors to participate is by donating their vehicle to the organization, which then applies the value of the car to the member's account, from which they draw funds to pay for rides. The model aims to use member fees for half of the operating costs, relying on donations, volunteer support and grants for the other half. The Portland example charges a $35 annual membership fee, and rides cost $2 per mile; significant discounts are applied for advanced reservations and for riding with other members.[1] Doctors, grocery stores, and other businesses used heavily by seniors can provide donations for each trip.[2]

Figure 26: Summary of ITN® Service (Source: http://www.itnamerica.org/about/model.asp)

- ITN® service is available 24 hours a day, 7 days a week.
- ITN® service is available for any type of ride within the service area, no limitations on ride purpose.
- ITN® service is provided in private automobiles, by trained drivers.
- Service is provided door-through-door, with help provided for packages and other items.
- Membership in the ITN® is necessary to receive service.
- People 65 years and older, and visually impaired adults are eligible to join.
- Rides may be booked any time, no advanced notice is required. However, there are substantial discounts for booking rides at least one day in advance.
- Discounts are applied for shared rides and advance notice.

CARSHARING

Although it is often confused with ride-sharing or carpooling, car-sharing is essentially a short-term/hourly car rental. Car-sharing involves a formal organization of members who share a fleet of vehicles owned and maintained by the organization. Members reserve a vehicle in advance, often through a phone or online reservation system. Vehicles are strategically parked throughout a city in designated "car-sharing" spaces (also known as pods; see

Figure 27) and are accessed by members through a universal key or identification code. Members are charged by the mile (about 44¢) or by the hour (between $4 and $11) or a combination of both; some

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1 *Ignition* 2006.

2 Associated Press/USA Today, "Ride program for senior citizens flourishes in Maine," 1/16/06, available at: http://www.usatoday.com/news/nation/2006-01-16-senior-rides_x.htm?csp=34.

car-sharing organizations (CSOs) also charge a monthly membership fee (between $10 and $50). Gasoline, vehicle maintenance, registration fees, parking and insurance are all included in the fees. CSOs often maintain various types of vehicles (for example, mini-vans, pick-up trucks, compact cars, and large sedans) to accommodate the needs of different types of trips.

Figure 27: http://www.ibabuzz.com/transportation/2006/08/

National companies such as FlexCar (www.flexcar.com) and ZipCar (www.zipcar.com) have expanded into several cities (including Boston, Amherst, and Northampton, MA) over the past few years, while local, non-profit organizations have been quite successful in some cities (such as City Carshare in San Francisco)[1]. Middlebury College recently introduced ZipCar to its campus to help reduce its carbon footprint.

Research indicates that carsharing saves gasoline and reduces vehicle miles traveled[2]. Carsharing can greatly enhance personal freedom and mobility for people who either choose not to own their own

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[1] See "Bringing Car-Sharing to Your Community" by City Carshare; available at: http://www.citycarshare.org/download/CCS_BCCtYC_Long.pdf.

[2] Cervero, R. et al. "City CarShare: Longer-Term Travel-Demand and Car Ownership Impacts," TRB Annual Meeting 2007. Bay City News, "City CarShare: Millions of Gallons of Gas Saved," 10/11/05.

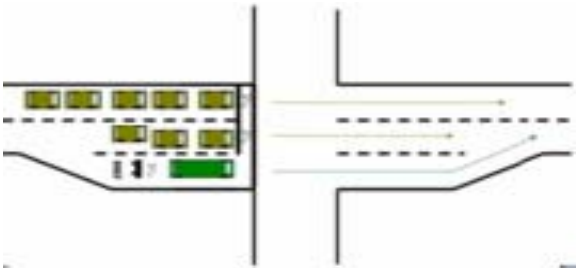
car or cannot afford to own a car. Research has also shown that car-sharing reduces vehicle ownership, which would result in a reduction in total parking demand.[1]

ADVANCED TRANSIT TECHNOLOGIES

While Bus Rapid Transit (BRT) is a high-performance transit service that is more similar to light rail than to a regular bus route in terms of travel times, carrying capacity, and ridership (Figure 28), individual elements of BRT can be applied to a conventional bus system to make it more efficient. BRT offers a flexible package of features (Table 11) that could include advanced vehicles, exclusive right-of-way along certain segments of a corridor, limited-stop service, enhanced passenger facilities, real-time passenger information, high frequency and span of service. Other elements that can be applied to a conventional bus system are transit signal prioritization (which gives buses a green light as they approach a signal) and queue-jump lanes (which allow buses to bypass long lines of vehicles that are waiting at traffic signals (Figure 29)). MetroTransit in Halifax, Nova Scotia is using transit priority traffic signals and queue jump lanes on two service corridors[4], and Saint John, New Brunswick will be implementing a transit priority system in fall 2007. Transit signal prioritization is also a planned improvement in Chittenden County.[5]

Figure 28: Bus Rapid Transit and Curb Side Pick-up[2]

Figure 29: Queue Jump Lane[3]



1 Cervero 2007.

2 BRT newsLane, January-February 2005

3 http://en.wikipedia.org/wiki/Queue_jump

4 http://www.halifax.ca/metrotransit/BRT.html

5 *Regional ITS Architecture for Chittenden County*-Final Report, CCMPO, April 2005.

Table 11: Basic Features and Attributes of Full BRT [1]

Running Way	• Dedicated running ways, exclusive bus lanes • Distinctive pavement treatment
Stations	• Level boarding and alighting • "Branded," consistent with appearance of BRT vehicles • High-quality, attractive, functional amenities
Vehicles	• Easy-to-board (level with platform) • Multiple-door boarding and alighting • "Branded" exteriors that are distinctive and consistent with appearance of stations • High capacity • Pleasant interior conveniences • Quiet • Low or zero emissions
Service	• Frequent all-day service • Short headways (10 minutes or better) • Wide station stop spacing
Route Structure	• Simple route layout • Convenient transfers • Station locations coordinated with land-use plans • Service to major activity centers
Fare Collection	• Off-vehicle fare collection • Emphasis on prepaid fares
Intelligent Transportation Systems (ITS) and Technology	• ITS technologies (for example, real-time "next bus" arrival information signs at stations, "next stop" signs on board buses, smart fare payment media and technology, traffic signal prioritization, and traffic management) • Automated guidance features for precision operations and docking

INTELLIGENT TRANSPORTATION SYSTEMS

Intelligent Transportation System, or ITS, refers to the application of advanced sensor, computer, electronics, and communication technologies – in an integrated manner – to improve the safety and efficiency of the transportation system. Intelligent Transportation Systems are interrelated systems that work together to deliver transportation services. National and Regional ITS Architectures define the overall function and coordination of specific ITS applications. The term "architecture" in this context refers to framework in which various systems are built, their function, and the information

[1] Source: Caltrans, Bus Rapid Transit: A Handbook for Partners, February 2007.

that is exchanged between them. The National ITS Architecture provides the general framework for planning, defining, and integrating ITS. Regional ITS Architecture is a specific framework for ensuring institutional agreement and technical implementation of ITS projects in a particular region.[1]

Specific ITS applications are organized in "market packages" which ensure cross-jurisdictional compatibility and consistency with the National ITS Architecture. There are many market packages which can be further organized into the general application areas listed in Table 12. Table 12 also provides some specific examples of the types of market packages that may be appropriate in the Central Vermont Region within the 20 year horizon of this plan.

Table 12: ITS Application Areas

General Application Area	Market Package Examples
Advanced Traffic Management Systems	• Deploy network surveillance equipment to obtain real time information about travel conditions. • Establish signal coordination along arterial roadways and provide pre-emption capability (emergency vehicles, trains, transit buses)
Advanced Public Transportation Systems	• Acquire and operate transit operations software to improve efficiencies • Provide Automatic Vehicle Location capability to transit vehicles • Provide transit users at transit stops and on-board transit vehicles with ready access to information on transit information (time of next bus, next stop, etc)
Advanced Traveler Information Systems	• Provide real-time information on weather affecting roadway conditions • Provide real-time information on travel conditions and travel options, with variable message signs at strategic locations or in vehicles • Provide tailored information regarding traffic conditions, transit service, ride share/ride match, parking management etc in response to a traveler request
Advanced Vehicle Safety Systems	• Vehicle Safety Monitoring. On-board sensors will determine the vehicle's condition and performance. • Driver Safety Monitoring: Determine the driver's condition, and warn the driver of potential dangers. • Intersection Safety Warning: Determines the probability of a collision in an equipped intersection (either highway-highway or highway-rail) and provide timely warnings to drivers in response to hazardous conditions.
Commercial Vehicle Operations	• High speed weigh in motion: Weighs commercial vehicles while moving to eliminate stops.
Emergency Management	• Provide real time information on incidents, provide link with E911 for sharing information

To date, VTrans ITS programs have focused on traveler information systems to collect and disseminate data so that travelers can make informed decisions. The technologies used to gather information on roadway conditions can be organized into three groups:

1) surveillance, monitoring and prediction;

2) information dissemination; and

[1] "Regional ITS Architecture Guidance Document. Developing, Using and Maintaining and ITS Architecture in Your Region", National ITS Architectute Team, U.S. Department of Transportation; October 12, 2001.

3) decision support, control and treatment.[1]

Surveillance and monitoring are achieved through Environmental Sensor Stations (ESSs), mobile sensing devices, and remote sensing systems. ESSs are placed along a roadway and feed data to a Road Weather Information System (RWIS). The RWIS distributes data on surface, atmospheric, and water level conditions, helping travelers as well as agency managers in decision making. A program is underway in Vermont to deploy 60 ESSs throughout the state. (Two sensors are already up and running along I-89 – one in Brookfield and the other near Williston.) Table 13 indicates the data collected by an ESS, which is disseminated via the VTrans Road Weather Information System website (www.rwisvt.com; see Figure 30) and via the 511 national traveler information phone number.

Beyond informing travelers, the Federal Highway Administration is developing Surface Transportation Weather Decision Support Requirements as a tool to aid transportation managers and maintenance engineers in decision making.[2]

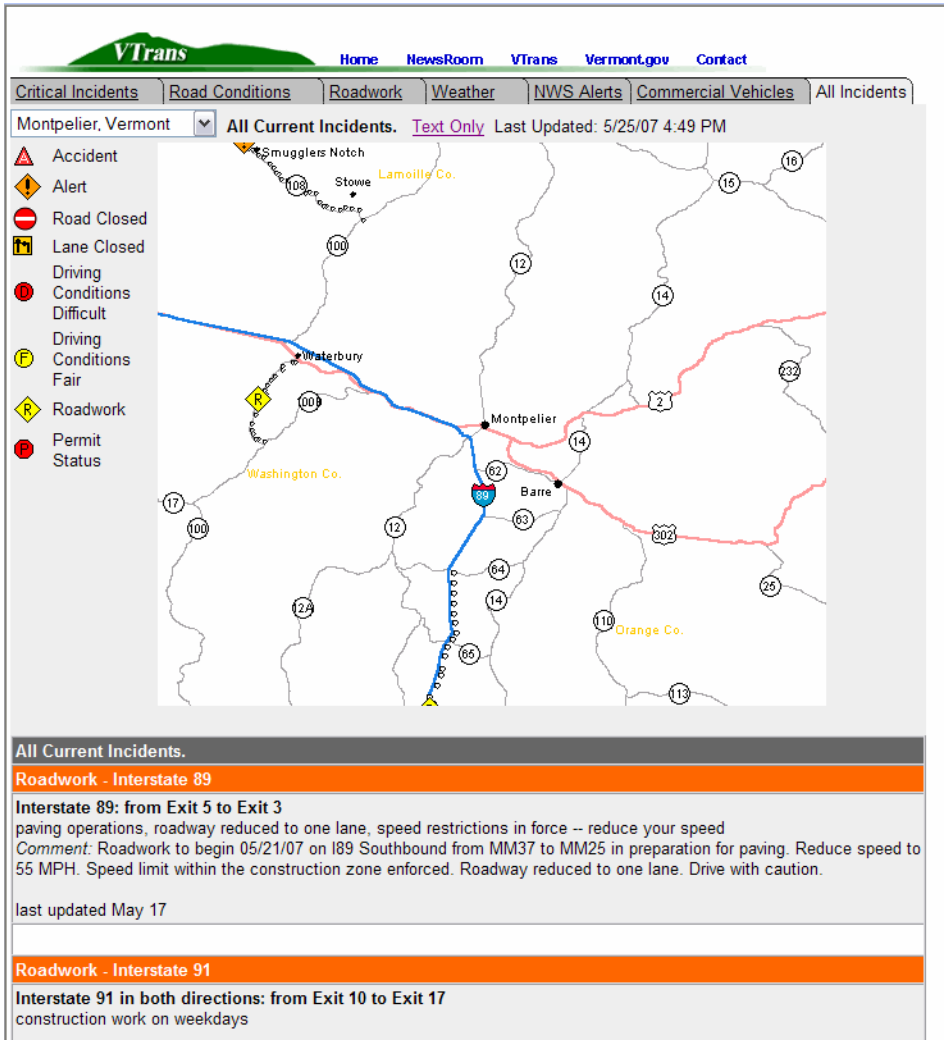
Table 13: Data collected by ESSs for a RWIS
(source: FHWA Road Weather Management Program http://ops.fhwa.dot.gov/Weather/faq.htm)

Surface Data	Pavement temperature
	Pavement freezing point
	Pavement condition (e.g. wet, icy)
	Pavement chemical concentration
	Subsurface conditions (e.g. soil temperature)
Atmospheric Data	Air temperature and humidity
	Visibility distance
	Wind speed and direction
	Precipitation type and rate
	Cloud cover
	Tornado or waterspout occurrence
	Lightning
	Storm cell location and track
	Air quality
Water Level Data	Stream, river, lake levels near roads

[1] See also: http://ops.fhwa.dot.gov/Weather/mitigating_impacts/technology.htm.

[2] See also: http://ops.fhwa.dot.gov/Weather/best_practices/1024x768/transform_param2.asp?xslname=pub.xsl&xmlname=publications.xml&keyname=164.

Figure 30: Screenshot of Vermont Road Traveler Information System



The road weather information system is just one example of an ITS application. The Chittenden County Metropolitan Planning Organization is planning to apply network surveillance, emergency routing, traffic information dissemination, and multi-modal coordination to various I-89 interchanges and corridor management systems. The Vermont Intelligent Transportation Systems Strategic Plan[1] suggests the following implementation schedule for the statewide system:

	Application	**Examples**
Short-term (1 to 3 years)	Network surveillance	Cameras to monitor traffic flow
	Traffic information dissemination	Variable message signs
	Incident management	Call boxes (for detection of incident), service patrols (for mobilization and response), and temporary traffic control (e.g. portable message signs)
	Road weather information systems	Pavement condition surveillance, anti-icing systems on bridges, devices on-board maintenance vehicles to monitor equipment and chemical applications
	Broadcast traveler information	Internet, television, radio
Medium-term (3 to 10 years)	Surface street control	Work zone management (intrusion detection, speed enforcement/automatic ticketing)
	Interactive traveler information	In-vehicle systems, advanced parking payments, electronic payments
	Transit tracking	Safety & security (in-vehicle and facility surveillance)
	Demand responsive transit operations	Dynamic routing/scheduling, ride sharing/matching
	Weigh-in-motion	Efficient measurement without requiring the vehicle to stop
	Emergency response	Early warning systems, evacuation and re-entry management
Long-term (10+ years)	Regional traffic control	HOV facilities, reversible flow lanes, road closure management
	Transit information	Information dissemination (in-vehicle and in-terminal systems)
	Multi-modal coordination	Freight highway connector system
	HAZMAT management	Hazardous material tracking and route planning
	Emergency routing	Emergency traveler information, telemedicine (linking emergency response vehicles to nearby medical facilities)
		Source for examples: US DOT ITS Applications Overview (http://www.itsoverview.its.dot.gov/)

The VTrans ITS program can help identify ITS applications that are most relevant to the unique nature of the state of Vermont, and the needs of its travelers. The following are nine recommended actions to maintain and improve the ITS network in Vermont, taken from Vermont's ITS Strategic Plan:

[1] *Development of an Intelligent Transportation systems Strategic Plan for the State of Vermont*, VTrans, 2002.

1. Develop a Statewide ITS Steering Committee.
2. Conduct a comprehensive communications study.
3. Seek opportunities for partnership with telecommunications companies.
4. Maintain the statewide and regional architecture.
5. Keep monitoring the status of National Standards.
6. Develop guidance for ITS Procurement.
7. Develop guidance for ITS Projects, Design, Operations and Maintenance.
8. Develop a Statewide ITS/Commercial Vehicle Operations Element.
9. Initiate Steps to incorporate ITS into the planning process.

CVRPC should consider completing a Central Vermont ITS Strategic Plan to identify the Regional Architecture and specific applications appropriate for the Region.

TELECOMMUNICATIONS ACCESS

Traveler information services, teleshopping, and telecommuting are advancing as a consequence of the Internet and have the potential to improve system operation and reduce trip making by providing "virtual mobility." As noted under the ITS section above, traveler information can play an important role in improving the operation and efficiency of the system. The Internet, combined with mobile communication technologies, will improve the ability to disseminate traveler information. Teleshopping may have implications for freight movement and logistics. The expectations are that e-commerce will lead to more home deliveries. However, an increase in home deliveries does not necessarily mean that more freight traffic will be generated nor that it will lead to a worsening of transportation services. Rather, advances in innovative logistics schemes can be used to consolidate transport flows to and within urban areas and this could potentially lead to better service in terms of faster and more reliable deliveries[1].

To date, telecommuting has not had a significant impact on the transportation system. Nationally, participation rates in work at home have remained low with most of the increase attributable to the self-employed rather than employees. Increasing the number of people that telework depends largely on people having jobs with the types of tasks that can be done away from the office. For these types of jobs, an existing constraint is the lack of an "always on" high capacity broadband connection to the Internet such as DSL, cable modems, or satellite. Productivity is limited with a 56k dial-up

[1] "E-commerce and the Consequences for Freight Transport" Innovations in Freight Transport; Visser, JGSN; Nemoto, T, 2003

modem that requires giving up use of the telephone line. If individuals can obtain broadband connectivity, more work at home will be encouraged.[1]

This year the Vermont Legislature passed a bill to create the Vermont Telecommunications Authority and build the infrastructure necessary to provide internet and cell phone service access throughout Vermont. Telecommunications access will remove a major restriction to businesses wishing to locate in rural areas. Home-based businesses will be more viable, and telecommuting and teleconferencing will perhaps become more widespread as a result of this expanded connectivity. The potential for growth in home-based businesses and telecommuting implies that there may be less commuting travel as business communications take place over the phone or internet rather than face to face. Lower vehicle miles traveled would reduce roadway maintenance needs and costs, reduce peak period congestion and delay costly road expansion needs, and improve air quality conditions.

Telecommuting has the potential to reduce work trips during the peak periods, but has not been shown to reduce the total number of daily trips by teleworkers. As a result, work trips and other trips become more dispersed throughout the day. This shift can help reduce congestion during peak periods. The disadvantage to dispersed trips is that it is more difficult to provide transit service when travel needs are more spread out in time[2].

Commuting in America III[3] notes that the number and share of people who work at home has continued to increase since 1980. 2000 Census Journey To Work data show that Vermont has a higher percentage of people who work at home (5.7%) than the nation (3.3%).

DON'T BLOCK THE BOX – OPTION FOR ADDRESSING OPERATIONAL ISSUES AT CONGESTED INTERSECTIONS

During peak periods, some drivers attempt to make a turn or proceed through a congested intersection by passing through the end of an amber light, and occasionally through the all-red phase. These vehicles then become stuck in the middle of the intersection, resulting in unnecessary and unanticipated queuing on other approaches.

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[1] "Teleworkers, Trips, and Telecommunications. Technology Drives Telework- But Does it Reduce Trips"; Transportation Research Record, No 187, Transportation Planning and Analysis 2002; Pratt, Joanne H; 2002

[2] "The Relationship Between Daily Travel and Use of the Home Computer"; Transportation Research. Part A: Policy and Practice; Hjorthol, RJ; June 2002

[3] Pisarski, A., *Commuting in America III: The Third National Report on Commuting Patterns and Trends*, NCHRP Report 550/TCRP Report 110, Transportation Research Board, 2006.

Used in New York City to prevent gridlock, the "Don't Block the Box" concept uses striping to prevent drivers from blocking the middle of an intersection (see Figure 31). The Don't Block the Box Campaign fines ($500 as of 2006) and places two points on the license of drivers unable to clear the intersection and who stop in the "box."

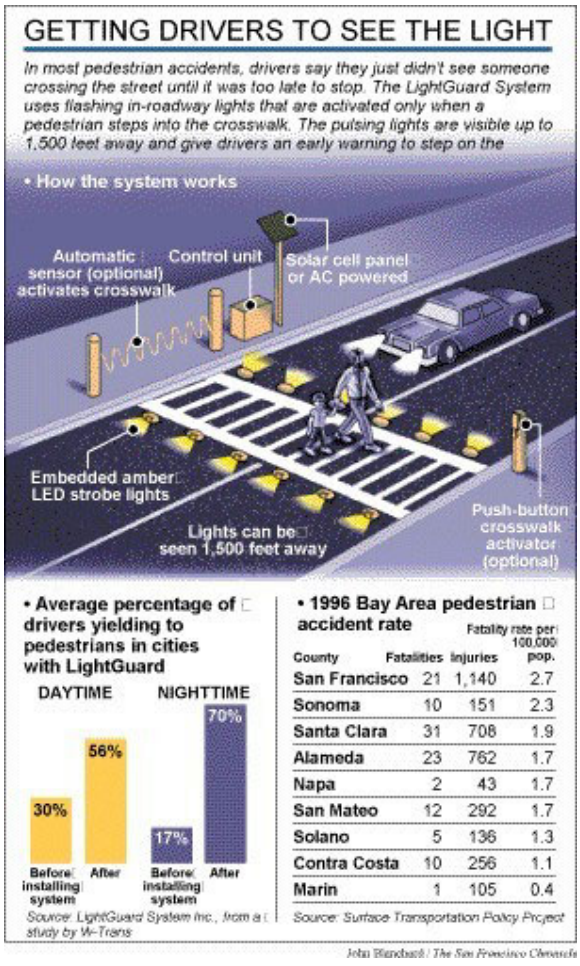
Figure 31: Don't Block the Box Intersection (NYC, New York)

IN-GROUND FLASHERS

To reinforce the residential nature of an area, improve the safety of crossings for diverse users (children through senior citizens), and to help slow traffic, pedestrian crossings can be emphasized with a textured surface and in-ground flashers (see Figure 32). The flashers can be actuated by a pedestrian using a push button or automatically (weight activated, infrared, or microwave sensors) when they leave the curb and enter the crosswalk. In-ground flashers improve the visibility of pedestrians during nighttime and daytime hours. VTrans has recently installed the State's first set of in-ground pedestrian crossing flashers along US 4 at the Quechee Gorge rest area.

ALTERNATIVE FUELS

Figure 32: In-Ground Pedestrian Flashers[1]



Alternative fuels are being used today in place of gasoline and diesel fuel made from petroleum. The U.S. Department of Energy classifies the following fuels as "alternative fuels": biodiesel, electricity, ethanol, hydrogen, methanol, natural gas, propane, and solar energy. Information on each is provided in Table 14. The most common alternative fuels used across the USA are natural gas, electricity, and biodiesel fuels[2]. In Vermont, natural gas and electricity are also the most common alternative fuels used.

The State of Vermont has some electric vehicles, with charging stations in Montpelier, Middlesex, Waterbury, and Burlington. EVermont is an organization founded by former Governor Howard Dean in 1993 to test and demonstrate electric vehicles in a cold climate with hilly terrain. They have programs to lease electric cars to organizations and individuals. Their latest initiative is a pilot station car/ shared car demonstration project. This is a three year program funded by the Federal Transit Administration. They are seeking host locations for a group of 2-5 electric vehicles to be used by identified users. Examples of uses include: car pools to a business, condominium association, retirement communities, neighborhood associations, or in conjunction with transit. The vehicles have a range of 50-75 miles and operate at normal driving speeds.

The Green Mountain Institute is attempting to set up a similar program in Montpelier. They have 50 Global Electric Motor (GEM) Cars available that look and perform like golf carts, but are street legal, have a range of 30 miles, and a top speed of 25 mph. These vehicles could only be used in the low speed environment of residential neighborhoods and downtown Montpelier. Interested participants

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[1] San Francisco Chronicle, October 1998, reprinted on Light Guard Systems website at http://www.lightguardsystems.com/html/reports_kirkland.html

[2] "Alternative Fuels Across America"; Alternative Fuel New, January 2003

for this programs have been the New England Culinary Institute, Vermont College, Montpelier Recreation Dept., Montpelier School Dept., and Stone Environmental.

There is currently only one natural gas refueling station in Vermont, located in South Burlington[1]. There are plans for a second refueling station at the Burlington Public Works under a partnership with businesses that have teamed up to offer alternative fuel vehicles to qualifying public entities in Chittenden County, including: EVermont, the Chittenden County Metropolitan Planning Organization, VTrans, Burlington Electric Department, and the University of Vermont.

The potential of hydrogen as an alternative fuel received a boost in January of 2003 when President Bush announced a $1.2 billion FreedomCAR and Fuel Initiative. The purpose of this initiative is to reverse America's growing dependence on foreign oil by developing the technology needed for commercially viable hydrogen-powered fuel cells - a way to power cars, trucks, homes and businesses that produces no pollution and no greenhouse gases.

[1] VT 85 Swift Street, exit 13 Vermont Gas Systems, Inc

Table 14: Description of Alternative Transportation Fuels

Biodiesel	Biodiesel is a domestically produced, renewable fuel that can be manufactured from vegetable oils or recycled restaurant greases. Biodiesel is safe, biodegradable, and reduces serious air pollutants such as particulates, carbon monoxide, hydrocarbons, and air toxics.
Electricity	Electricity can be used as a transportation fuel to power battery electric and fuel cell vehicles. When used to power electric vehicles or EVs, electricity is stored in an energy storage device such as a battery. EV batteries have a limited storage capacity and must be replenished by plugging the vehicle into a recharging unit. The electricity for recharging the batteries can come from the existing power grid, or from distributed renewable sources such as solar or wind energy.
Ethanol	Ethanol is an alcohol-based alternative fuel produced by fermenting and distilling starch crops that have been converted into simple sugars. Feedstocks for this fuel include corn, barley and wheat. Ethanol can also be produced from "cellulosic biomass" such as trees and grasses and is called bioethanol. Ethanol is most commonly used to increase octane and improve the emissions quality of gasoline.
Hydrogen	Hydrogen gas (H_2) will play an important role in developing sustainable transportation in the United States, because it can be produced in virtually unlimited quantities using renewable resources.
Methanol	Methanol, also known as wood alcohol, has been used as an alternative fuel in flexible fuel vehicles that run on M85 (a blend of 85% methanol and 15% gasoline). However, it is not commonly used as such because automakers no longer are supplying methanol-powered vehicles.
Natural Gas	Domestically produced and readily available to end-users through the existing utility infrastructure, natural gas has become increasingly popular as an alternative transportation fuel. Natural gas is also clean burning and produces significantly fewer harmful emissions than reformulated gasoline. Natural gas can either be stored on board a vehicle in tanks as compressed natural gas (CNG) or cryogenically cooled to a liquid state, liquefied natural gas (LNG).
Propane	Propane or liquefied petroleum gas (LPG) is a popular alternative fuel choice because an infrastructure of pipelines, processing facilities, and storage already exists for its efficient distribution. Besides being readily available to the general public, LPG produces fewer vehicle emissions than reformulated gasoline. Propane is produced as a by-product of natural gas processing and crude oil refining.
Solar	Solar energy technologies use sunlight to produce heat and electricity. Electricity produced by solar energy through photovoltaic technologies can be used in conventional electric vehicles. Using solar energy directly to power vehicles has been investigated primarily for competition and demonstration vehicles. Solar vehicles are not available to the general public, and are not currently being considered by OEMs for production. However, solar vehicles have been developed and used in several competitions

D. 2006 VTRANS LONG RANGE BUSINESS PLAN SURVEY

INTRODUCTION

This section summarizes the results of the 2006 Long Range Transportation Plan Survey as it pertains to the Central Vermont Region. VTrans periodically conducts this survey to estimate changes in travel habits as well as to understand attitudes and perspectives on transportation in the state.

For the purposes of the survey, Vermont was divided into five regions. The Central Region consists of Washington, Lamoille, and Orange Counties. Within this region, 25% of the survey participants were from Lamoille County, 25% were from Orange County, and the remaining 50% were from Washington County. The results summarized here are based on the answers of survey participants from the Central Region. The 2006 survey was conducted by telephone, using 1,243 Vermonters over 18 years old who are selected at random.

TRANSPORTATION SERVICES USED

Respondents were asked how many minutes of a recent weekday they spent using particular modes (e.g., driving a private vehicle, being a passenger, walking, biking, riding a bus); the results are summarized in Figure 33. Not surprisingly, 80% of respondents spent some part of their day driving a private vehicle. As many respondents walked during part of the day as well. The average number of minutes spent driving a passenger vehicle on a weekday in the Central Region was 69 minutes; this is consistent with the statewide average of 70 minutes. 54% of Central Region respondents spent more than 20 minutes walking. The average amount of time spent walking in the Central Region was 54 minutes, which is slightly lower than the statewide average of 62 minutes.

Survey participants were asked how many times during the past year they had used particular transportation facilities. The results are as follows:

- 10% had used local public transit bus service at least once during the past year (Figure 34); 3% had used the service over 6 times, suggesting that these are regular users of the system. Of all the regions in Vermont, the Central Region had the lowest average number of times public transit was used (16); the statewide average was 35.

Figure 33

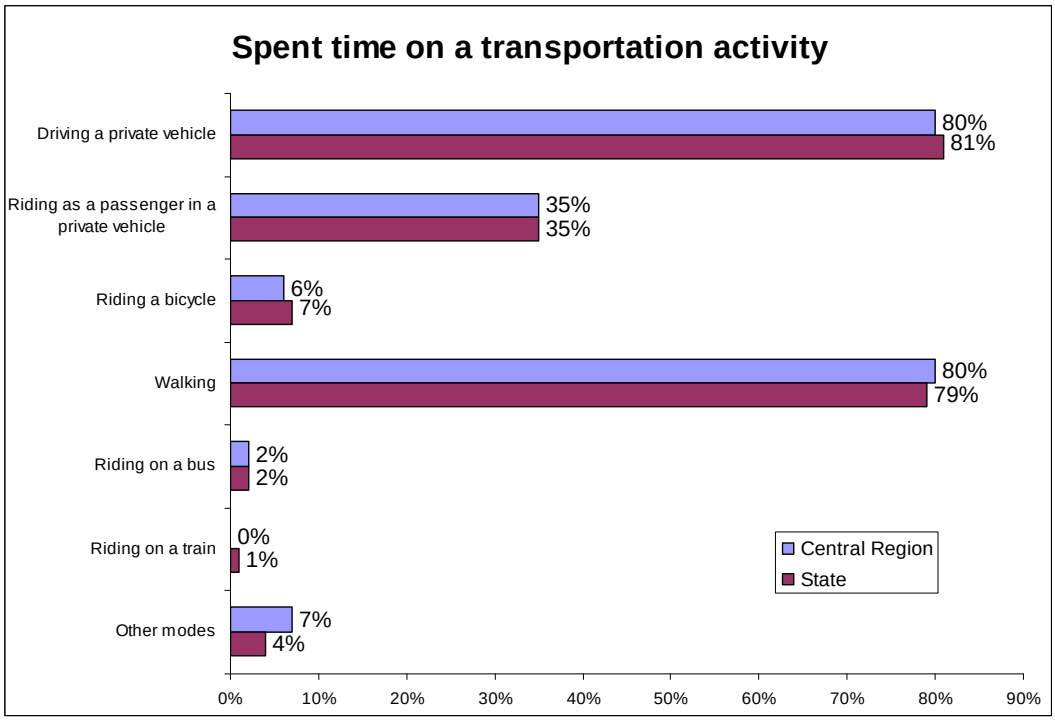
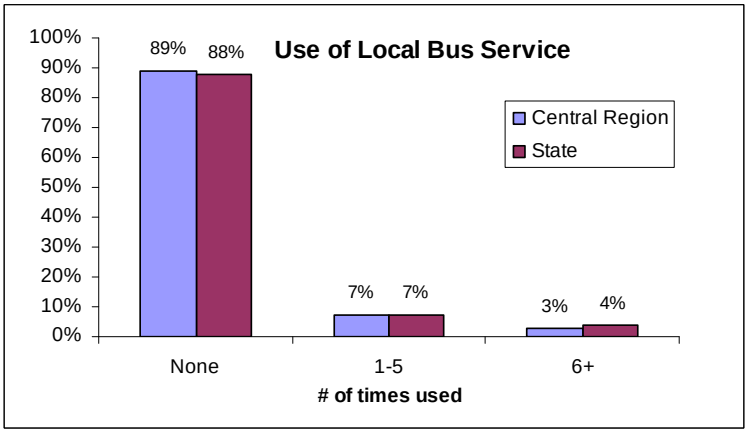


Figure 34[1]

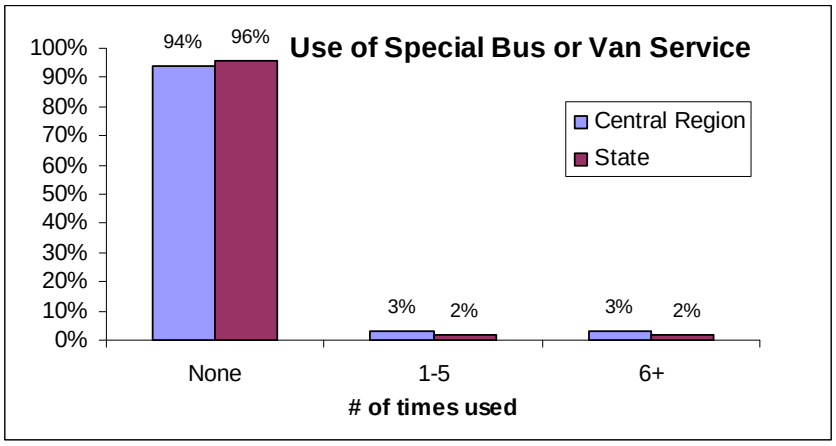


- 6% of Central Region respondents had used a special dedicated bus or van service for senior citizens or the disabled during the past year; half of these respondents used the

[1] In many figures, results may not add up to 100% due to respondents refusing to answer or answering "Don't Know."

service over 6 times, suggesting that these are regular users of the system. The average number of times the service was used in the Central Region was 22. These results are consistent with the rest of Vermont, which had an average of 20 times. (See Figure 35.)

Figure 35



- 37% of Central Region respondents used a Park & Ride lot at least once during the past year; 16% used the service over 6 times (Figure 36). The average for the Central Region was 15 times; the statewide average was 13 times.
- 30% of respondents used bike lanes or road shoulders in the past year; of these, 4% used the facilities over 51 times, indicating regular use (Figure 37). The average number of times a Central Region resident used the facilities was 38; the statewide average was 44.
- 35% used a bike path, trail, or shared use path at some point over the past year; 4% used these facilities over 20 times (Figure 38). This is consistent with statewide results.

Figure 36

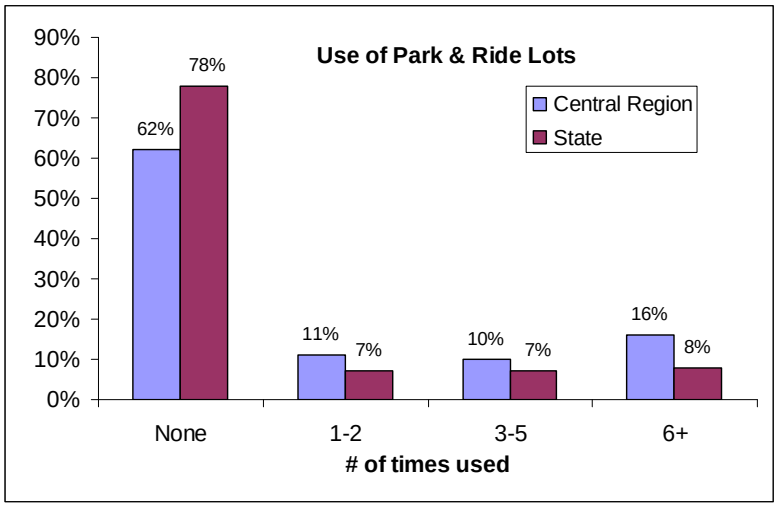


Figure 37

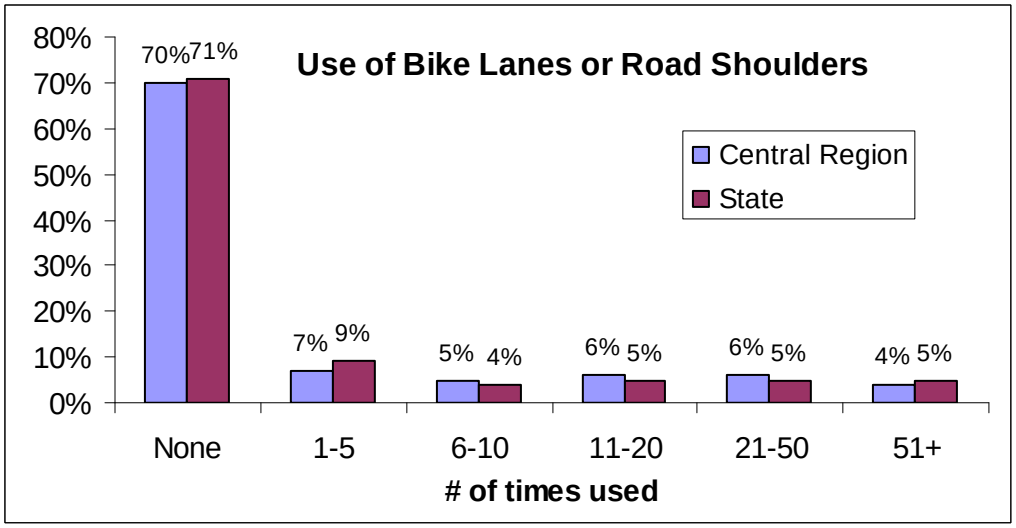
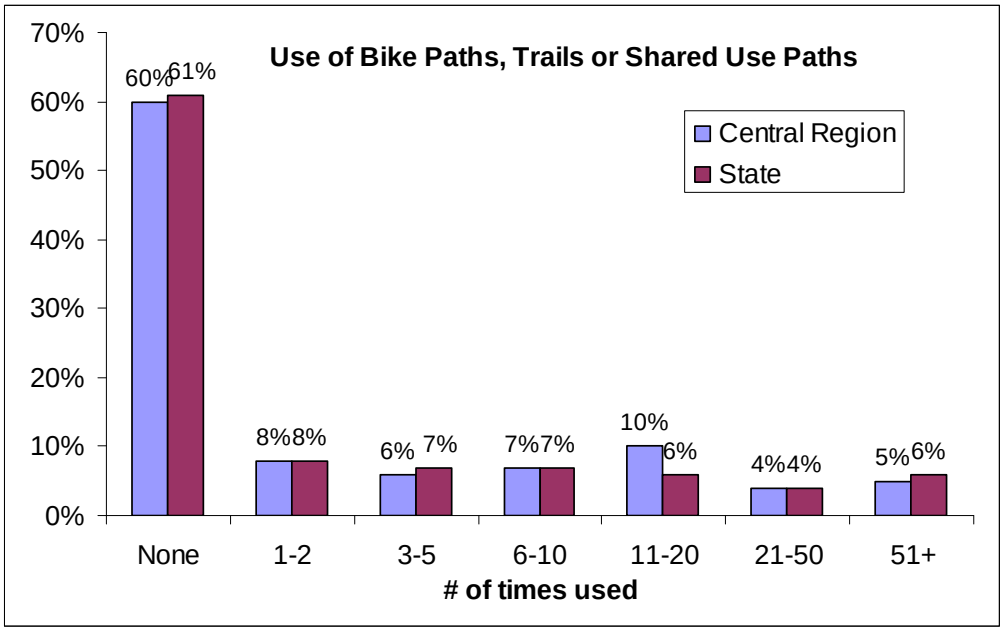
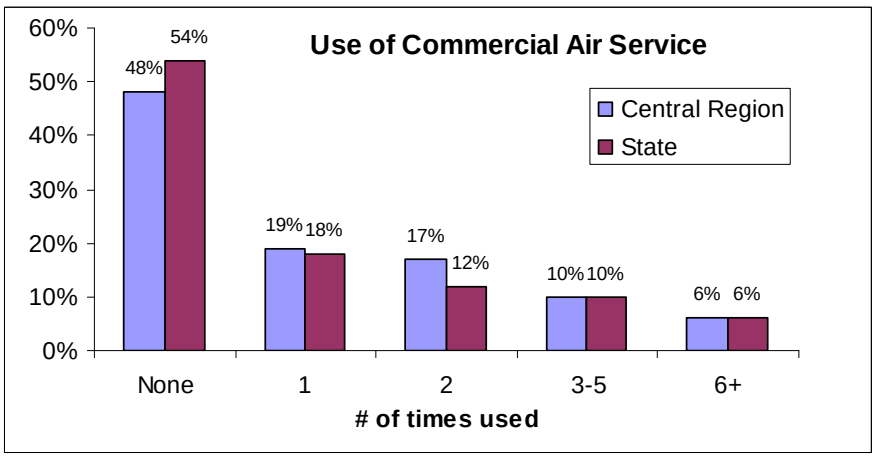


Figure 38



- Commercial air travel in the Central Region was consistent with the statewide results as shown in Figure 39; residents of the Central Region used commercial air service an average of 2.8 times.

Figure 39



The average frequency with which other modes were used by Central Region residents are summarized below:

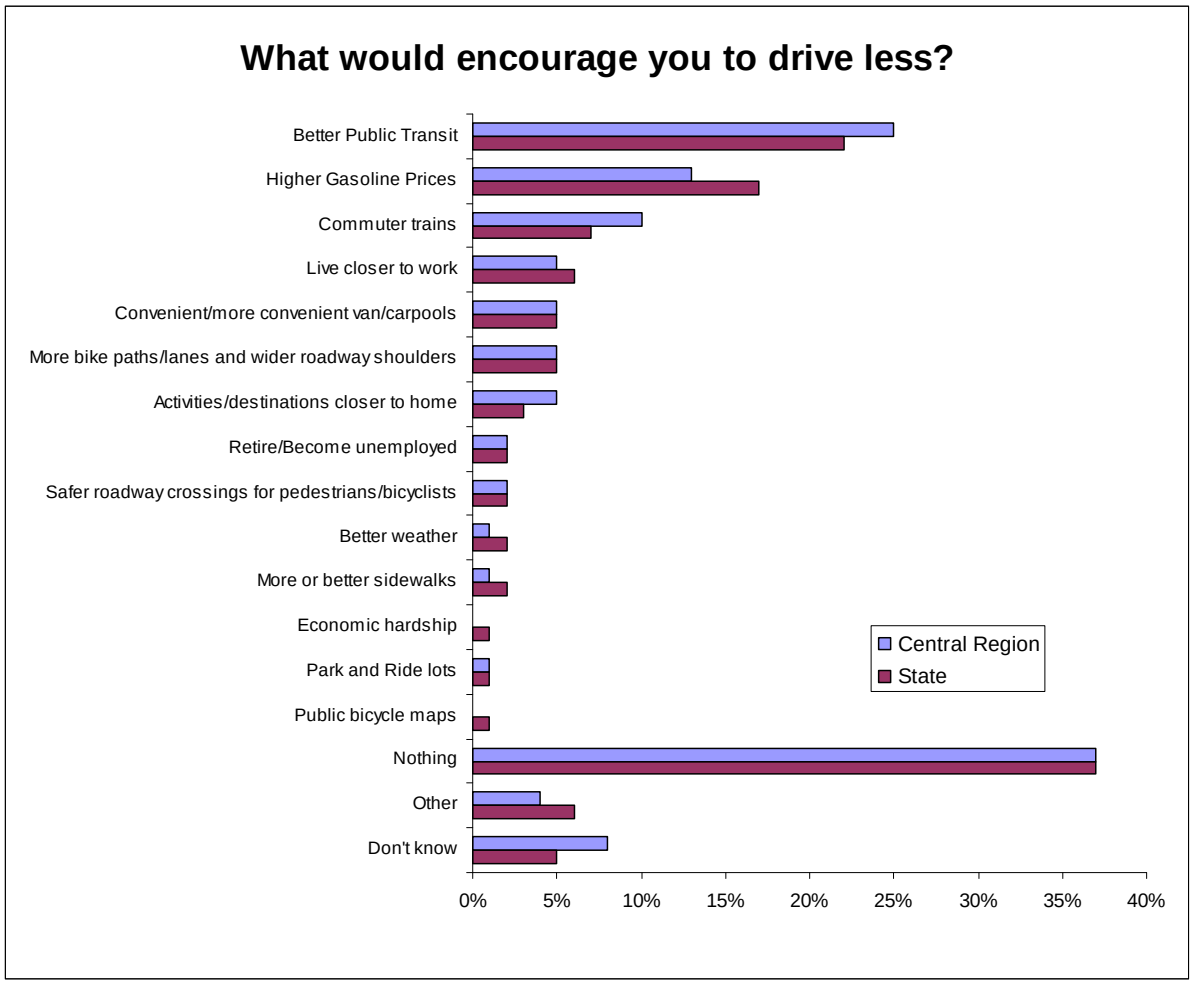
Mode	Average number of times used in the past year
Ferry across Lake Champlain	2.5
Taxi	5.6
Passenger Train (e.g. Amtrak)	3.9
Intercity Bus (e.g. Greyhound, Vermont Transit)	2.8

MOTOR VEHICLE USE

Participants were asked about their motor vehicle use and their commute to work.

- Respondents were asked how they usually travel to work; 70% answered that they drive alone, which is slightly lower than the statewide result of 75%. In the Central Region, the next highest response was to drive with one or more people (11%) and 8% responded that they are a passenger in a private vehicle.
- 55% of Central Region respondents travel ten or more miles to work; the regional (and statewide) average is 16 miles.
- The average estimated number of miles traveled by a Central Region resident in a private vehicle on a weekday is 56 miles (consistent with the 53 miles reported for the statewide average); it is estimated that 42 of these miles (38 statewide) are spent driving alone.
- Respondents were asked what actions, circumstances or transportation alternatives might cause or encourage them to drive less. The top responses from the Central Region (Figure 40) were "Nothing," "Better Public Transit," "Higher Gasoline Prices," and "Commuter Trains." Compared to the rest of the state, people in the Central Region did not indicate as high a sensitivity to gasoline prices, but they did show a greater interest in public transit.

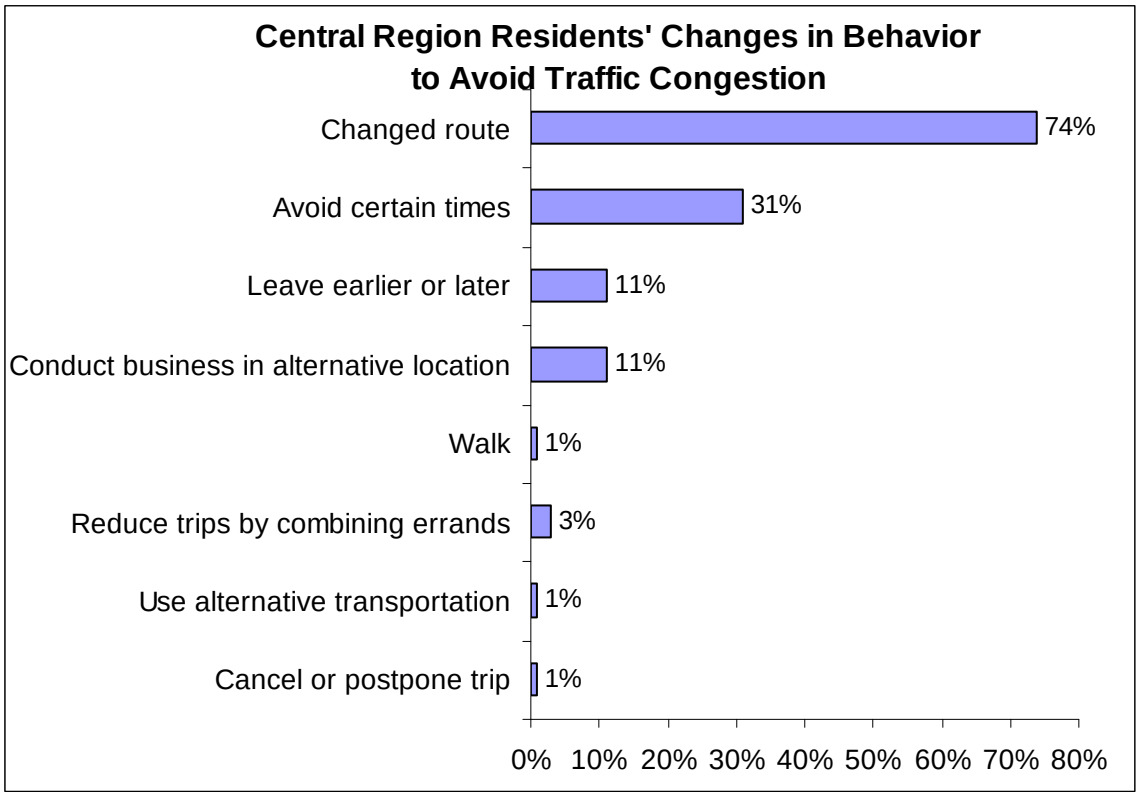
Figure 40



TRAFFIC CONGESTION IN VERMONT

- 44% of Central Region respondents indicated that they had experienced traffic congestion while traveling in Vermont, only slightly lower than the 50% statewide.
- 42% of Central Region respondents indicated that they had changed their behavior to avoid traffic congestion at a location (see Figure 41).

Figure 41



- Participants were asked to rate (on a scale of 1 to 10; 1 being no negative effect and 10 being a strong negative effect) how congestion affects their overall quality of life. The average response for the Central Region was a 3, with 43% of respondents indicating that congestion has no negative effect on their quality of life. (See Figure 42.)
- Compared to a year ago, 65% of respondents perceive that traffic congestion has remained the same (as opposed to improved or gotten worse). These results are consistent with the statewide result of 62%.
- In the Central Region, 77% of survey participants perceive that traffic congestion is worse in some seasons than in others.
    - Of these, 38% feel that summer is the worst season and 41% feel that fall is the worst season. These results are consistent with the rest of Vermont (Figure 43).

Figure 42

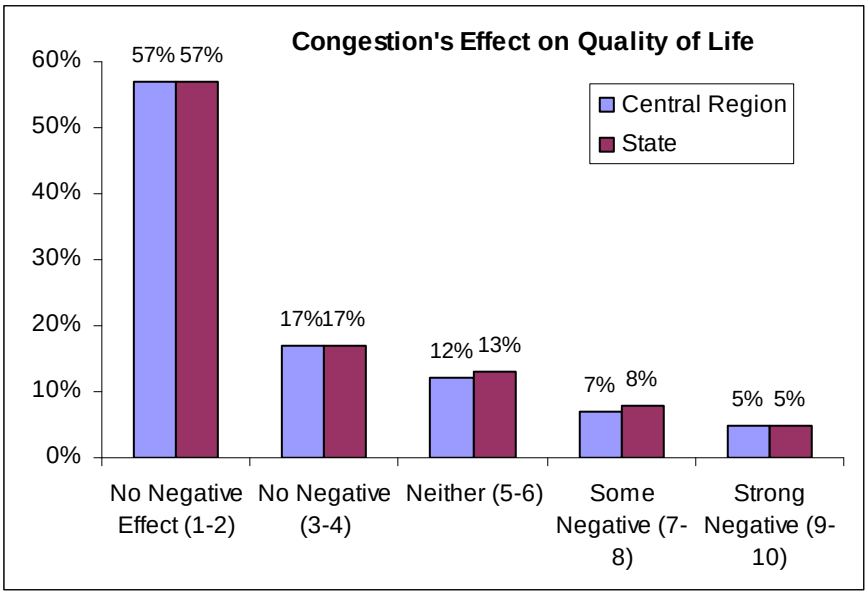
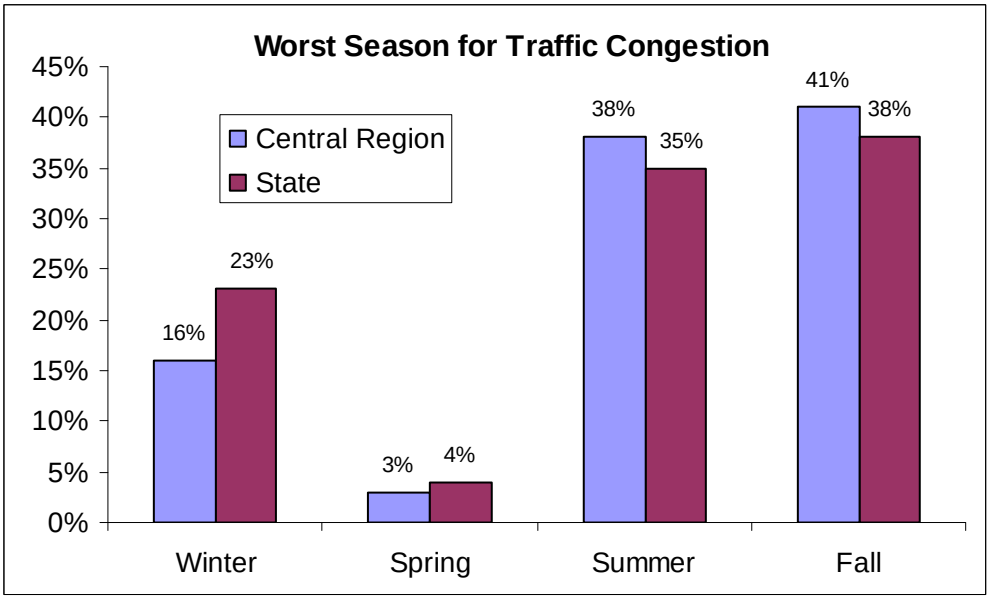


Figure 43



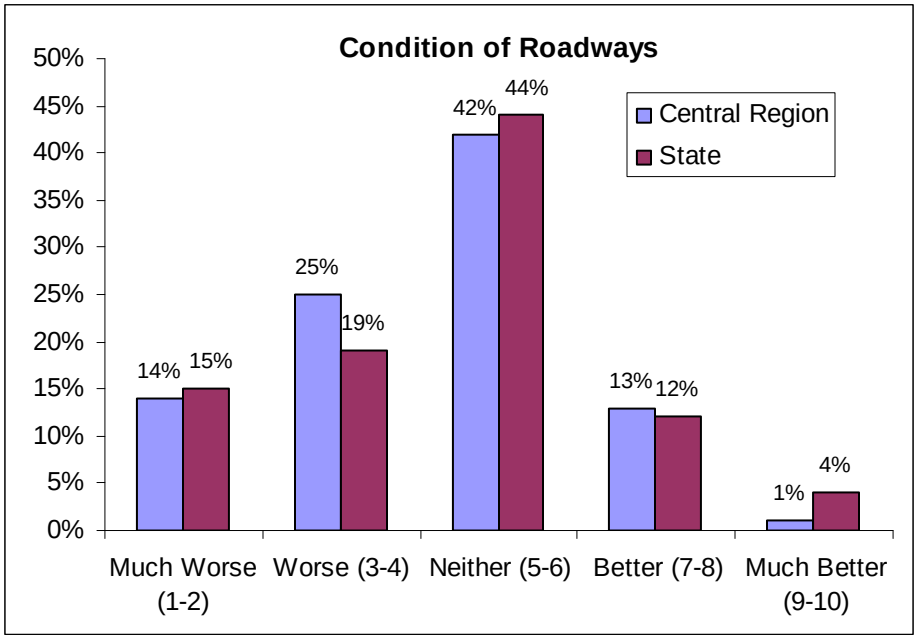
INFRASTRUCTURE CONDITION

In the Central Region:

- 36% of survey respondents live along an unpaved town road
- 24% live along a city or village street
- 24% live along a paved town road
- 16% live along a state numbered road.

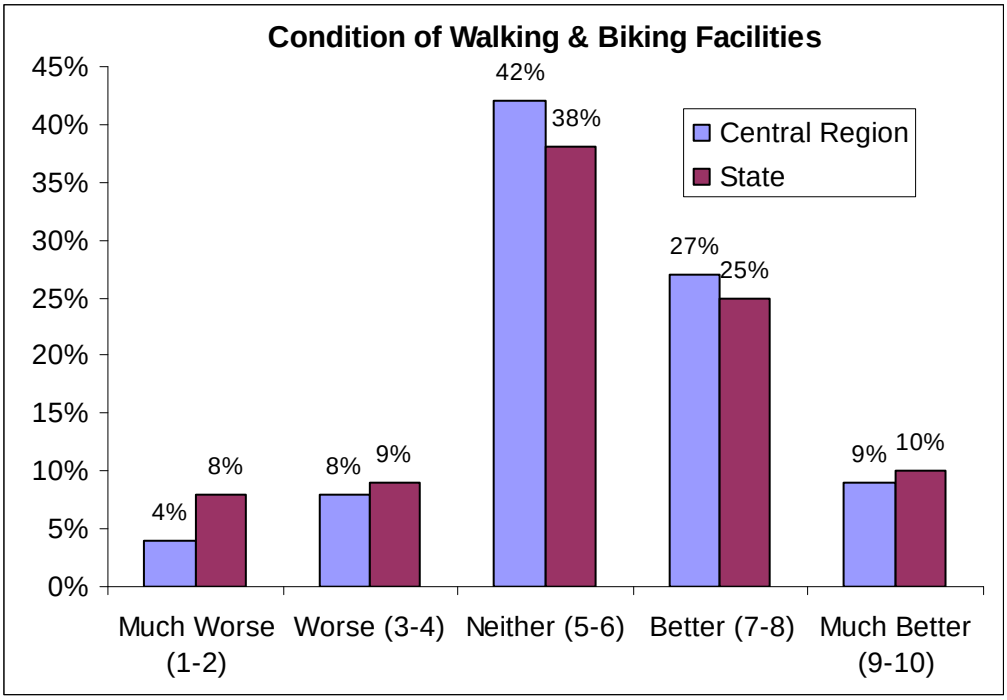
When asked to rate the condition of Vermont highways compared to five years ago (on a scale in which 1 indicates that the state highways are MUCH WORSE and 10 indicates they are MUCH BETTER than five years ago), the average response for the Central Region was approximately 4.6 (consistent with the statewide average of 4.7), suggesting that roadway condition is approximately the same (Figure 44).

Figure 44



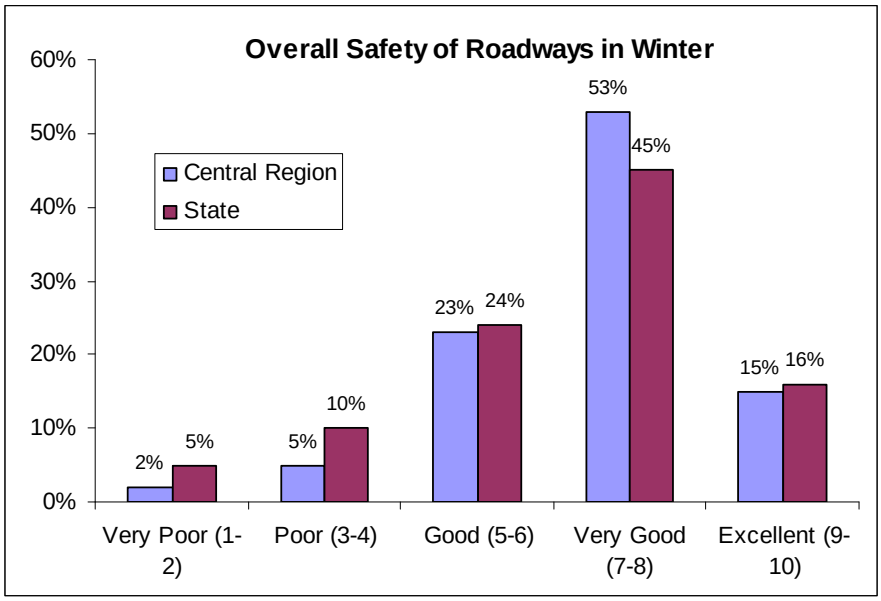
Using the same scale, respondents were asked to rate the condition of sidewalks, trails, shoulders and other facilities for walking and bicycling compared to 5 years ago; the average response for the Central Region was approximately 6.0 (5.9 statewide). This suggests that walking and bicycling facility conditions have improved only slightly (Figure 45).

Figure 45



Using a scale of 1 to 10 in which 1 is very poor and 10 is excellent, respondents were asked to rate overall winter safety of the roadway system during the winter (Figure 46); the average response was approximately 7.0, which is consistent with the statewide average response of 6.7.

Figure 46



MOST IMPORTANT ISSUES

Among the Central Region survey participants, 31% felt that "Safety and Security" is the most important transportation issue, followed by "Environmental Protection" (22%) and "Cost to Taxpayers" (19%) (Figure 47). "Preserving landscapes and village character" was considered the most important issue by a larger portion of people in the Central Region (10%) than "Economic development" was (7%); statewide (Figure 48), these issues were rated as the most important issue by nearly the same portion of people (10% and 11% respectively). In the Central Region, the second most important issue was "Environmental Protection" (23%), followed by "Safety and Security" (15%) and "Preserving landscapes and village character" (14%). Statewide, these items appeared in a slightly different order as the second most important issue: "Environmental Protection" (20%), "Preserving landscapes and village character" (17%), and "Safety and Security" (15%).

Figure 47

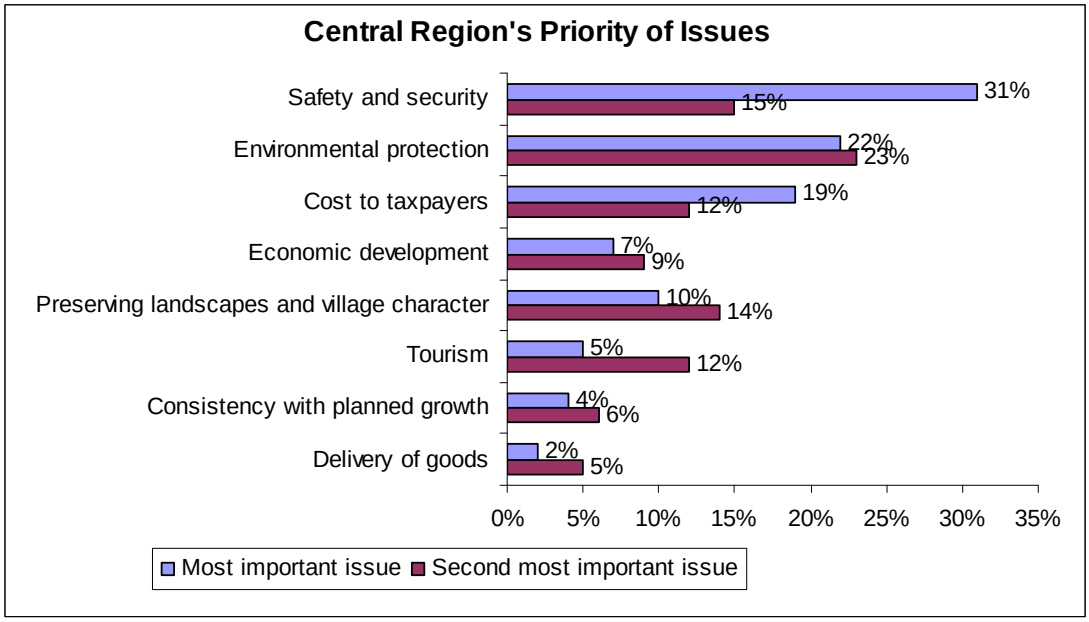
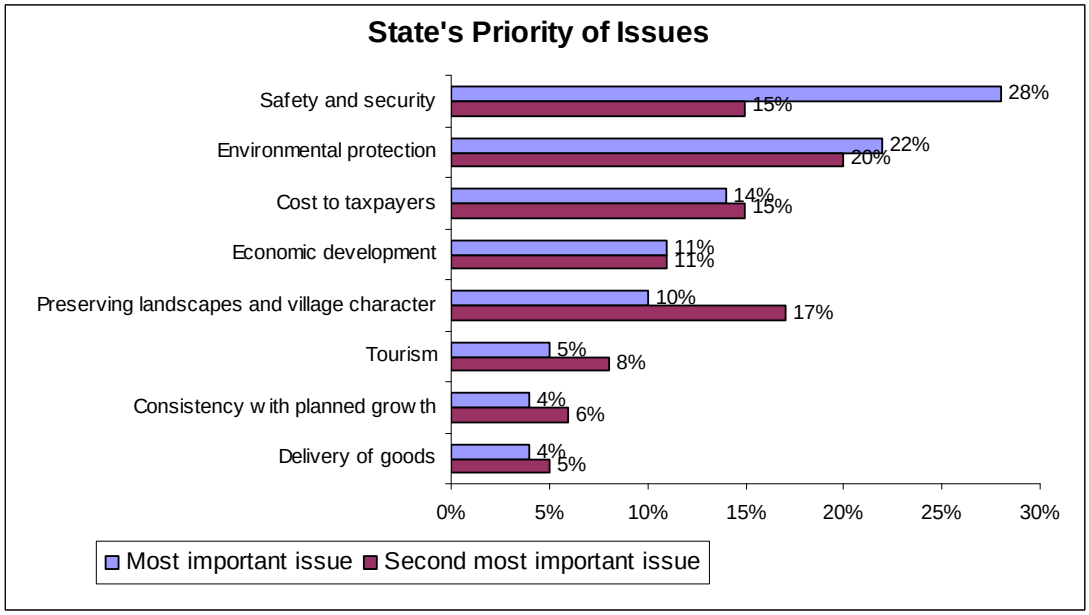


Figure 48



E. CVRPC PRIORITY METHODOLOGY

INTRODUCTION

This section reviews the project prioritization process used by the Central Vermont Regional Planning Commission (CVRPC) and its Transportation Advisory Committee (TAC) to organize and prioritize transportation projects within their region. Projects are rated according to criteria selected by the CVRPC (and criteria required by VTrans) to organize the projects according to regional priorities. These results help to direct VTrans' own project prioritization by accounting for about 20% of the score in the statewide prioritization process.

Important aspects of any prioritization process are that it be effective, transparent, understandable, and based on data that is readily available. The process should reflect local and regional plans and goals. Effective methodologies use both quantitative and qualitative criteria.

In 1998, RSG and Wilbur Smith Associates, under contract to the Chittenden County Metropolitan Planning Organization (CCMPO), reviewed and described prioritization methods used in other areas of the country. Prioritization methods were described for the Metropolitan Planning Organizations (MPOs) in Chicago, IL; San Francisco, CA; Portland, OR; and Albany, NY. A method used by the Lamoille County Planning Commission's Transportation Advisory Committee was also reviewed. The following common themes were identified among the various prioritization approaches:

- All methods used a combination of objective technical criteria and subjective decision making. No matter how quantitative the priority method, subjective decision making was part of all of the prioritization methods.
- Most of the methods were linked to the goals and policies of a long range plan.
- Performance-based measures make good auditable screening tools.
- Methods requiring cost/benefit analyses are data dependent and run the risk of being black boxes that engender mistrust.
- Even simple prioritization systems tend to separate the worthy from the unworthy projects fairly well.

This section describes how the CVRPC prioritization process works and how it compares to the ranking systems used by VTrans and in other regions. The section then provides recommendations for improvements.

CVRPC'S CURRENT PROJECT PRIORITIZATION METHOD

The CVRPC prioritization method is a two-step process that begins by assigning points to projects to order them in a preliminary list. Then, the TAC discusses the qualitative aspects of each project to incorporate subjective measures such as cultural significance and economic development.

Step 1: Point-Based System

The point-system ranks projects in the following programs:

- interstate bridges
- state bridges
- town bridges
- paving
- roadway
- safety & traffic operations
- park and ride
- bicycle and pedestrian.

A project is assigned 0 to 5.5 points in each of the categories shown in Figure 49. For example, if a project involves an area that is a High Crash Location, it will score 4 points in the Safety category. Whole point values are assigned to the project status, functional classification, safety, sufficiency rating, bridge deficiency, and level of service. Average Annual Daily Traffic (AADT) is allotted in half-point values. There are bonus points (in ½ point increments) given to projects that include elements such as bus routes, school associations, or strong regional support. However, these are used quite sparingly only as tie-breakers.

After points are assigned in all categories and the totals have been summed, projects are then ranked according to their final scores: projects with more points are assigned higher priority.

Figure 49: Prioritization Criteria and Scoring Ranges

# of points assigned	Project Status	Functional Classification	Safety	Sufficiency Rating	Bridge Deficiency	Level of Service	Average Annual Daily Traffic
5.5							25,000 - 27,499
5	Final/Contract Plans	Interstate					22,500 - 24,999
4.5							20,000 - 22,499
4	ROW Plans	Principal Arterial	High Crash Location	0.0 - 19.9	Structurally deficient	F	17,500 - 19,999
3.5							15,000 - 17,499
3	Semi-Final Plans	Minor Arterial		20.0 - 39.9		E	12,500 - 14,999
2.5							10,000 - 12,499
2	Preliminary Plans	Major Collector	Hazardous Site	40.0 - 59.9	Functionally deficient	D	7,500 - 9,999
1.5							5,000 - 7,499
1	Scoping/Conceptual Plans	Minor Collector		60.0 - 79.9		C	2,500 - 4,999
0.5							1,000 - 2,499
0	Not Active	Local		80.0 - 100		A or B	0 - 999

Individual Funding Program Bonus Point Tie Breakers - 0.5 pts each	**Other Adjustments made for:**
VIL - Village	REG RANK - Previous Regional Ranking
CITY - City	Recent Improvement - NEW DECK REHAB
SCH - School	
COM - Commercial Area	
IND - Industrial Area	
REC - Recreation Area	
INT - Intersection	
DET - Long Detour	
NAR - Narrow Lanes	
IS - Interstate Access	
IT - Intertown Access	
Bus - Bus Route	
PNR - Park & Ride Access	
SUP - Strong Support	

Step 2: Finalization by TAC

Prioritization systems based only on technical quantitative criteria sometimes produce unintended results since they do not take into account how a project may support long-term regional goals or strong public support. Since these qualitative aspects are not easily measurable with technical data, they are usually determined through discussion by the region's TAC.

After the CVRPC's point system organizes the projects into an initial list, the TAC discusses the qualitative aspects of each project. State legislation/VTrans suggests that the RPCs to include the following in their project prioritization:

- Project impact on congestion and mobility
- Availability, accessibility, and usability of alternative routes

- Functional importance of the highway or bridge to the economy
- Functional importance of the highway or bridge to the social life and culture of surrounding communities
- Conformance to local and regional plans
- Local support

The TAC can re-order the project list based on the results of their discussion. So while the point system considers quantitative criteria and initially organizes the project list, the TAC finalizes the order of the projects based on qualitative criteria.

COMPARISON TO VTRANS' AND OTHER REGIONAL PLANNING COMMISSIONS' METHODOLOGIES

VTrans' Project Prioritization Process

VTrans' prioritization methodology also uses a point-system. A detailed summary of the VTrans methodology is provided in Attachment A: Summary of VTrans Project Prioritization. Projects are organized into the following categories: paving, bridge, roadway, park & ride, bicycle & pedestrian, Transportation Enhancement Projects, aviation, rail and public transit. Assignment of points is based on technical engineering metrics such as pavement condition index, sufficiency ratings, and average daily traffic, as well as cost/benefit ratios and resource impacts.

Two significant aspects of the VTrans process are the consideration given to project momentum and to input from the RPCs. Project momentum refers to how far along a project is in the development process and how much difficulty is anticipated in completing the project.

For example, for bicycle and pedestrian projects, VTrans estimates project momentum by assigning two points for each of ten factors:

- Project Development Process
  - Project definition complete
  - Preliminary design complete
  - Environmental permits acquired
  - Right-of-Way clear
- Funding
  - Project was funded in previous fiscal year
  - Project construction included in State Transportation Improvement Plan
  - Project expenditures are included in the current Capital Improvement Program

- Anticipated Workflow Issues
  - No environmental/resource issues anticipated
  - No design issues anticipated
  - No Right-of-Way issues anticipated

Regional priority and input account for about 20% of a project's ranking in the VTrans process. The RPC's ranking is important to VTrans because it provides local input and a qualitative assessment of the projects. These aspects are not as readily available to VTrans as quantitative data is (for example, sufficiency ratings).

OTHER RPC'S PROJECT PRIORITIZATION PROCESSES

RSG conducted an informal survey of RPCs in Vermont and asked each one to briefly describe their project prioritization methodology. Table 15 compares the methodologies of the RPCs that responded. To varying degrees, all of the commissions rate their projects through a combination of measuring quantitative technical data and discussing local, qualitative aspects. A few of the responding RPCs noted that they used a version of the CVRPC's point-system to develop a preliminary list of projects for their TAC to discuss. The CVRPC's spreadsheet appears to be widely-used by the other RPCs in the state.

Table 15: Prioritization Methodologies of RPCs in Vermont

RPC	Methodology
Addison County	TAC discusses potential impacts and performance of projects to determine priorities
Central Vermont	Two-step process: 1) point-based system considers project status, functional classification, safety, sufficiency rating, bridge deficiency, level of service, Average Annual Daily Traffic; 2) TAC discusses qualitative criteria and finalizes priority projects
Chittenden County Metropolitan Planning Organization	Projects are rated according to what kind of impact (high/medium-high/medium/low/no impact) they have in each of the areas listed below; impact rating is based on the guidelines shown in Appendix B: – Economic vitality – Safety and security – Accessibility, mobility and connectivity – Environment, energy and quality of life – Preservation of existing system – Efficient system management
Lamoille County	Two-step process: 1) uses CVRPC's point-based system to consider project status, functional classification, safety, sufficiency rating, bridge deficiency, level of service, Average Annual Daily Traffic; 2) TAC discusses qualitative criteria and finalizes priority projects
Northeastern Vermont Development Association (NVDA)	Two-step process: 1) uses CVRPC's point-based system to consider project status, functional classification, safety, sufficiency rating, bridge deficiency, level of service, Average Annual Daily Traffic; 2) TAC discusses qualitative criteria and finalizes priority projects

Southern Windsor County	Prioritization determined by combination of technical/quantitative data and discussion of qualitative aspects Criteria: – Road and bridge sufficiency ratings (quantitative data) – AADT (quantitative data) – High Crash Locations (yes/no) – Impact on congestion & mobility (high/low) – Availability of alternative routes (yes/no) – Importance for economy (high/low) – Social/cultural importance (yes/no) – Conformance with local/regional plans (yes/no) – Local support (high/medium/low) Notes: Prioritizing projects within the specified categories is preferable to one comprehensive list, as it better corresponds to existing funding programs. Certainty in the proposed construction dates would help town selectboards plan for the required local match, and to better prioritize local projects.
Two-Rivers-Ottauquechee	Prioritization determined by combination of technical/quantitative data and discussion of qualitative aspects Criteria: – System preservation (30%; maintenance/rehabilitation or replacement/reconstruction) – Safety (30%; high/medium/low) – Economic development (15%; direct/indirect) – Social and cultural importance (10%; high/medium/low) – Alternative routes (10%; high/medium/low) – Multi-modalism (5%; direct/indirect) – Miscellaneous (up to 15%; determined by issue) Notes: ADT is used as tie breaker
Windham Regional Commission	Two-step process: 1) uses a point-based system to score projects on safety, congestion & mobility, economic impact, functional importance, conformance to local and regional plans/local support, and intermodal capacity/transit viability/bike and ped accommodations; 2) TAC discusses and finalizes priority projects

Common elements of the methodologies:

1. All methodologies involve some combination of measuring quantitative technical data and discussing local, qualitative aspects.
2. Since VTrans considers technical data in its prioritization system, there is some debate as to whether it would be redundant for an RPC to include similar criteria in its own ranking. For significant criteria, it appears that including the same measures in both the VTrans and regional prioritization will reinforce meaningful measures rather than be redundant. .

3. While the TAC is an excellent forum for these discussions, some guidance or framework/structure for discussion is beneficial. For example, some RPCs use a point-based system to identify projects which the TAC will discuss. The CCMPO uses guidelines to determine how much of an impact a project will have (see Attachment B).
4. It is essential that any prioritization system be transparent and explainable to the public. A decision-making process that is not transparent becomes a "black box" and can create mistrust. Maintaining transparency can be difficult to accomplish in a potentially subjective discussion of qualitative criteria. But guidelines like those used in the CCMPO methodology can add structure and transparency while discouraging arbitrariness.
5. While a benefit-cost ratio would be logical to include in the project rankings, this is applied in the VTrans process and would therefore be redundant in an RPC prioritization; in addition, benefit-cost data is not always readily available. Likewise, VTrans assesses project momentum to address permitting complexities, so it might be redundant for the RPC to consider this as well.

RECOMMENDATIONS FOR IMPROVEMENTS TO CVRPC METHODOLOGY

The current CVRPC methodology works well and produces valid results. Given the VTrans suggestion to include qualitative criteria in the regional prioritization, however, there are other options for incorporating qualitative aspects which the TAC may want to consider. Based on our assessment of the current CVRPC prioritization process and our understanding of the VTrans and Vermont RPC prioritization processes, we have identified the following two options.

- **Option 1: Revise Existing Scoring Methodology**
  In 2006, the CVRPC drafted a methodology to incorporate the qualitative criteria suggested by VTrans into its prioritization process. For various reasons, this methodology was not adopted at the time. The methodology (summarized in Table 16) is transparent and establishes guidelines based on technical data. However, this methodology would present a significant departure from the current prioritization procedure and would also require a significant investment in staff time to develop the quantitative metrics.

Table 16: Draft Regional Priority Criteria (source: CVRPC 5/17/2006)

Criteria	Guidelines	Measure
1. The impact of the project on congestion and mobility conditions in the region (Max - 10 pts)	Will the project significantly improve a congestion problem?	None – 0 pts Minor (one or two LOS grade improvement) – 1 pts Moderate (three LOS grade improvement) – 2 pts Major (four or five LOS grade improvement) – 3 pts Widen Road < 28' or Bridge < 22' – 1 pts
	Is the project located in a corridor projected for high AADT growth by 2020 ?	Less than 1,000 – 0 pts 1,000 to 1,999 – 1 pts 2,000 to 2,999 – 2 pts 3,000 to 3,999 – 3 pts 4,000 plus – 4 pts
	Importance of the project on a state or local highway network?	Class 3 – 0 pts Class 2 – 1 pts State – 2 pts Truck Network – 3 pts
2. The availability, accessibility and usability of alternative routes (Max - 10 pts)	Are there alternative ways to get around a problem area?	Readily available detour that can handle the traffic volume – 0 pts <4 mile detour – 2 pts 4 – 9.9 mile detour – 5 pts Over 10 mile detour – 10 pt
3. The functional importance of the project as a link in the local, regional or state economy (Max - 10 pts)	Does the project support the existing economy?	Local (small sized employers, villages) – 1 pts Regional (moderate sized employers, less than 1,000), Norwich U., Cabot) – 2 pts State (major or clustered employers, over 1,000, CVMC, Nat. Life) – 3 pts
	Is the project important for projected 2020 economic development?	Less than 100 future employment – 0 pts 100 to 499 future employment – 1 pts 500 to 999 future employment – 2 pts 1,000 to 1,999 future employment – 3 pts 2,000 plus future employment – 4 pts
	Is the project within a commercial, industrial zone, or mixed use zone?	See Regional Zoning Map – 3 pts
4. The functional importance of the project in the social and cultural life of the surrounding communities (Max - 10 pts)	Is the project important to access a school, shopping, recreation area, health care, or other institutions?	1pt each
	Does the project enhance/preserve a historical area/facility?	
	Does the project improve bicycle and pedestrian facilities?	
	Does the project improve the streetscape?	
	Will the project provide traffic calming in cities or villages?	
	Will the project support public transit/ridesharing?	
5. The project is within a recognized Growth Area (Max - 10 pts)	Use the Growth Area Map defined in the Region Transportation Plan	Local – 2 pts Sub-Regional – 5 pts Regional – 10 pts
6. Conformance to the local and regional plans (Max - 10 pts)	Is the project supported in the Town and/or Regional Plan?	5 pts each
7. Local support for the project (Max - 10 pts)	Does the Select Board and/or Planning Commission support the project?	5 pts each
	Is there an organized group or neighboring community opposing the project?	Yes-Minus 5 pts

Option 2: Maintain Current Scoring; Add Local & Regional Plan Conformance to Scoring

If Option #1 is not pursued, the CVRPC should incorporate regional goals into the prioritization system to ensure consistency with local and regional plans. One approach would be for CVRPC staff to examine the list of projects in relation to regional goals and subtract points from any projects that are inconsistent with the Regional Plan's goals (see Table 17). The remainder of the qualitative measures requested by VTrans would be discussed subjectively by the TAC after reviewing the preliminary project rankings.

Table 17: Central Vermont Regional Plan Goals

Transportation

Goal 1:	To achieve a regional transportation planning process that is comprehensive, multimodal, and public, and is integrated with regional and local land use planning as outlined in the Central Vermont Regional Plan.
Goal 2:	To preserve and maintain the existing transportation system.
Goal 3:	Enable the transportation system to operate at it's highest efficiency by managing travel demand and encouraging shifts to under-utilized and more efficient travel modes.
Goal 4:	To integrate modes of travel in order to allow for their most effective use and ultimately reduce dependence on single occupant vehicles.
Goal 5:	To establish a transportation system that minimizes consumption of resources and maximizes the protection of the environment.
Goal 6:	To make necessary improvements to achieve a transportation system appropriately structured and designed to safely, effectively, and economically move goods and people.
Goal 7:	Promote a transportation system design that strives for aesthetic and functional characteristics that improve the quality of life.
Goal 8:	To promote a regional transportation system that preserves and enhances residential and economic development potential in growth areas.
Goal 9:	To promote a regional public transportation system.

Land Use

Goal 1:	To promote sound management, conservation and use of the Region's natural resources.
Goal 2:	To enhance and support the viability of the Region's resource based industries.
Goal 3:	To encourage the historic settlement pattern of compact village and urban centers separated by rural countryside while promoting development in economically viable locations.
Goal 4:	To protect environmentally sensitive or unique areas.
Goal 5:	To preserve the aesthetic quality of the Region.
Goal 6:	To ensure that new development in the vicinity of the Region's interstate interchanges is appropriate to the setting and considers the impact of such development on adjacent village and urban centers.
Goal 7:	To manage the quality and quantity of stormwater runoff in order to avoid property damage and negative impacts on surface and groundwater.

Central Vermont Regional Plan Goals (continued)

Energy

Goal 1:	The efficiency with which energy is used should be increased.
Goal 2:	The use of non-renewable energy resources should be decreased, while the use of renewable energy resources, particularly those of local origin, should be increased.
Goal 3:	Emissions of greenhouse gases, acid rain precursors, and other environmental toxins should be decreased.

Utilities, Facilities, and Services Element

Goal 1:	To promote the upgrading, improvement, and expansion of sewage treatment facilities and options so as to protect public health, maximize public investment, and reinforce desired patterns of growth.
Goal 2:	To promote the upgrading, improvement, and expansion of public water system facilities so as to protect public health, maximize public investment, and reinforce desired patterns of growth.
Goal 3:	To promote the upgrading, improvement, and expansion of electric power generation methods and infrastructure so as to provide adequate service, conserve energy, maximize public investment, and protect public health.
Goal 4:	To promote adequate access to a wide range of high quality outdoor recreation experiences to all sectors of the population.
Goal 5:	To promote adequate access to a wide range of high quality cultural experiences for all sectors of the population.
Goal 6:	To promote the protection and use of the Region's historical and archeological resources.
Goal 7:	To promote effective and efficient communication systems.
Goal 8:	To promote effective, efficient and accessible emergency and health care services.
Goal 9:	To build disaster resistant communities in Central Vermont through sound emergency planning and management.
Goal 10:	To ensure that all communities in Central Vermont have the appropriate information, resources, and tools to respond to disaster events and recover from their impacts.
Goal 11:	To minimize community conflicts within Central Vermont, reduce the Region’s already low crime rate, and protect the community from violence and serious crimes.
Goal 12:	To prevent the social and economic conditions that often lead to community conflicts.
Goal 13:	To foster safe and supportive communities by educating municipal officials on crime issues, supporting prevention programs, encouraging rehabilitation strategies, and fostering public safety.
Goal 14:	To protect the community from violence and other serious crimes.
Goal 15:	To promote effective, efficient, accessible, and affordable educational facilities and services.
Goal 16:	To promote safe, sound, cost effective, and efficient solid waste management.

Central Vermont Regional Plan Goals (continued)

Housing

Goal 1:	The region should have a sufficient stock of safe and healthy housing available for all residents in the locations where it is needed.
Goal 2:	The region should explore the development of a "fair share" plan for the equitable distribution of housing and associated municipal and social services among the region's municipalities.
Goal 3:	The region should encourage innovative planning, design and construction which minimizes the cost, energy consumption and environmental impact of housing.
Goal 4:	The region should increase coordinated action between private, non-profit and public entities involved with planning and financing affordable housing.
Goal 5:	Support the preservation and enhancement of local initiatives to review policies and programs that affect housing within the community.
Goal 6:	Promote the conservation and preservation of the existing housing stock, while maintaining affordability to the region's residents.
Goal 7:	Develop, with the provision of funding, complete and accessible information on local housing values, transfers, construction, permits and conditions; soil and infrastructure capacity; and land use regulation and conditions affecting the development of housing.

Economic

Goal 1:	Promote and support a diversified economy that will provide full employment at a livable wage*, display minimal fluctuation, and have minimal negative environmental impact.
Goal 2:	Work with municipalities to find land that both the municipality and CVRPC would agree would be suitable for commercial and industrial development.
Goal 3:	Assist in maintaining and strengthening the region's city, village and growth center economies.
Goal 4:	Encourage improvement and expansion of the region's commercial recreation. (Commercial recreation is defined as any recreational enterprise operated as a business and open to the public for a fee).
Goal 5:	The Region should have a sufficient inventory of commercial and industrial sites to meet future employment needs.
Goal 6:	Use existing GIS information to assess the development capacity of and for commercial and industrial sites in the Region in light of available data and the policies of this Plan.
Goal 7:	Ensure that State laws which affect job creation are reviewed and revised to respect local decision making to the maximum extent possible consistent with sound environmental planning.
Goal 8:	Region to have and provide consistent, regional data, estimates, and projections.
Goal 9:	Support the development of the Region’s technological infrastructure.
Goal 10:	Promote and enhance educational opportunities for all residents, as well as improvements to and use of the transportation infrastructure as outlined in the Utility, Facility and Services and Transportation Elements of this Plan.

* A livable wage is defined as the hourly wage/annual income necessary to cover all basic needs plus all relevant local, Federal, and State taxes. Basic needs include: food, housing, child care, transportation, health care, clothing, household and personal expenses, and insurance.

ATTACHMENT A: SUMMARY OF VTRANS PROJECT PRIORITIZATION

Factor	*Maximum Points*

Paving

Pavement Condition Index	17.5
Benefit/Cost Ratio	35
Regional Priority	17.5
Contract Status	30
Total	100

Bridge*

Bridge Condition	35
Remaining Life	15
Functionality	5
Load Capacity and Use	15
Waterway Adequacy and Scour Susceptibility	15
Project Momentum	5
Regional Input and Priority	15
Asset - Benefit Cost Factor	15
Total	120

* This category also includes a network system factor to serve as a multiplier to the total number of points.

Roadway

Highway System	40
Cost per vehicle mile	20
Regional Priority	20
Project Momentum	20
Total	100

Park & Ride

Total Highway and Location	40
Cost/Parking Space	20
Regional Input and Priority	20
Project Momentum	20
Total	100

Bicycle & Pedestrian

Land Use Density	20
Connectivity to a larger network of B/P facilities	10
Multi-Modal Access	5
Designated Downtown or Village Center	5
Project Cost	20
Regional Priority	20
Project Momentum	20
Total	100

Transportation Enhancement Projects

Project promotes quality, linkage, and variety in system.	10
Benefits substantial number of people.	10
Compatible with surroundings and is supported by RPC/MPO	10
Project is feasible and likely to be completed	10
Strong community support	10
Addresses one or more Transportation Enhancements activities	10
Particularly innovative or creative	10
Budget is 50% or more for pedestrian or bicycle travel surfaces	10
Benefits economically disadvantaged area	10
Benefits designated downtown or village	10
Total	100

Aviation (does not include Burlington International Airpo

Airport activity	100
Population served & local government support	24
Economic development	40
Project type (runway, paving, navigation, etc.)	120
FAA Priority & Standards Ranking	120
Previous Federal/State Funding	200
Cost/Benefit for projects less than $75,000	100
Resource Impacts	40
Local interest/support	20
Total	764

Rail

Railroad freight operations	60
Railroad passenger operations	60
Line conditions	60
Operational costs	60
Facility standards	60
Priority route	60
Vermont-based activity	40
Government and local support	40
Economic development	40
Documented non-state funding opportunities	40
Resource impacts	60
Regional scope	60
Utilization of resources	30
General safety	60
Total	730

Public Transit New Starts

Mobility improvements	15
Environmental benefits	10
Operating efficiencies	15
Project coordination	10
Regional connectivity	15
Local financial commitment	20
Sustainability of funding continutation	15
Total	100

ATTACHMENT B: QUALITATIVE SCORING GUIDELINES USED BY CCMPO

	Economic Vitality	Safety and Security	Accessibility, Mobility and Connectivity	Environment, Energy and Quality of Life	Preservation of Existing System	Efficient System Management
High Impact (10 points)	☐ Projects that provide new or improved access to regional activity centers ☐ Projects that enhance freight movement on interstate or principal arterial ☐ Projects that improve airport access ☐ Projects that improve access to tourism facilities	☐ Intersection/roadway safety improvements (sight distance, alignment, pedestrian crossing, new signal) in location with a documented safety problem (high accident locations) ☐ Rail grade crossing improvements and warning signs ☐ Bridge **safety** improvements for bridges with sufficiency rating up to 25 ☐ Other project deemed very important to the safety of the transportation system	☐ New/expanded transit infrastructure, service or dedicated facilities for buses ☐ Bicycle /pedestrian facilities making intermodal linkages or regional connections ☐ New/expanded access to airports, freight distribution facilities, major industrial centers or regional activity centers ☐ Provides gap closure in major regional corridor, including new bridges ☐ Bridge rehab or replacement in areas with limited alternative routes	☐ Traffic calming project within established neighborhood or activity center ☐ Bus replacement for vehicles beyond useful life ☐ Bicycle/pedestrian facilities within an established neighborhood or activity center ☐ Significant reduction in the quantity and improvement to the quality of water runoff ☐ Clean fuel buses/vehicles. Alternative fuel infrastructure. ☐ Transportation demand strategies, programs and incentives, including park and ride lots ☐ Projects that encourage compact land use or transit oriented design	☐ Reconstruction, resurfacing or intersection improvements for project with perceived critical need (preservation projects) ☐ Bridge structural improvements for bridges with sufficiency rating of less than 25, or in imminent danger of being closed or weight restricted ☐ Reconstruction or resurfacing of existing bike/ped facilities that are in danger of being closed due to deficiencies	☐ TDM strategies, programs and incentives including new or expanded park and ride lots ☐ Increases transit service capacity and/or reliability ☐ New or improved intermodal transportation center ☐ Traffic signal interconnect or other ITS improvements ☐ Improvements to roadways, corridors or intersections with significant congestion (LOS E or F) including roundabouts ☐ Improvements to intersections accessing bicycle/pedestrian facilities serving primarily a transportation use
Medium-High Impact (7 points)	☐ Projects that provide new or improved access to local activity centers ☐ Projects that provide access to planned future activity centers ☐ Projects that improve access facilities important to rural communities ☐ Address environmental issues that could impact economic development ☐ Projects that maintain existing access facilities on interstate or principal arterial ☐ New/expanded Park and Ride Lots	☐ Improve emergency access ☐ Bridge **safety** improvements for bridges with sufficiency rating of 25.1 to 50 ☐ New median barriers, guardrail or shoulder ☐ Upgrading signage and pavement markings to improve safety ☐ Intersection/roadway safety improvements (sight distance, alignment, pedestrian crossing, new signal) in location with a perceived safety problem	☐ Bridge rehab or replacement on interstate or principal arterials ☐ Bicycle/pedestrian facility connecting neighborhoods ☐ Upgrade to existing access facilities to airports, freight distribution facilities, major industrial centers or regional activity centers ☐ Projects that improve connectivity and mobility for rural communities	☐ Streetscape enhancement project	☐ Reconstruction, resurfacing or intersection improvements for project with perceived significant need (preservation projects) ☐ Bridge structural improvements for bridges with sufficiency rating of 25 – 50, or with significant structural deficiencies ☐ Reconstruction or resurfacing of existing bike/ped facilities with significant need. ☐ Existing transit facility replacement/rehab that prolongs useful life of assets ☐ Transit vehicle replacement/rehab consistent with FTA Standards	☐ Improvements to congested roadways, corridors or intersections (LOS D) including roundabouts ☐ New interchanges on limited access highways, in locations with significant congestion, to relieve congestion ☐ New signals or roundabouts where warranted ☐ Reduces congestion on congested parallel route (LOS D, E or F)
Medium Impact (5 points)	☐ Streetscape or bike/pedestrian improvements in regional activity centers that improve commercial attractiveness ☐ Supports mobility needs of rural community ☐ Projects that enhance freight movement on minor arterial or major collector ☐ Bicycle/pedestrian projects that encourage tourism ☐ Projects that maintain existing access facilities on minor arterial or major collector	☐ Transit equipment for safety or security. For example, shelters. ☐ Bridge **safety** improvements for bridges with sufficiency ratings from 50.1–80 ☐ Repaving interstate or principal arterial	☐ Access to local activity centers ☐ Bicycle/pedestrian facility making connections within an established neighborhood or activity center ☐ Signing and informational systems (other than ITS) ☐ Improvements to interstates, freeways and principal arterials that do not provide direct access to airports, freight distribution facilities, major industrial centers or regional activity centers ☐ Provides gap closure in minor regional corridor ☐ New facilities to remove traffic from parallel congested routes ☐ Bridge rehab/replacement on minor arterial or principal collector or other rural bridges	☐ Rehabilitation or reconstruction of transit vehicles or facilities that increases ridership ☐ Signal updating and interconnections ☐ Projects that remove traffic from a neighborhood within an established activity center ☐ Addresses stormwater or quarter quality issues associated with existing transportation system ☐ New roundabout or signal projects	☐ Reconstruction, resurfacing or intersection improvements for project with perceived need (preservation projects) ☐ Bridge structural improvements for bridges with sufficiency raging of 50.1-75, or with moderate structural deficiencies ☐ Reconstruction or resurfacing of existing bike/ped facilities with perceived need. ☐ Necessary improvements to existing park and ride lots ☐ Addresses environmental issues impacting the existing transportation system	☐ Improvements to existing interchanges, intersections or roadways (LOS C) including roundabouts ☐ Introduces new connections between existing street patterns ☐ Improvements that reduce travel time ☐ New signal which relieves congestion ☐ Median treatments or access management ☐ Left or center turn lanes ☐ Reduces congestion on parallel route ☐ Bicycle/pedestrian facility within established neighborhood or activity center, or access improvements at existing intersections
Low Impact (3 points)	☐ Supports mobility needs of business or industry not in an activity center ☐ Other improvements that support tourism ☐ Other streetscape or bike/ped improvement in activity centers	☐ Paving minor arterial or major collector ☐ Other safety improvements	☐ Provides gap closure in local corridor ☐ Bridge rehab/replacement to other urban bridges ☐ Improvements to minor arterials	☐ Streetscape enhancement associated with another project ☐ Stormwater treatment or water quality improvements associated with another project ☐ New bike/pedestrian facility associated with another project ☐ Traffic calming associated with another project ☐ Other intersection improvements to reduce congestion	☐ Other improvements to the existing transportation system ☐ Transportation improvements that have an indirect benefit to the existing transportation system	☐ Bus station/stop amenities and shelters ☐ Traffic flow improvements
No Impact (0 Points)	☐ No discernable benefits	☐ No discernable benefits	☐ No discernable benefits	☐ No discernable benefits	☐ No discernable benefits	☐ No discernable benefits

F. FUTURE LAND USE SCENARIOS

1. This section provides an overview of the State of Vermont's Long Range Transportation Business Plan and how that plan's scenarios relate to the CVRPC region.

VT LONG RANGE TRANSPORTATION BUSINESS PLAN OVERVIEW

Concurrent with the update to the Transportation-Land Use section of the Central Vermont Regional Transportation Plan, VTrans is in the process of developing the Vermont Long Range Transportation Business Plan (VT LRTBP). The LRTBP establishes the vision, goals, and objectives that guide how VTrans maintains, operates, and builds the state's transportation system.

The following are some significant trends identified in the development of the LRTBP:

- **Funding Challenges**:
  The VT LRTBP describes two financial likelihoods: a projected state funding gap of $3 to $8 billion (cumulative) between 2006-2030, and the possibility that states will only be eligible, at most, for an amount of federal funding proportional to what they contribute to the Highway Trust Fund. Since Vermont is a "donee" state and receives $1.90 for every dollar that it contributes to the Fund, this would be a massive change for transportation funding.[1] Either of these scenarios – much less both - would require creative and diverse strategies to maintain and enhance the transportation system.
- **Aging Population:**
  The "graying of Vermont" will continue in the coming years, meaning that a larger segment of the population will not be able to drive themselves. Demand for public transit and other alternatives will rise, or else this population will be isolated due to lack of mobility.
- **Environmental Concerns:**
  There is a growing focus on regulation of greenhouse gas emissions and transportation fuel consumption. In Vermont, 46% of the state's carbon emissions come from the transportation sector. It is likely that fossil fuel demand management will be directed by economics, as interruptions in supply cause prices to rise and consumers seek less expensive alternatives. However, in areas where alternatives such as public transportation, walking, or bicycling are not available or feasible, the supply of alternative fuels will be expected to make up the gap. In the short term, tax breaks and other incentives may help to promote alternative fuels and make the transition to using them more gradual.

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1 "Taking the High Road, A Metropolitan Agenda for Transportation Reform", Table 4-4, page 88; The Brooking Institution, 2005. Highway Trust Fund Account Receipts and Apportionments, by State, 1998-2003.

This trend combined with the 'graying of Vermont' will make it imperative to increase state investment in public transportation and other alternative modes. As the region's public transportation provider, Green Mountain Transit Agency (GMTA) will require support to serve anticipated increases in demand. In addition, large regional employers like the State of Vermont might consider forming a Transportation Management Association (TMA) or developing transportation demand management (TDM) programs to supply alternatives to its employees.

- **Decentralization of Residential Uses:**
  The VT LRTBP describes a trend towards decentralization of land uses across the State. Vermont's new Growth Center designation adopted in 2006, along with downtown and village center designation, attempts to guide development to specified areas in order to manage growth and curb sprawl. It is difficult for public transportation to operate efficiently in rural areas, and relatively low funding for transit exacerbates the issue.

  By obtaining Growth Center designation, towns in Central Vermont should be able to centralize growth and manage development. The advantages of Growth Center designation include financing opportunities which could help to finance critical infrastructure investments.

- **Changes in the Economic Landscape:**
  Despite residential decentralization, jobs are continuing to move towards centralized areas. Employment centralization further supports the formation of TMAs in appropriate areas. Employment is becoming more service-oriented and manufacturing jobs are projected to continue their decline. Estimates cited in the VT LRTBP suggest that overall, the economic outlook is positive through 2030 as global trade and freight are expected to rise.

- **Importance of Freight Movement:**
  Increases in freight movements will impact Central Vermont because of its location on the I-89 corridor and the New England Central Railroad, and the Washington County Railroad spur which links Barre to the New England Central Railroad in Montpelier. A significant issue for rail freight is the ability of a line to carry double stacked cars and/or cars at the new standard weight of 286,000 pounds. With the increase in freight movement, the impact of large trucks in small towns and villages in Central Vermont may need to be further managed.

- **Growing Broadband Connectivity:**
  The Telecommunications Law promotes broadband and wireless access throughout the state, reflecting the trend towards comprehensive information technology services even in a largely rural state like Vermont. The widespread coverage is expected to have significant impacts on the economy as it attracts businesses to the state and allows for greater communication without physical transportation.

VT LONG RANGE TRANSPORTATION BUSINESS PLAN SCENARIO PLANNING

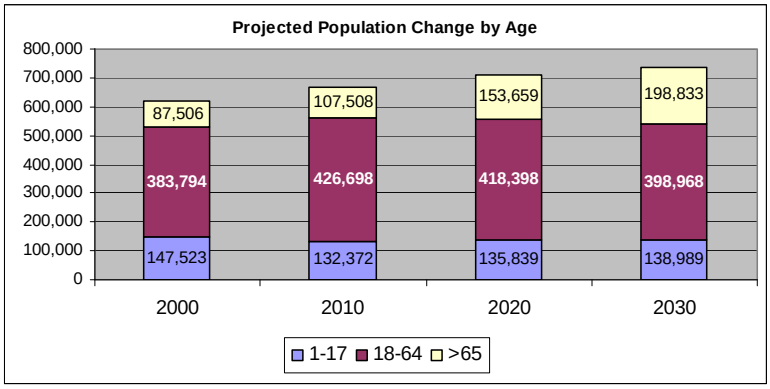
Among the unique aspects of VTrans' LRTBP is its use of "Scenario Planning." Long range plans are often used to identify needs for one assumed future condition. The scenarios are based on emerging trends that may have a significant influence on Vermont's future, such as climate change or changes in federal financing roles. This section summarizes the four scenarios used to develop recommendations in the VT LRTBP.

Scenario 1: Business as Usual

In this scenario, Vermont's population is older, but the state feels and looks very similar to today. The state's total population grows slowly and ages as the number of people over 65 more than doubles (FIGURE 50). Population and housing continue to decentralize into rural and suburban areas while growth in established cities and villages occurs at a slower place. Work force and affordable housing is located on less expensive land away from employment centers. Daily activities occur in regions where work, errands, education, recreation and entertainment are carried out in multiple towns. As a result, Vermonters remain very dependent on personal cars and trucks to get around and to deliver goods and services.

The economy grows slowly and is increasingly dominated by service sector jobs. Employment in the service sector accounts for three-quarters of the job growth between 2000 and 2030 while the number of manufacturing jobs decreases. Statewide broadband and wireless service support growth in the service sector economy and also create more at-home businesses. The number of jobs in the state grows faster than the population as more people continue to work beyond the traditional retirement age.

Figure 50: Projected population change in VT (US Census)



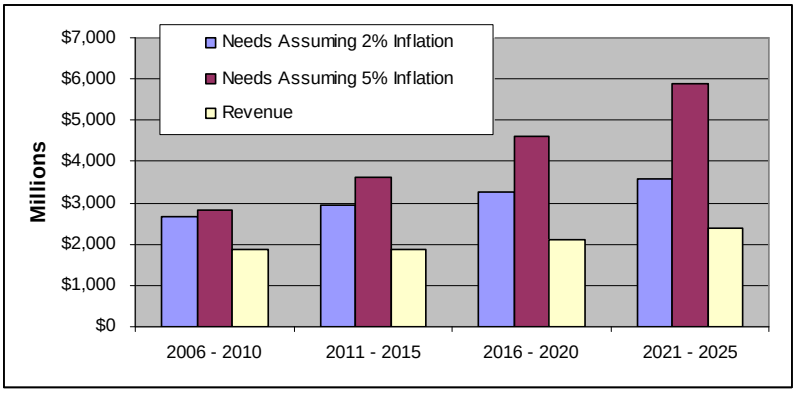
This projection is based on current trends. It shows slow change in VT's overall population while the number of people over the age of 65 is expected to double.

The supply and cost of oil and gas are volatile and Vermonters respond by purchasing more fuel efficient vehicles. However, this scenario assumes that oil remains available, is the primary source of energy for the transportation system, and that Vermonters continue to depend on their personal vehicles for daily activities.

On the environmental front, this scenario assumes that none of the air borne pollutants in Vermont exceeds the National Ambient Air Quality Standards (NAAQS). The recent weather trends of frequent and heavy rain, ice storms and high winds continue but do not intensify more than what has been experienced in recent years. These events require some short-term/emergency fixes (for example, a temporary bridge becomes necessary when the abutment for an old bridge is undermined), accelerate to some degree the deterioration of roadways, bridges, and culverts, and more frequently overburden stormwater management systems.

Transportation funding is a challenge in Vermont. Transportation revenues have not kept pace with inflation. After taking care of the basic maintenance needs of existing roads, bridges and transit systems, there is not much money left to pay for new facilities and services (Figure 51). There is growing pressure for municipalities to fund projects and services and more competition for less state and federal funds. On the national level, states that contribute more funds through the federal gas tax than they receive back (donee states), advocate for a "go it alone" approach to transportation funding. Each state, they argue, should be responsible for funding its transportation system with minimal federal participation. In Vermont, that means additional loss of revenue and widening of the funding gap.

Figure 51: VT's Projected Transportation Funding Gap



This chart shows the gap between projected revenue and the cost of transportation needs.

Scenario 2: Environmental Change

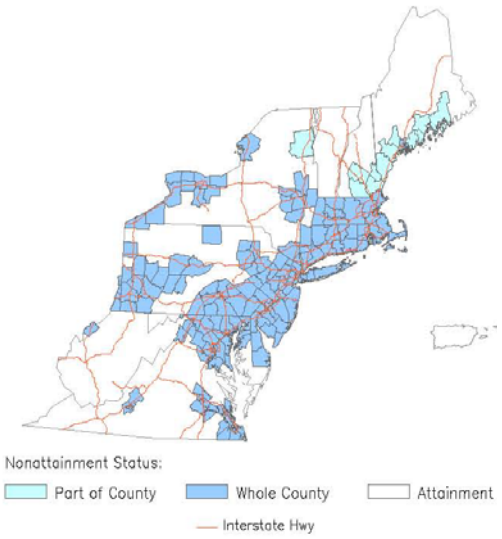
This scenario assumes that certain air borne pollutants exceed national air quality standards established to protect public health and Vermont becomes warmer and wetter due to climate change. The same basic demographic and economic trends, land use patterns, and funding challenges as described under the Business as Usual Scenario are assumed.

As required by the Clean Air Act (CAA), the EPA set National Ambient Air Quality Standards (NAAQS) for six principal pollutants, which are called "criteria" pollutants. The criteria pollutants are generated by the transportation system (mobile sources) and stationary sources such as homes, non-residential buildings, and power plants (point sources). Non-attainment status is designated for a geographic area, (usually a county, metropolitan area, or state) when at least one of the criteria pollutants measured in the field exceed its standard.

Currently, there are no documented NAAQS violations in Vermont; but this status has not always been the case. Non-attainment status was assigned in Vermont during the 1970s related to particulate matter (small particles in the air). The violation was eliminated by implementing methods that reduced roadway dust and through technical improvements that reduced tail pipe emissions. There have not been any documented violations in Vermont since the mid 1980s.

In the context of a long range transportation plan, it is reasonable to plan for a scenario where Vermont falls into non-attainment. Non-attainment could occur because the air quality worsens or due to a regulatory or legislative action that revises the NAAQS (which has occurred several times).

Figure 52: Ozone Non-Attainment Areas as of December 2006[1]



This map shows Vermont relative to the ozone non-attainment areas in the surrounding northeast states. The Environmental Change Scenario assumes that Vermont will also be in non-attainment.

It is not hard to imagine the first case, where air quality in Vermont becomes worse. Vermont is currently part of the Ozone Transport Region (OTR), which was established by the 1990 CAA to address ozone across the northeast region of the United States from New England to northern Virginia (Figure 52) [2]. Ozone is a pollutant that can be created in one area and transported to another and is often referred to as smog. The OTR was established to develop a regional and coordinated solution to reducing ozone. In Vermont, the level of ozone is close to but does not currently exceed the standard. Changes throughout the northeast USA could result in increased ozone levels in Vermont resulting in violation of the NAAQS.

Being designated as a non-attainment area will make transportation planning and the development of projects and services more complex. It will be necessary to demonstrate how projects and services conform to a state implementation plan designed to address air quality problems. More importantly, poor air quality would have public health and quality of life implications, would threaten Vermont's clean environment "brand" important to tourism and business recruitment, and may hinder economic development activities.

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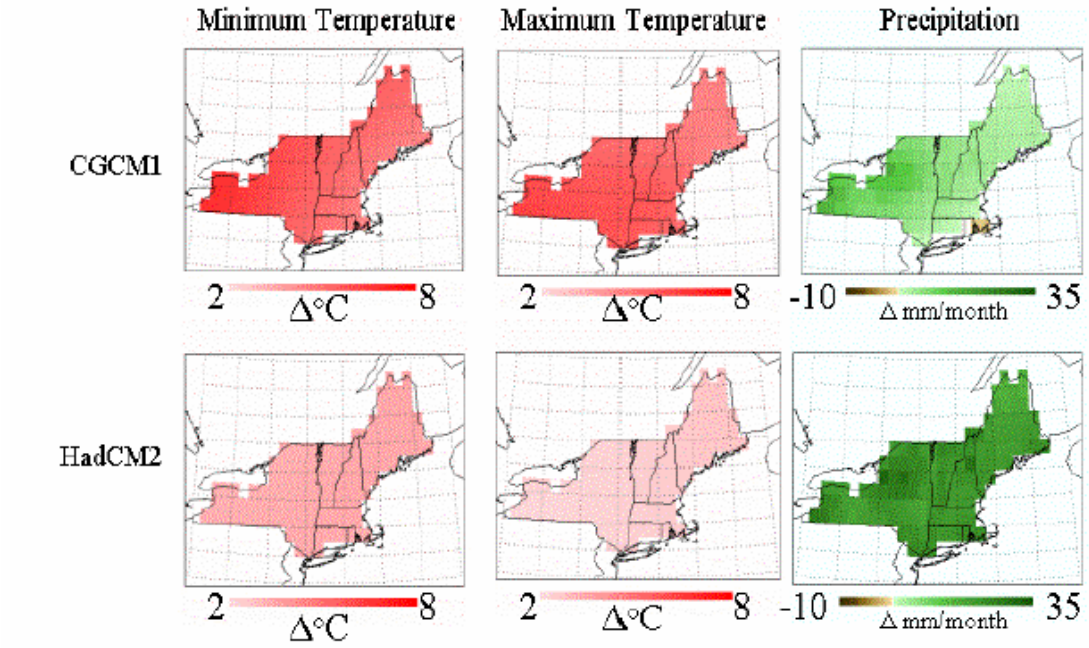
1 Map generated using map tools available from EPA at http://www.epa.gov/air/data/reports.html

2 The Ozone Transport Region includes all 6 New England States, New York, New Jersey Delaware, Maryland, and the Washington, D.C. area including the northern Virginia suburbs.

In addition to poor air quality, this scenario assumes that Vermont's climate will become warmer and wetter as described in the New England Regional Climate Variability and Change Assessment (FIGURE 53). The assessment analyzes how global climate change may affect New England and is a source of information for Governor Douglas's Commission on Climate Change. Two climate models referenced in the assessment predict an increase in New England's average annual minimum In addition to poor air quality, this scenario assumes that Vermont's climate will become warmer and wetter as described in the New England Regional Climate Variability and Change Assessment (FIGURE 53). The assessment analyzes how global climate change may affect New England and is a source of information for Governor Douglas's Commission on Climate Change. Two climate models referenced in the assessment predict an increase in New England's average annual minimum temperature of 6-10 degrees Fahrenheit and an increase in precipitation of 10-30% over the next century.

Figure 53: Forecasted Change in Temperatures and Precipitation by 2100



This graphic shows the best approximation of forecasted change in temperature and precipitation in New England using two different climate models. The Environmental Change Scenario assumes these forecasts are correct and Vermont becomes warmer and wetter.

These changes have two implications directly related to transportation. First, warmer temperatures promote the creation of smog (ozone) which would accelerate Vermont's fall into non-attainment. Second, storms will become more frequent and intense. As noted in Vermont's 2004 Hazard Mitigation Plan, warmer temperatures will likely increase the frequency and severity of flood inundation, erosion along rivers and streams, and landslide hazards. Vermont's roadway and rail

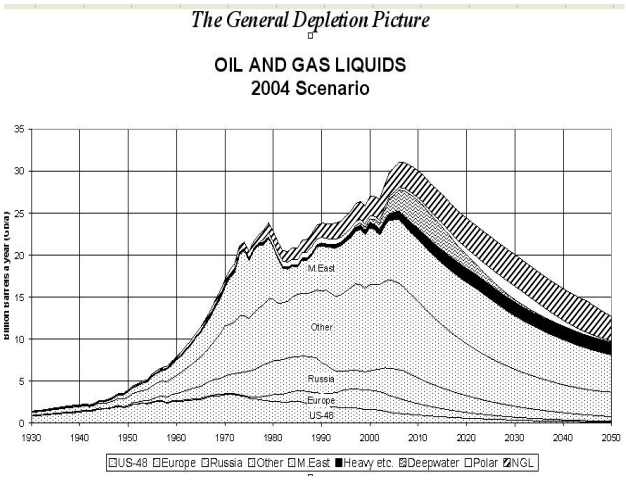
networks were constructed near or along rivers, in flood prone areas, or in narrow, steep valleys making them particularly vulnerable to floods. With global warning, more funds and resources will be necessary than currently anticipated (Business as Usual Scenario) to preserve and upgrade the transportation system's basic infrastructure: culverts, drainage and stormwater systems, and bridges; and to make emergency repairs that keep roadways open after severe weather events.

The potential impacts of climate change go well beyond the transportation system and include risks to human health due to increased levels of air pollution, encroachment of southern insects (like the deer tic) and tree diseases, and the loss of maples and other hardwood trees to pine and oak. With a changing forest and warmer weather, Vermont will be a different place and the economy may also be affected. The greatest economic impacts are in the human health sector and in the tourism sector, where a dull foliage season and less snow would reduce Vermont's attraction as a tourist destination during the fall and winter.

Scenario 3: Energy Crunch

The global supply of oil peaks or is interrupted for other reasons (Figure 54). There is a permanent and significant rise in the cost of crude oil which over time causes gas prices to more than triple. In addition, Vermont Yankee, which provides 30% of the state's electricity, is decommissioned and a replacement source that provides electricity at a similar cost has not yet been secured. As a result, electricity is more expensive and not competitive as an energy source for electric or hybrid vehicles that need to charge batteries over night.

Figure 54: One Estimate of Future Declining Oil and Gas Supply[1]



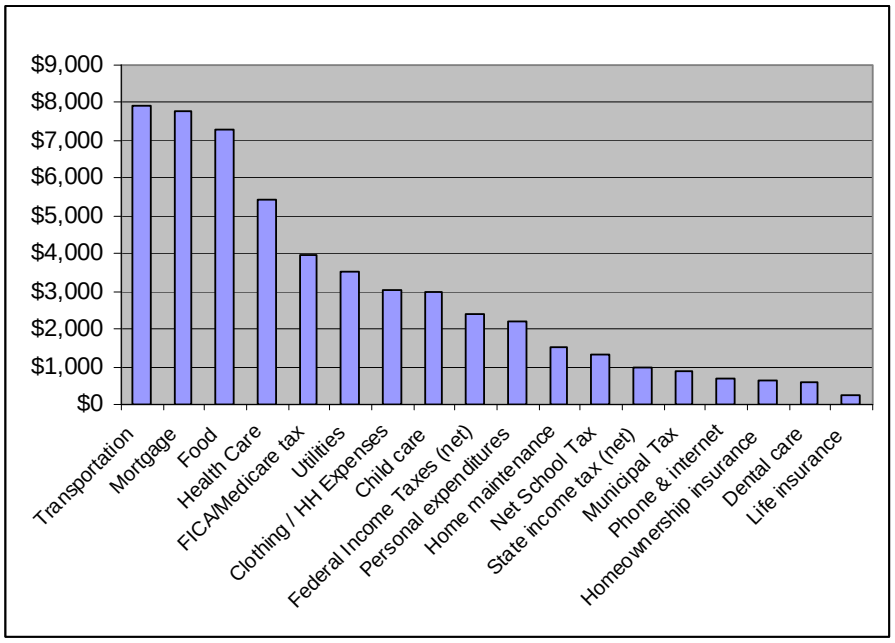
This chart shows one estimate of how oil and gas production could begin decreasing sometime after the year 2010.

During the early years of the energy crunch, the jump in fuel costs for transportation squeezes Vermont families that earn the median income or less (Figure 55). The cost is greater for people with homes located further away from jobs, services, and other activities because they need to drive longer distances. These homes were initially more affordable than similar sized houses in town, even when transportation costs were considered. As the supply of oil drops, gasoline costs double and then triple. Rising transportation costs generate

1 From www.peakoil.com

demand for more in-town housing. In the long term, these market forces reverse the trends of the last forty years and established cities, villages and growth centers are growing faster than rural areas.

Figure 55: 2006 Annual Household Expenses



This chart shows the annual expenses for a hypothetical household in VT with two adults and one child in 2006[1]. They earn the median income and own a home that was purchased at the median price in 2000. Note that transportation costs are slightly more than the mortgage. If gas prices triple, their transportation costs will increase by about $240 a month ($2,880 per year).

Higher cost oil, gas and electricity make Vermont less attractive to new businesses and existing businesses begin to consider out-of-state locations with lower cost, and more reliable energy sources. High fuel costs also increase the cost for goods movement by truck and have resulted in a rail renaissance. Over the years, the state upgraded its priority rail lines to handle heavier and double stacked cars at higher speeds and the railroads have expanded the types of services they offer. Businesses located near the rail line were able to take advantage of the new services but most businesses in the state remain dependent on trucks for shipping and receiving.

Scenario 4: Growth Scenario

This scenario assumes that employment and population growth occur above the rate described in the Business as Usual Scenario. The additional growth occurs due to the establishment of major employers in two different regions of the state and a statewide increase in in-migration.

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1 Based on data presented in "Vermont Household Affordability Analysis"; Douglas Hoffer and Paul Cillo; Public Assets Institute; October 2006. Available at http://www.publicassets.org/publications/

The employment growth occurs in two "hot spots" creating spin-off jobs and demand for new housing in the host regions. For the sake of the scenario planning exercise, the employment hot spots are assumed to be a manufacturing facility in the US 7 corridor south of Rutland and a high technology/information based company near Saint Johnsbury. Each facility is assumed to create 2,000 new jobs by 2030. (The locations, types of businesses and employment levels have been selected for the purpose of this exercise and do not reflect any known or anticipated development projects.)

This type of hot spot growth has occurred in the past and it is reasonable to think broadly about how to prepare for similar types of growth in the future. There are many examples of this type of hot spot economic growth in the state created by home grown businesses and out-of-state companies that choose to locate here. Although it is larger than the hypothetical examples in this scenario, the IBM facility in Essex Junction has been an economic force in and beyond Chittenden County for 50 years. Other examples include Ben and Jerry's with facilities in many locations, Green Mountain Coffee Roasters in Waterbury, IDX in South Burlington, and C. & S. Wholesale Grocers in Brattleboro.

Figure 56: A Recent Growth Hot Spot

The Husky Injection Molding facility in Milton is a recent example of a growth hot spot. As noted on the Husky web site, "Vermont was chosen because of the area's high standard of living and its close proximity to major transportation hubs in Montreal, New York and Boston."

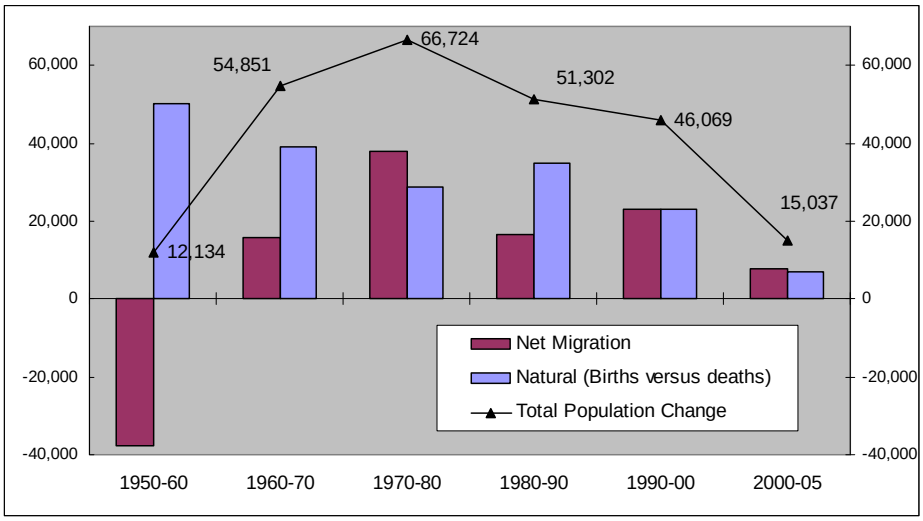
In addition to the hot spot growth, this scenario also assumes that the state's total population will increase beyond current trends as more people choose to move into Vermont. During the 1990s through 2005, Vermont's population change has been equally affected by the differences between birth and death rates (natural causes) and net in-migration. However, the contribution of natural causes and migration has varied significantly over the last 50 years (Figure 57). It is conceivable that national or global events could result in an increase in in-migration and the state's population would grow more than current trends suggest.

Like the hot spot economic growth, changes in in-migration have occurred in the past and it is reasonable to plan for the same type of event for the future. During the 1950s, Vermont experienced a net out-migration of almost 40,000 people. High birth rates off-set the difference resulting in a small increase in population. By the 1970s there was a significant change and a net in-migration accounted for more of the state's population growth than natural causes. The in-migration of the 1970s affected two decades of population growth as those that moved into the state began to have children presumably resulting in the increased birth rates in the 1980s that are implied in Figure 57.

It is generally accepted that a significant portion of the 1970s in-migration was due to a cultural change on the national level that could not have been anticipated in prior decades. It brought more

young people into the state and affected Vermont's own culture and economy in many ways. The Business as Usual Scenario assumes that current trends continue, the youth drain affecting all of New England occurs in Vermont, and the population becomes older. In the Growth Scenario, the opposite is assumed. Hot spot employment growth occurs and young people migrate into the state, grow their families and contribute to the economy in creative ways yet to be conceived.

Figure 57: Components of VT's Population Change from 1950 to 2005



This chart shows how natural causes (difference between births and deaths) and migration patterns have contributed to overall population change in Vermont. Note the large increase in in-migration in the 1970s followed by an increase in natural population growth in the 1980s. The growth scenario assumes that in-migration similar to the 1970s occurs again resulting in two decades of faster population growth.

Applying LRTBP Scenarios to Central Vermont

The LRTBP is a statewide plan, so what does it mean for Central Vermont? **Error! Reference source not found.** attempts to identify the implications that the scenarios could have on the CVRPC region. Each scenario is described using brief statements and broad observations. The table is organized as follows:

- **Scenario Name.**
- **Event or Primary Driving Factor.** Briefly describes the key event or change in driving factor that defines the scenario.
- **How other Driving Factors are Affected**. This section of the table describes how the primary event or driving factor could affect all other driving factors (listed in the general categories of land use/development, demographics, economy, etc). As scenarios were developed, it became clear that there are many interrelationships between the various driving factors. For example, the

Migration Change scenario could result in additional land use decentralization and could also drive economic growth. The general areas of land use/development and economy are driving factors on their own. But in this example they change in response to the primary driving factor of migration. These columns are also the building blocks that help describe the scenario. They provide a framework for thinking about how a particular scenario could be modified or refined.

- **Transportation Implications for Central Vermont**. This section identifies how a scenario could potentially affect the transportation system and demand in Central Vermont.
- **General Comments and Other Implications.** This section identifies issues beyond transportation for consideration.

	Event or Primary Driving Factor	Effects	Transportation Implications for Central Vermont
Business as Usual	Current trends continue. Vermont in 2030 looks very similar to today.	Demographics: low population growth; Migration and natural causes are equal share of population change; Doubling of people over the age of 65 and aging in place; Youth drain Land Use & Development: Regional Communities; Decentralization continues although some seniors may choose to locate closer to services; Separation of housing from jobs and services Economy: Growth in service sector jobs; Slow economic growth; High cost of housing; Traditional small entrepreneurs remain important part of state's economy Energy: Volatile energy costs and fossil fuel supply, but oil remains available. Environment: Stay within air quality attainment; Degradation of scenic qualities, due to decentralization, which are major quality of life and tourism assets Technology: Single occupant vehicles remain dominant mode of personal transportation; Broad band and wireless access provided throughout the state Transportation Funding: $3-8 billion funding gap 2006-2030; More reliance on state and local generated revenues; Funding gap intensifies competition for funds between different modes and regions of the state.	More older drivers: Safety concerns, increased demand for transit and special transportation services from Green Mountain Transit Agency combined with land use dispersion could lead to isolation; Travel demand keeps pace with population and employment growth; More regional travel on state highways, such as US 2, US 302, VT 14, VT 62, VT 12 & VT 100; Continued dominance of single occupant vehicle trips; More truck traffic, particularly on I-89, US 2, VT 100 & VT 14; More delivery trucks to support internet economy; Increased demand to improve and invest in system to support economic development, but less funds to do so.
Environmental Change	Vermont becomes a non-attainment area VT becomes warmer and wetter due to climate change	Demographics: Same as Business as Usual Land Use & Development: More emphasis on concentrated development as a strategy to address non-attainment and Green House Gas reduction, but market forces continue to favor decentralization. Economy: Generally the same as Business as Usual, but perceived or actual cost increases for economic development on initial implementation Energy: More emphasis on alternative fuels to address non-attainment and Green House Gas reduction Environment: Negative health impacts; Negative impact on water quality with more run-off due to storm intensity Technology: Same as Business as Usual Transportation Funding: Gap may increase due to increased needs from weather impacts and project development complexities.	Government may impose reductions in Vehicles Miles Travelled (VMT) and VMT/household, setting in motion new strategies for bicycling and walking, ridesharing, paratransit, transit, and more compact development requirements; Funds for highway capacity expansion restricted; Shifts in air and rail transport with associated state investments; More centralized growth in existing centers (e.g. Montpelier and Barre); Some events such as increased rainfall averages might affect transportation and stormwater design.

	Event or Primary Driving Factor	Effects	Transportation Implications for Central Vermont
Energy Crunch	Oil supply declines or international / security event restricts fuel supplies; De-commissioning Vermont Yankee	Demographics: Population grows even slower, or declines due to slower economy and population shift to more urban states. Land Use & Development: Market forces begin to encourage more growth in established cities, villages and growth centers. Economy: Big negative economic impact in short term on both households and businesses; Energy prices increase making VT less affordable to establish new or grow existing business Energy: Electricity less cost effective as source for transportation; Vermonters become more energy independent using local resources Environment: Might cause use of domestic energy sources (wood) short-term that have larger environmental effects; Less fossil fuel consumption combined with less travel means less impact on all aspects of environment Technology: Should stimulate technology innovations and more institutional collaboration to achieve long term improvement Transportation Funding: Same funding gap as Business as Usual; Significant state and local financial implications beyond transportation.	Attractiveness of establishing a Central Vermont or Montpelier Transportation Management Association is heightened. More centralized growth in existing centers (e.g. Montpelier and Barre); Increase in cost and need for substitution in construction and maintenance materials and in operations for VTrans and municipal public works departments; Heightened shift to non-single occupant vehicle trips due to rise in travel costs generates need to expand alternative transportation modes.
Hot Spot Growth and Migration Change	Significant job growth occurs in two hot spots (Waterbury and Montpelier, for example). Event occurs, either globally, or in nearby major metropolitan areas that causes significant increase in in-migration	Demographics: Population increases much faster than anticipated in first 5 years after event; More younger people move to VT with growing families that fuel continued population growth into next generation; Population growth occurs around new employment hot spot Land Use & Development: Significant residential and retail growth around new employment hot spots.; Decentralization continues in rest of state Economy: Employment growth in hot spot; Overall economy also grows in response to in-migration. Businesses may be started by people moving to VT. (Also depends on how other systems like education respond.) Energy: Same as Business as Usual Environment: Same as Business as Usual Technology: Same as Business as Usual Transportation Funding: Some potential to generate funds through tax increment finance or impact fees around growth hot spots; These options could address capacity needs near hot spot, but would not address overall funding gap; Some additional revenue generated through growth, but significant gap remains.	Hot spot location(s) could be in Central VT, thereby creating demand to improve/expand system in and around hot spot; If location is rural and remote, will be challenging to provide non-auto modes. Even if the new major employer were not located within Central Vermont, the fact that 2 major state corridors (I-89 and US 2) transverse the region which serve as dominant routes to the employment sites could have major implications.

G. TRANSPORTATION & LAND USE

THE TRANSPORTATION & LAND USE CONNECTION

Transportation and land use are linked by the fact that they are both spatial in nature. As land use becomes more dispersed, less centralized, and less dense, transportation consumes more energy, requires more infrastructure, and takes longer to travel the greater distances between places. With more centralized and dense land use, transportation is more efficient since the distances between places are shorter. However, if single-occupant vehicles remain the dominant transportation mode, denser land use can create more congestion. Transit, walking and bicycling are much more efficient and effective at higher densities.

Figure 58 graphically depicts the transportation-land use connection and illustrates that traffic engineering and land use planning determine individual but related elements of the system. Therefore, engineering and planning should be coordinated to prevent conflicts between land uses and supporting infrastructure.

Figure 58: The Transportation-Land Use Connection

Development patterns can be a contentious issue in Vermont. While some enjoy the sense of community offered by a compact village setting (Figure 59), others prefer the privacy and quiet of a dispersed rural setting (Figure 60). Table 18 compares the potential advantages and disadvantages of concentrated and dispersed development patterns.

Figure 59: Centralized, high density land use (Source: Smart Growth Vermont)

Figure 60: Dispersed, low density land use (Source: Smart Growth Vermont)

Table 18: Comparison of Advantages and Disadvantages of Compact and Dispersed Development Patterns

COMPACT DEVELOPMENT		***DISPERSED DEVELOPMENT***	
ADVANTAGES	**DISADVANTAGES**	**ADVANTAGES**	**DISADVANTAGES**
Walkable/pedestrian-friendly = health benefits	Real estate prices in centralized areas can be high and unaffordable	Desirable residential and business locale for some	Requires larger public investment in infrastructure
Supports all transportation modes (accommodating parking for single-occupant vehicles may be difficult, but this problem is offset by availability of transportation alternatives)	Retrofitting area to manage access may be difficult	Real estate is often more affordable than in centralized areas	Does not support transportation modes other than the single-occupant vehicle
Supports community development/vitality; greater social interaction	Planning and design may be more complicated (thereby making development more expensive)	Design and construction tends to be simpler and less costly	Dependence on single-occupant vehicle means continued high energy consumption, vehicle emissions, parking demand and deterioration of health due to sedentary lifestyles
Availability of transportation alternatives means better energy-efficiency and lower environmental impact	Implementation can be difficult, especially approval of high density development	Easier to implement and avoid potential housing shortages	Poor accessibility (especially for Vermont's growing 65+ population)
Potential for diversity of housing options and land uses (e.g. retail, office, residential) can reduce travel needs	Difficult to provide the "backyard with picket fence" that some homeowners look for.	Initially, less traffic congestion that urban centers	Premature disinvestment in existing buildings and infrastructure
Better connectivity and accessibility (especially for those who can't or choose not to drive)	Potentially constrained public facilities (e.g. water, sewer schools)		More impervious surface area leads to more stormwater run-off and greater environmental impacts.
Consolidating impervious spaces minimizes stormwater run-off			

THE TRANSPORTATION & LAND USE CONNECTION IN CENTRAL VERMONT

How can transportation and land use support each other in Central Vermont? To answer this question, it is best broken up into three separate questions:

1. ***Can the existing transportation system accommodate anticipated land use growth?***

Currently, in certain congested areas of the CVRPC region, development is being limited due to constrained transportation capacity. If the historic trend of decentralized land use continues, new transportation infrastructure will need to be built and existing facilities will need to be improved to accommodate volume increases in single-occupant vehicle travel. However, expansion and improvements may not be feasible with projected funding deficits. If facilities cannot be improved, congestion and delays will increase and drivers will either have to expect delays or switch to another travel mode.

In light of energy supply and environmental uncertainties, centralized growth will be a more efficient option due to the greater transportation alternatives it affords. Perhaps most importantly, budget constraints at all levels will require that maintenance of existing facilities take priority over increases in system capacity.

2. ***What are the implications of increasing transportation system capacity to meet land use projections?***

As the previous section pointed out, increasing transportation system capacity to meet land use projections will often contribute to a more dispersed settlement pattern and greater maintenance costs. However, the projected transportation funding gap may make financing major new transportation facilities very difficult in the future. Increasing system capacity may not be an option. Unchanging capacity in the transportation system may drive land use trends rather than the other way around. What funds are available may be directed at energy-efficient modes in growth centers or maintenance of existing infrastructure. Maintenance of outlying facilities will continue to wane due to lower demand and use of those facilities.

3. ***If the capacity of the transportation system is increased, how much land use growth could be accommodated?***

Increasing the capacity of the transportation network can certainly allow for additional land use growth to occur. However, in light of the identified future transportation funding challenges, a more pertinent question may be what type of capacity increases can most efficiently and cost-effectively accommodate future land use growth.

If, on one hand, the capacity increases are directed at new roads and facilities that serve outlying areas, then the return on investment in terms of new land use growth will be relatively low. This is

primarily due to the fact that the dispersed land uses will require comparatively more road miles to serve fewer people and will not be very conducive to non-single occupant vehicle travel options.

On the other hand, capacity increases that target growth centers and transportation alternatives that can efficiently serve compact areas are more cost effective. The transportation and land use relationship implies that centralized growth will allow a multimodal transportation system to serve more people over shorter distances.

MITIGATING SITE DEVELOPMENT IMPACTS

As new developments are proposed for communities, the impact of the new land use on the existing transportation system can be mitigated through the use of zoning impact fees or site plan review. The intent of these regulations is to hold the proposed development accountable for an appropriate share of the cost to upgrade or create new transportation facilities by the community. Act 250 currently regulates larger developments and their regional impacts. Smaller proposals not covered by Act 250 may have significant local impacts.

As an example, the City of Montpelier currently has a Replacement Parking Fee. New developments are required to provide a certain amount of parking spaces based on the type and size of the proposed land use. If this required off-street parking can not be accommodated on-site, the development can use public parking with a fee. For each waived parking space, the developer must contribute to the cost of creating or leasing public parking. It was estimated, in 1989, to create a new public parking space cost $8,000; the City decided a fair Replacement Parking Fee was $1,000 per space.

Another example is Waitsfield's Site Plan Review Regulations. Any proposed "use that will cause the Level of Service to go from C to D or will contribute to a Level of Service D traffic condition, the Planning Commission may require modifications to the access, circulation, and parking, or contributions for making modifications based on the project's share of the projected volume of traffic above Level of Service C."

Vermont state statutes allow municipalities to levy development impact fees on any new development within its borders (Title 24 Chapter 131 Section 5203) when several conditions are satisfied including approval of the municipal comprehensive plan by the regional planning commission. The statute also requires that a reasonable methodology be developed for determining a developer's share of the cost of capital projects. For transportation projects, impact fees are often linked with the amount of peak hour vehicle trips generated by a new development (for example, $100 per new peak hour vehicle trip generated).

In order to determine an impact fee for highway related capital projects the following generalized steps could be followed:

- Identify the area in which the impact fee will be applied. This area could be the entire municipality, but is often limited to the high growth areas of the municipality;

- Establish performance standards for the highway system in the impact fee area. For example, level of service at intersections will be maintained at LOS D or better;
- Estimate the future land use within the impact fee area;
- Estimate the amount of new vehicle trips expected during the peak hour as a result of future land use development;
- Evaluate the performance of the highway network in the impact fee area accounting for growth in background traffic and traffic generated by future land use development;
- Identify deficiencies in the highway system based on established performance standards;
- Develop mitigation measures such as modification to intersections, adding traffic signals, adding through lanes to road segments, etc.;
- Develop a highway system capital plan for the impact fee area that includes cost estimates for all of the mitigation measures identified;
- Determine how the costs will be shared by developers, the municipality, and the state if appropriate;
- Convert the developers' share of the cost to an amount per new vehicle trip generated;
- If the fee isn't used in six years, it has to be returned to the developer.

The methodology described above focuses only on highway related capital projects. However, the methodology could also be linked to transit service and bicycle and pedestrian facilities within the impact fee area. If a municipality's plan for the impact fee area also identifies a sidewalk/bike path network and transit service, the cost for these non-auto modes could also be built into the impact fee.

It is recommended that the communities of the region consider adopting these or other similar techniques for their regulations.

TRANSPORTATION FUNDING ISSUES AND OPTIONS

A large gap between transportation needs and funding has been identified for both Vermont and the nation.[1] Contributing factors include the rising cost of construction, slower growth in transportation revenues, and increasing maintenance needs for an aging system. Revenues have slowed partly because vehicles have become more fuel efficient, meaning that less gas tax is collected. As the refueling infrastructure shifts to alternative fuels, a new system of revenue collection will need to be developed that is not based on a per gallon tax. One option being considered is a transition to a

[1] Vermont Long Range Transportation Business Plan Working Paper #3-draft (page 47) estimates a gap of $8 billion over the next 20 years for Vermont.

mileage-based tax. The per mile tax could be calculated to raise the same amount of revenue as the current fuel volume-based gas tax. This system also provides options for managing demand (for example, charging more per mile when traveling during peak hours).

Given the transportation funding challenges at the state and national levels, the costs for transportation improvements will likely be increasingly shifted to the local level. Two particular funding mechanisms available for local governments are:

Transportation Impact Fees, through which a developer pays a fee to reflect the impact that their development will have on an area. For example, if a new development is estimated to add a significant amount of traffic to an intersection, the fees paid by the developer will go towards improvements to increase intersection capacity. The town of Williston, VT is currently updating its transportation impact fee methodology.

Tax Incremental Financing (TIF), which establishes a district in which any increase in non-school taxes generated by new development are used to pay off the bond for public improvements necessary to support the district's growth. Eligibility for TIF districts is one of the benefits of the new Growth Center designation, discussed below.

LAND USE & TRANSPORTATION WORKSHOP

Approximately 30 people attended the workshop in addition to CVRPC staff and consultants. Workshop participants included CVRPC Commissioners and Transportation Advisory Committee (TAC) members, local planners, citizens, and representatives from the Vermont Agency of Transportation (VTrans).

Participants were asked to answer the following two questions:

1. What transportation actions can support regional land use goals?
2. What land use actions can support transportation goals?

Actions were defined as policy recommendations, planning studies, changes to regulations or process such as zoning and permitting, or specific projects. Major themes, other ideas, and recommendations are summarized below. All of the comments made at the workshop are contained in Table 19 and Table 20 at the end of this section.

Transportation Actions to Support Land Use Goals

Major Themes

Improving Alternative Modes – Suggestions to expand and improve alternative modes were the most common comments made at the workshop. The comments included providing new bike and pedestrian facilities, improving the efficiency of the existing transit system, and implementation of Transportation Demand Management programs.

Supporting Growth Areas – Workshop participants recognized that the transportation system's function changes in growth areas from mobility to access. Comments include addressing through traffic and context sensitive design. Participants appeared to agree with the idea that growth areas have a positive effect on the transportation system. However, not enough is being done to implement growth areas.

Access Management - Use access management to guide land use and to preserve the function and capacity of the existing highway system

Financial – Use financial incentives and disincentives to support priorities.

Context Sensitive Design – Context sensitive design is important within and outside of growth centers.

Other Ideas

Separate highway and utility corridors - This idea seems most appropriate in growth areas where conflicts between aesthetics and power and communication utilities are most acute.

Put land use first - The transportation system should be designed to support desired land use goals.

Recommended Actions (no particular order)

- Develop a transportation system design manual for growth areas similar to other reference manuals such as the "Access Management Guidebook" completed by the Northwest Regional Planning Commission and "Transit Oriented Design for Chittenden County" completed for the Chittenden County Regional Planning Commission by Wilbur Smith Associates.
- Study the potential for establishing Transportation Management Associations (TMA) in the Central Vermont Region at major employment centers. TMAs are private, non-profit, member-controlled organizations that provide transportation services in a particular area, such as a commercial district, mall, medical center or industrial park. TMAs provide an institutional framework for implementing TDM programs.

- Study the potential for applying Intelligent Transportation Systems (ITS) in the Central Vermont Region. The ITS plan could be used to improve overall system efficiency including improvements to the transit system recommended by participants.
- Develop a strategy plan for corridors with the potential for industrial and commercial development and rail service.
- Establish air quality benchmarks for the Central Vermont Region and monitor.
- Include surveys for future long range plan updates of Central Vermont residents regarding their satisfaction with the transportation system, the types of modes they use and would like to use if available, and other general transportation issues.
- Assist municipalities in incorporating access management principles and the VTrans Access Management Guidelines into zoning regulations.
- The Transportation Advisory Committee and Regional Planning Commission should comment on federal transportation legislation currently being written.
- Identify potential locations for multi-modal centers in the Central Vermont Region.
- Consider adding a goal to the Regional Transportation Plan that focuses transportation funding to projects that support growth areas.
- Consider acknowledging, possibly in the Regional Transportation Plan's Vision Statement, that the transportation system should be designed to support the desired land use goals of the region (put land use first).

Land Use Actions to Support Transportation Goals

Major Themes

Make Growth Areas Work – There appeared to be general agreement among the workshop participants that growth areas in and of themselves have a positive effect on the transportation system. As noted above, implementation has been challenging. Ideas to make growth areas work include changes to zoning that allow for mixed use and higher densities, limiting development outside of growth areas by strengthening the rural economy thereby keeping land unavailable for development, and providing the sewer and water infrastructure necessary to support development in growth areas.

Defining Growth Areas – Many different ideas about growth areas were discussed. Ideas include focusing development in existing areas, providing growth areas in rural villages to serve local needs, and allowing scattered residential development that is served by concentrated employment/service areas. There is a need to define growth areas and develop a regional growth area plan.

Reducing the need to Travel – Ideas raised that would reduce the need for travel include modifying zoning to allow for home-based businesses, improving the advanced communications infrastructure, and universal access to the internet.

Other Ideas

Providing facilities for alternative energy use - Begin to identify the types of facilities, and their appropriate locations, necessary to support vehicles powered by alternative energy sources.

Better communication between municipalities - Improve communications between municipalities when decisions that affect land use or the transportation system across municipal borders are being considered.

Identify, acquire, and preserve rights-of-way and easements – Town plans should identify potential opportunities for future use as transportation corridors.

Recommended Actions (no particular order)

- Develop a Regional Growth Area Plan. The plan could help address policy issues related to new versus emerging growth areas, develop growth area definitions for different areas (for example: existing urban, emerging suburban, or rural village), and could incorporate recommendations for transportation systems within growth areas. The plan should also include an implementations section that identifies how the growth areas would be defined and implemented. Many of the general zoning changes suggested by workshop participants could be incorporated into the implementation section.
- Consider supporting context sensitive design in the Comprehensive Plan Goals.
- Develop a rural economy strategy plan. The plan would identify strategies to strengthen the rural land based economy.
- Develop a communications infrastructure plan.
- Develop an alternative transportation energy action plan.
- Include a standard item on the TAC and regular Commission meeting agendas for representatives to discuss local projects.
- Assist municipalities in making appropriate changes to zoning regulations to support home-based businesses.
- Develop a GIS coverage of all rights-of-way and easements for use by municipalities in developing town plans
- Assist municipalities in incorporating access management principles and the VTrans Access Management Guidelines into zoning regulations.

- Work with municipalities to develop town plans and zoning regulations that support affordable housing and senior housing in growth centers.
- Work with municipalities to develop regulations that encourage developers to create connections to adjacent properties.
- Develop methodologies for computing and administrating transportation system impact fees resulting from development proposals, and the process for implementing transportation projects with the funds collected.

INCORPORATING TRANSPORTATION FEATURES INTO GROWTH AREA PLANNING

The general function and purpose of the transportation system within a growth area can be synthesized from growth area characteristics identified by the Vermont Planners Association, national smart growth principles, and the VTrans multimodal classification system developed, but never implemented, in its 1995 long range transportation plan:

- Provide for access and local circulation rather than mobility (through traffic);
- Provide for pedestrian travel; and
- Provide multiple travel choices.

Specific transportation system characteristics within a growth area that will achieve these three principles include:

- A network of streets with a high level of connectivity and short blocks that provide for local travel and circulation needs;
- A network of interconnected sidewalks and bicycle/pedestrian paths;
- Landscaping, lighting, and other enhancements, such as bus shelters and bicycle racks, designed to create a safe, high quality, and inviting environment for pedestrians and bicyclists;
- Transit service;
- Transportation Demand Management services;
- An adequate, but not excessive, parking supply consisting of on-street parking, off-street parking adjacent to or behind buildings, and/or satellite parking facilities connected to a growth center by shuttle service; and

- Efficient connections between different modes. For example, bike racks on buses, bike racks at transit stops, and sidewalks and bike paths that connect central parking areas to final destinations and other modes[1] [2].

In addition to the transportation infrastructure and services listed above, local regulations can help achieve, over time, the land use mix, land use densities, and urban\village design that further support the access and circulation function of the transportation system and the viability and success of transit and non-motorized modes. Having the following policies and regulations in place is particularly important for new growth areas:

- Allow densities that support transit;
- Allow mixed uses so that critical and daily services can locate near homes, jobs, and transit;
- Use maximum parking regulations rather than minimum parking regulations;
- Require sidewalks in all new developments;
- Adopt design standards that require landscaping, lighting, or other enhancements that create a safe and inviting pedestrian environment;
- Require building designs and site plans that make commercial areas more walkable;
- Adopt an official town map that identifies the future street network, and bicycle and pedestrian path system; and
- Allow for different street widths and implementation of traffic calming techniques in public works specifications and/or subdivision regulations that vary depending on the character of the area, traffic volumes, and speeds.

Development of a growth area plan for the region and a growth area design guidebook are two planning efforts recommended as a result of the November 12, 2002 Land Use and Transportation Workshop.

INCORPORATING TRANSPORTATION IN SUBSTANTIAL REGIONAL IMPACT GUIDELINES

Each regional planning commission in Vermont is required to define "substantial regional impact" by Vermont State Statutes as follows:

> "As part of its regional plan, define a substantial regional impact, as the term may be used with respect to its region. This definition shall be given due consideration, where relevant, in state regulatory proceedings" (24 VSA Section 4345(a)).

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[1] Vermont Forum on Sprawl; "The Vermont Smart Growth Score Card"; October 2000.

[2] Smart Growth Network; "Getting to Smart Growth, 100 Polices for Implementation"

CVRPC, and the other regional planning commissions in Vermont, use the definition of substantial regional impact to determine whether or not to participate in the Act 250 permit process. Regional planning commissions will take a position on projects of substantial regional impact and whether or not a project conforms with the regional plan. A project with a substantial regional impact may have positive and/or negative impacts. When a project is deemed to have a substantial regional impact, a regional planning commission may participate in the Act 250 process by supporting a project, negotiating with an applicant on certain aspects of the project proposal, or opposing an entire project.

The CVRPC defines substantial regional impact in its "Operating Guidelines for Review of Act 250 Projects" (Adopted October 9, 1990 and amended March 12, 1996). Items 1-4 of the CVRPC Act 250 operating guidelines provide the criteria currently used to define substantial regional impact. Items 5-9 of the CVRPC Act 250 operating guidelines define how the CVRPC commission and staff will participate in the Act 250 permitting process after a project has been defined as having a substantial regional impact. No recommended changes are suggested regarding items 5-9.

Changes are recommended to the CVRPC's Act 250 Procedural Guidelines so that (1) the guidelines incorporate substantial regional impact thresholds for a development's effect on the transportation system, and (2) to identify when a transportation project has a substantial regional impact. The recommendations are based on a review of criteria used by other Vermont regional planning commissions and the VTrans when deciding whether or not to participate in Act 250 because of concerns related to transportation.

Recommendations Related to the Substantial Regional Impact of a Development on the Transportation System

Identify a regional highway system. At a minimum, the system should include all interstate highways, federal numbered routes, state numbered routes, and Class 1 Town Highways which carry a state or federal route number but are owned by a municipality. Class 2 Town Highways are defined as roads that connect two or more municipalities, and may also be included in the regional highway system. The regional significance of Class 2 Town Highways varies. It would be reasonable for the TAC to determine which Class 2 Town Highways should be included on the regional highway system.

Revise the CVRPC Act 250 Guideline 1 to include the VTrans threshold of 75 additional vehicles per hour. Consider adding the language below to Guideline 1. Condition "a" covers the situation where a development impacts the regional highway system in one or more municipalities. The impact would be considered regionally substantial, even if limited within one municipality, because the facility serves travelers from all over the region. Condition "b" covers the situation where traffic from a proposed development impacts streets in two or more municipalities, even if those streets are not part of the regional highway system. The most common example is a situation where a development adds traffic to residential streets in a neighboring town. Although those streets are not themselves regionally significant, they could be impacted by a regional development.

"A development has a substantial regional impact on the highway system for the following two conditions:

1. An additional 75 vehicles per hour is added to any intersection or road segment on the regional highway system (to be defined by CVRPC as recommended above) in one or more municipalities; or
2. An additional 75 vehicles per hour is added to any intersection or road segment in two or more municipalities even if the highway or streets affected are not included on the regional highway system."

Recommendations Related to the Substantial Regional Impact of a Transportation Project

CVRPC Act 250 Guideline 2. Consider replacing "development projects" with "projects". This change would allow the CVRPC to identify development projects, transportation projects, and other types of projects such as those related to public works or utilities, as having a substantial regional impact. Information developed in the VTrans project development process can be used to determine whether or not a transportation project impacts any of the resources referred to in CVRPC Act 250 Guideline 2.

CVRPC Act 250 Guideline 3. Consider replacing "development projects" with "projects" and adding a sentence that lists transportation projects that have the potential to change settlement patterns.

Proposed Revisions to CVRPC Act 250 Guideline 2:

"~~Development~~ Projects of substantial regional impact are those which may affect settlement patterns to the extent that the character or identity of the Region (or its sub regions) is significantly impacted. *These projects include, but are not limited to, new development projects, new highways, new interstate exits, or new passenger rail service."*

CVRPC Act 250 Guideline 4. Consider replacing "development projects" with "projects" so that transportation projects are included under this guideline.

Table 19: Transportation Actions to Support Land Use Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
1	Set policies for access management to guide land use priorities and goals (Including support for existing transportation infrastructure)		Access Management	Access management is covered under Goals 2 and 6.
2	Improve access management to prolong existing capacity		Access Management	Provide assistance to municipalities to incorporate VTrans Access Management guidelines in zoning regulations
1	Improve functionality of arterials and ability to accommodate diverse use (i.e., tourism, logging, commuting)		Access Management	No specific recommendation
1	Develop park and ride, public transportation, bike routes, etc. getting from outside city to downtown		Alternative Modes	Include recommendations in Regional Transportation Plan update.
1	Maintaining and improving alternative transportation		Alternative Modes	General statement that is already included in Regional Transportation Plan goals 3 and 4
1	Provide significant incentives for non-single occupancy vehicles		Alternative Modes	Study potential for establishment of Transportation Management Associations (TMA) in major employment centers to coordinate Transportation Demand Management Programs (TDM)

Table 19: Transportation Actions to Support Land Use Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
1	Support public transportation options (Bus, Bike, Carpooling)		Alternative Modes	General statement that is already included in Regional Transportation Plan goals 3 and 4. Studying potential for TMA's and associated TDM programs would also support this idea.
2	Appropriately time bus terminals for ticket-to-ride (online?)		Alternative Modes	Study application of Intelligent Transportation Systems (ITS)
2	Coordinate local bus systems with state bus systems		Alternative Modes	Study application of Intelligent Transportation Systems (ITS)
2	Develop core business and train routes that connect growth areas		Alternative Modes	Identify corridors and study potential for (1) industrial and commercial development potential and (2) potential for improvement to rail service.
2	Provide multi-modal transit centers throughout the state		Alternative Modes	Identify multi-modal nodes in the Central Vermont Region
2	Provide safe bicycle corridors		Alternative Modes	Continue bicycle planning work.
2	Public transportation for concentrated growth		Alternative Modes	General statement already supported by goals 3 and 4.
2	Design standards should support the area		Context Sensitive Design	Context sensitive design is supported by Goal 7 and is implemented through the VTrans Project

Table 19: Transportation Actions to Support Land Use Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
2	Do not over-design for the function		Context Sensitive Design	Definition Process and the Vermont State Standards.
1	Reduce air pollution emissions		Environment	Supported by Goal 8. Establish air quality emission benchmarks for the Central Vermont Region and monitor. Incorporate air quality in the project development process.
2	Avoid environmentally sensitive areas		Environment	Supported by Goal 8 and addressed through the VTrans project development process.
1	Address and examine state and federal policy and spending (Divert Amtrak $$$ to local public transportation)		Financial	Work with legislators, VTrans, and other regional planning commissions to review and current state and federal funding priorities. Review and comment on TEA-3 legislation.
2	Address federal policies and subsidies that limit our planning options		Financial	
2	Increase the price of gasoline to reduce travel (driving cars)		Financial	Not a regional issue.
2	Setting transportation funding priorities that encourage implementation of land use goals		Financial	The regional plan does this already.
1	Address through traffic in growth areas		Growth Areas	Identify growth areas where through traffic is a major concern and study alternatives to address the problem

Table 19: Transportation Actions to Support Land Use Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
1	Build appropriate transportation system to support growth area planning		Growth Areas	Develop transportation system design guidelines for growth areas.
1	Focus funding on transportation projects in growth areas rather than new facilities in outlying areas.		Growth Areas	Consider making this idea an official goal or policy in the regional transportation and comprehensive plans
1	State, regional, and local should be aggressive with developing all aspects of growth areas and preserve historic centers with appropriate transportation forms		Growth Areas	Work with state and federal representatives, VTrans, other regional planning commissions, Vermont League of Cities and Towns and others to advocate for polices that support growth areas.
2	Design facilities appropriately within growth areas (function is different)		Growth Areas	See comments on context sensitive design
2	Consider expanding local street networks in growth areas		Growth Areas	Include in study of growth areas with through traffic problems and in growth area transportation system guidelines.
1	Fix intersections to support towns and cities and quarry		Highway	Key intersections are being identified in the Regional Transportation Plan update and will be included in the project development process.

Table 19: Transportation Actions to Support Land Use Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
2	Focus improvements on highways that are heavily used		Highway	Improvements are already focused on highways that are the most heavily used because they tend to have the most congestion and maintenance problems.
1	Bypass – limited access, preservation	Policy recognize role of bypasses?	Highway Function	Include in study of growth areas with through traffic problems and in growth area transportation system guidelines.
1	Keeping transportation efficient, affordable, and safe		Other	General statement currently addressed in Goals 3 and 6
1	Start with desired land usage, review transportation alternatives and regulate intensity of transportation modes (Look at different transportation modes and use the best alternative to tie to land use)	Put land use first - design transportation system to support it.	Other	Consider emphasizing the philosophy that land use should drive transportation improvements as part of the Regional and Comprehensive plan goals
2	Examine relationship between interstate corridor and land use		Other	Potential land use change at interstate interchanges is currently being studied by VTrans and by CVRPC.
2	Goods to people and people to goods	Unclear	Other	No comment or recommendation

Table 19: Transportation Actions to Support Land Use Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
2	Involve community (conduct surveys about preferences for different modes)		Other	Include surveys in future updates of the Regional Transportation Plan and compare to past survey results. Community involvement is a requirement of the VTrans project development process.
2	Separate utility and highway corridors	Separating utility and transportation corridors would be more appropriate in growth areas where it may be desirable to hide power and communication utility lines.	Other	Consider this issue as part of the growth area transportation system design guidelines.

Table 20: Land Use Actions to Support Transportation Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
1	Land use should encourage context sensitive transportation infrastructure	Land use "plans" or zoning regulations could encourage context sensitive design	Context Sensitive Design	Include context sensitive design as a goal on the Regional Comprehensive Plan
2	Create minimum design standards for transportation infrastructure to enhance the public environment		Context Sensitive Design	Context Sensitive Design is currently implemented through the VTrans Project Definition Process and the Vermont State Standards.
1	Provide facilities for alternative energy usage		Environment	Develop alternative transportation energy plan
2	Link land use growth with resource base (limited resources) – understand the limits		Environment	Conduct build-out analysis, as Part of a Regional Growth Area Plan, that considers resource constraints as well as local zoning
1	Make positive public financial incentives to accomplish land use goals		Financial	Work with state and federal representatives, VTrans, other regional planning commissions, Vermont League of Cities and Towns and others to advocate for funding.
1	including bike paths, rail stations, park and rides, bus service		General	General - no comment
1	Land use decisions that encourage multi-modal transportation systems		General	General - no comment

Table 20: Land Use Actions to Support Transportation Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
1	Municipality to coordinate public transportation and services for them		General	General - no comment
2	Improve communications between municipalities regarding land use changes in one municipality that may affect the transportation system in another municipality or changes in the transportation system that may affect land use.		General	The Regional Planning Commission is the ideal place for this type of communication to take place. Include a regular agenda item on the TAC and Regular Commission meetings for representatives to discuss local projects
2	Limiting scale of new development		General	The advantages and disadvantages need to be assessed. Advantages include the reduction of intensified impacts to the highway system. Disadvantage include loss of flexibility and economies of scale that support transit service.
1	Allow scattered residential development served by large clustered employment and service areas (including affordable housing)	This suggestion recognizes that residential development is likely to continue in rural areas but commercial development could be more efficiently concentrated.	Growth Area Alternatives	Evaluate this alternative in Regional Growth Area Plan
1	Identify growth areas in rural towns and direct growth to areas (with existed and planned		Growth Area Alternatives	Evaluate this alternative in Regional Growth Area Plan

Table 20: Land Use Actions to Support Transportation Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
	transportation systems)			
2	Concentrate development in existing town centers		Growth Area Alternatives	Evaluate this alternative in Regional Growth Area Plan
2	Increase local development nodes in village areas to reduce pressure on large urban centers		Growth Area Alternatives	Address in the Regional Growth Area Plan
1	Create zoning tools to concentrate mixed use development		Make Growth Areas Work	Evaluate existing zoning as part of Regional Growth Area Plan and provide sample regulations for use by municipalities
1	Develop clearer definition of growth areas		Make Growth Areas Work	Additional clarifications could be an outcome of a Regional Growth Area Plan.
1	Develop regional growth area plan		Make Growth Areas Work	Develop regional growth area plan
1	Discourage development in areas that don't have adequate transportation or are outside designated growth areas		Make Growth Areas Work	Provide assistance to municipalities to strengthen zoning regulations

Table 20: Land Use Actions to Support Transportation Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
1	Encourage and allow mixed use within the growth areas		Make Growth Areas Work	Evaluate existing zoning as part of Regional Growth Area Plan and provide sample regulations for use by municipalities
1	Focus development in growth areas that can support alternative transportation		Make Growth Areas Work	Evaluate as part of Regional Growth Area Plan
1	Growth areas (mixed use) including affordable housing		Make Growth Areas Work	Work with municipalities to encourage affordable housing in growth areas
1	Promote and enhance healthy rural economy	By supporting the rural economy, less rural land will be converted to residential uses	Make Growth Areas Work	Develop rural economy enhancement strategy plan
1	Provide sewers and water in areas to allow for growth and capacity for the future by keeping compact centers		Make Growth Areas Work	Identify growth areas where sewer/water capacity are current issues, or will be future issues, and develop plans to address the deficiencies. Include in Regional Growth Area Plan
1	Senior housing in “core” of villages and growth areas		Make Growth Areas Work	Work with municipalities to encourage senior housing in growth areas
1	Zone for high density – supports alternate modes		Make Growth Areas Work	Develop density guidelines related to different modes, incorporate into Regional Growth Area Plan and provide that information to municipalities

Table 20: Land Use Actions to Support Transportation Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
2	Incentives and impact fees for private developers		Make Growth Areas Work	Develop methodologies for computing impact fees and the process for implementation.
2	Require development to provide transportation connections to adjacent properties		Make Growth Areas Work	Develop sample zoning regulation and assist municipalities in with making appropriate changes to zoning regulations.
1	Enhance and improve advanced communications infrastructure		Reduce Travel through New Technologies or Approaches	Develop a communications infrastructure plan.
1	Flexible zoning to accommodate and support development of home-based businesses		Reduce Travel through New Technologies or Approaches	Assist municipalities in making appropriate changes to zoning regulations.
2	Universal access to high speed internet (requiring less travel)		Reduce Travel through New Technologies or Approaches	Develop a communications infrastructure plan.
1	(Right of ways, easements, town plans)	Identify, acquire, and preserve ?	Transportation as a land use	Develop GIS coverage and develop strategy plan for preserving corridors
2	If goal is to support existing transportation system, then town zoning regulations should be written to not overload transportation system		Transportation as a land use	Consider the advantages and disadvantages. Adopting this approach as this policy could limit the ability to increase densities in growth areas.
2	Integrate access management with zoning		Zoning	Assist municipalities in making appropriate changes to

Table 20: Land Use Actions to Support Transportation Goals

Break-Out Group Priority	Break-Out Group Comment	Analysis of Comments		
		Remark - Interpretation	**General Theme**	**Implementation Recommendation and/or Response**
	process			zoning regulations.
2	Stronger zoning to require development in appropriate areas		Zoning	Assist municipalities in making appropriate changes to zoning regulations.

H. 2006 Central Vermont Bridge Sufficiency Ratings

Town Name	Route Name	Location	Bridge Number	Bridge Type	Deficiency S	Sufficiency Rating	Daily Traffic	Status
WARREN	FAS 0188	0.4 MI E JCT. VT.100 N	7	STEEL BEAM	Structural	4	1,020	Done
MIDDLESEX	VT12	4.0 MI N JCT. U.S.2	77	ROLLED BEAM	Structural	8.3	4,000	Candidate
WAITSFIELD	C2001	0.08 MI TO JCT W VT100	4	MULTI KG PST/ARCH CB	Structural	9	1,900	Enhancement
NORTHFIELD	C3096	0.01 MI TO JCT W VT12A	68	STEEL BM W TIMBER DK	Structural	11.8	250	
MONTPELIER	GRNIT	GRANITE STREET	17	STEEL THRU TRUSS	Structural	13.1	2,900	Done
MORETOWN	C3011	0.1 MI TO JCT W VT100B	40	STEEL PONY TRUSS	Structural	15	200	Closed
ROXBURY	VT12A	10.3 MI N JCT. VT.12 S	15	CONCRETE T-BEAM	Structural	17	1,600	Candidate
WARREN	FAS 0188	0.5 MI E JCT. VT.100 S	6	QUEEN POST COV. BR.	Not	21.8	280	
MORETOWN	US2	1.3 MI W JCT. VT.100B	50	2SP STEEL THRU TRUSS	Structural	23.9	3,600	Recon 2009
WARREN	VT100	3.1 MI S JCT. VT.17	173	STEEL THRU TRUSS	Structural	25.8	4,900	Recon 2012
MORETOWN	C3024	0.1 MI TO JCT W VT100B	41	STEEL PONY TRUSS	Structural	30	10	
NORTHFIELD	C3014	0.07 MI TO JCT W VT12	64	QUEEN POST COV BR	Structural	30.8	35	
NORTHFIELD	C3068	0.1 MI TO JCT W VT12A	55	STEEL BM W TIMBER DK	Structural	31.7	10	
WILLIAMSTOWN	VT64	0.1 MI W JCT. VT.14	10	CONCRETE SLAB	Structural	33.3	270	Recon 2008
WARREN	VT100	8.3 MI S JCT. VT.17	166	STEEL BEAM	Structural	33.4	970	Candidate
NORTHFIELD	C3057	0.1 MI TO JCT W VT12A	65	STEEL PONY TRUSS	Functional	37.3	150	
MARSHFIELD	C4048	0.1 MI TO JCT W US2	22	STEEL BEAM/FBEAM	Functional	38.3	10	
FAYSTON	C3010	0.25 MI TO JCT W CL2 TH1	19	STEEL BM W TIMBER DK	Not	39.3	50	
NORTHFIELD	C2003	0.4 MI TO JCT W VT12	10	STL BM/QUEEN POST CB	Structural	39.3	1,200	
WATERBURY	C3056	0.15 MI TO JCT W CL3 TH7	25	STEEL PONY TRUSS	Structural	42.4	30	
NORTHFIELD	C3054	@ JCT W VT12	56	STEEL BM W TIMBER DK	Structural	42.8	10	
MONTPELIER	TAYLR	TAYLOR STREET	5	THRU TRUSS	Structural	43	4,100	Recon 2009
MORETOWN	C3039	0.05 MI TO JCT W VT100B	42	STEEL PONY TRUSS	Functional	43	20	
NORTHFIELD	C3060	@ JCT W CL3 TH8	59	STEEL BM W TIMBER DK	Not	43.4	10	Candidate
NORTHFIELD	C3093	0.02 MI TO JCT W VT12	67	STEEL BM W TIMBER DK	Structural	45.3	10	
WAITSFIELD	C3008	0.1 MI TO JCT W VT100	24	STEEL BEAM/ FL BEAM	Functional	47.4	300	
CABOT	C3041	0.1 MI TO JCT W CL2 TH1	37	STEEL BM W TIMBER DK	Not	49	75	Recon 2008
WAITSFIELD	C2003	0.15 MI TO JCT W C3 TH15	20	STL BM/KING POST CB	Functional	49.2	250	

			Bridge			Sufficiency	Daily	
Town Name	Route Name	Location	Number	Bridge Type	Deficiency S	Rating	Traffic	Status
WILLIAMSTOWN	C3009	0.3 MI TO JCT W VT14	26	STEEL BM W TIMBER DK	Not	49.3	250	
BARRE CITY	PROSP	PROSPECT STREET	7	STEEL BEAM	Structural	49.9	5,000	Rehab 2008
NORTHFIELD	C3025	0.2 MI TO JCT W CL3 TH8	50	STEEL BM W TIMBER DK	Not	49.9	70	Candidate
FAYSTON	VT17	1.4 MI W JCT. VT.100	35	WELDED PLATE GIRDER	Not	51.1	3,900	
MIDDLESEX	VT12	5.4 MI N JCT. U.S.2	78	3 SPAN STEEL BEAM	Structural	51.1	3,000	Recon 2009
MARSHFIELD	US2	1.0 MI W JCT VT.232	81	CONCRETE T-BEAM	Functional	51.2	3,200	
WATERBURY	C3021	0.02 MI TO JCT W VT100	16	STEEL BEAM	Functional	51.8	150	
DUXBURY	C3012	0.02 MI TO JCT W CL3 TH5	41	RIVETED THRU GIRDER	Functional	52.1	200	
WAITSFIELD	VT100	2.5 MI N JCT. VT.17	181	CONCRETE SLAB	Functional	53.4	6,900	Candidate
MARSHFIELD	C3029	0.12 MI TO JCT W CL3 TH9	11	STEEL BEAM	Structural	54	50	
BERLIN	C3060	0.02 MI TO JCT W CL2 TH3	24	STEEL BM W TIMBER DK	Not	55	50	
WAITSFIELD	VT100	0.8 MI S JCT. VT.17	177	STEEL BEAM	Functional	55	4,900	
WAITSFIELD	VT17	0.1 MI W JCT. VT.100	38	ROLLED BEAM	Functional	56.3	3,000	Candidate
BERLIN	VT12	5.6 MI S JCT. U.S.2	67	STEEL THRU TRUSS	Functional	56.4	4,000	
CALAIS	VT14	5.2 MI N JCT. U.S.2 E	74	CONCRETE T-BEAM	Structural	56.8	4,100	
NORTHFIELD	C3008	0.4 MI TO JCT W CL3 TH51	63	STL BM/KING POST CB	Functional	56.8	400	
MORETOWN	C2001	0.57 MI TO JCT W C3 TH50	36	STEEL BEAM	Functional	57	175	
WAITSFIELD	VT100	0.9 MI S JCT. VT.100B	186	STEEL BEAM	Functional	57	6,900	
ORANGE	US302	1.3 MI E JCT. VT.110	15	CONCRETE T-BEAM	Not	58.1	3,600	
MONTPELIER	C30CU	0.1 MI TO JCT W CL1 TH5	13	STEEL BEAM	Structural	58.3	300	
BARRE TOWN	VT110	0.1 MI S JCT. U.S.302	21	CONCRETE T-BEAM	Not	58.6	3,000	
DUXBURY	C3012	0.18 MI TO JCT W CL3 TH6	40	STEEL BEAM	Functional	58.7	200	
BERLIN	C2007	0.01 MI TO JCT W CL2 TH2	29	STEEL THRU TRUSS	Functional	58.8	666	
E. MONTPELIER	VT14	0.1 MI S JCT. U.S.2 W	68	TWO SPAN ROLLED BEAM	Structural	59.1	4,700	Candidate
DUXBURY	C3012	0.01 MI TO JCT W CL3 TH6	39	STEEL BEAM	Functional	60.3	150	
CALAIS	C3038	0.42 MI TO JCT W VT14	28	ROLLED THRU BEAM	Functional	60.8	350	
MIDDLESEX	C3009	0.01 MI TO JCT W CL2 TH2	34	STEEL BEAM	Not	61	100	
WATERBURY	C2004	0.01 MI TO JCT W CL2 TH1	31	STEEL THRU TRUSS	Functional	61	850	

			Bridge			Sufficiency	Daily	
Town Name	**Route Name**	**Location**	**Number**	**Bridge Type**	**Deficiency S**	**Rating**	**Traffic**	**Status**
BARRE TOWN	FAS 0214	0.1 MI W JCT VT 14	11	STEEL BEAM	Not	61.3	1,990	Candidate
NORTHFIELD	C3008	@ JCT W VT12A	47	ROLLED BEAM	Functional	61.5	400	
WAITSFIELD	VT100	0.3 MI S JCT. VT.17	178	STEEL BEAM	Not	61.8	4,900	
MORETOWN	C2001	@ JCT W CL4 TH47	21	STEEL BEAM	Not	62.3	250	
NORTHFIELD	C2003	0.03 MI TO JCT W VT12	11	STL BM/QUEEN POST CB	Functional	62.8	1,200	
ORANGE	C2002	0.4 MI TO JCT W VT110	5	STEEL BEAM	Not	63.1	300	
MONTPELIER	C30GR	0.03 MI TO JCT W CL1 TH5	15	STEEL BM W TIMBER DK	Not	63.4	50	
E. MONTPELIER	US2	1.2 MI E JCT VT.14 N	74	CONCRETE T-BEAM	Functional	64.5	7,400	Recon 2009
FAYSTON	VT17	1.1 MI W JCT. VT.100	36	ROLLED BEAM	Structural	64.7	3,000	Done
E. MONTPELIER	VT14	3.0 MI N JCT. U.S.2 E	71	ROLLED BEAM	Functional	65.1	3,900	Under Design
MIDDLESEX	US2	2.0 MI E JCT VT.100 B	55	STEEL BEAM	Structural	65.8	2,500	
MARSHFIELD	C3038	0.08 MI TO JCT W US2	18	ROLLED THRU BEAM	Not	66.2	50	
DUXBURY	C3012	0.5 MI TO JCT W CL3 TH5	37	STEEL BEAM	Not	66.4	200	
NORTHFIELD	C2003	0.02 MI TO JCT W VT12	15	STLBM/LATTICE COV BR	Functional	67	1,500	
DUXBURY	C3037	0.1 MI TO JCT W CL3 TH7	7	STEEL BM W TIMBER DK	Not	67.4	10	
E. MONTPELIER	C3031	0.01 MI TO JCT W C3 TH30	21	PS CONC CHANNEL BEAM	Not	67.7	30	
WATERBURY	US2	1.3 MI W JCT VT.100 N	44	STEEL BEAM	Not	67.7	3,600	
BERLIN	US302	1.8 MI E JCT. U.S.2 E	3	STEEL BEAM	Not	68.2	15,500	
WAITSFIELD	C3029	0.1 MI TO JCT W VT100	22	WELDED PONY TRUSS	Not	68.2	180	
WORCESTER	C3020	0.1 MI TO JCT W CL3 TH3	28	STEEL BM W TIMBER DK	Not	69.7	30	
MARSHFIELD	C3027	0.07 MI TO JCT W US2	10	STEEL BEAM	Not	70.8	100	
BERLIN	I89	0.2 MI S EXIT 7	0037N	WELDED PLATE GIRDER	Functional	71.1	7,200	
NORTHFIELD	VT12A	0.8 MI S JCT. VT.12 N	36	CONCRETE T-BEAM	Functional	71.2	2,500	
WILLIAMSTOWN	VT14	6.2 MI S JCT. U.S.302 E	58	T-BEAM WID W/ SLAB	Functional	71.3	2,300	
MORETOWN	VT100B	0.2 MI N JCT. VT.100	1	CONCRETE T-BEAM	Functional	71.4	3,100	
WATERBURY	I89	0.3 MI S EXIT 10	0046S	STEEL BEAM	Not	71.5	11,000	
FAYSTON	VT17	0.9 MI W JCT. VT.100	37	ROLLED BEAM	Not	71.7	3,000	
PLAINFIELD	C2002	AT JCT W CL3 TH13	22	CONCRETE T-BEAM	Not	71.7	270	

			Bridge			Sufficiency	Daily	
Town Name	Route Name	Location	Number	Bridge Type	Deficiency S	Rating	Traffic	Status
MORETOWN	VT100B	0.6 MI N JCT. VT.100	2	CONCRETE T-BEAM	Functional	72.1	310	
WATERBURY	I89	0.3 MI S EXIT 10	0046N	STEEL BEAM	Not	72.6	11,000	
NORTHFIELD	VT12A	2.4 MI S JCT. VT.12 N	32	CONCRETE T-BEAM	Functional	72.8	1,900	
MONTPELIER	C30HA	0.01 MI TO JCT W CL1 TH5	16	STEEL BM W TIMBER DK	Functional	73.4	20	
MIDDLESEX	C3045	0.07 MI TO JCT W CL2 TH2	7	PRESTRESS CONC. SLAB	Not	73.6	250	
WORCESTER	VT12	11.2 MI N JCT. U.S.2	84	ROLLED BEAM	Functional	73.6	1,000	Candidate
ROXBURY	C3011	0.7 MI TO JCT W CL3 TH12	51	STEEL BEAM	Not	73.7	100	
MARSHFIELD	US2	8.9 MI W JCT VT.15	83	MULTI PLATE ARCH	Not	73.8	3,200	
MONTPELIER	US2	0.5 MI E JCT U.S.302	64	STEEL BEAM	Functional	73.8	8,600	
NORTHFIELD	VT12A	1.4 MI S JCT. VT.12 N	35	CONCRETE T-BEAM	Functional	73.8	3,300	
BERLIN	C3061	0.1 MI TO JCT W VT12	27	STEEL PONY TRUSS	Functional	73.9	277	
E. MONTPELIER	C3030	0.6 MI TO JCT W US2	22	STL BM/QUEEN POST CB	Functional	73.9	150	
MONTPELIER	I89	I89 EXIT 8	0041N	STEEL BEAM	Functional	74	9,850	
MONTPELIER	I89	I89 EXIT 8	0041S	STEEL BEAM	Functional	74	9,850	
PLAINFIELD	C2001	0.1 MI TO JCT W CL2 TH3	20	CONCRETE T-BEAM	Not	74.7	500	
MARSHFIELD	C3035	0.01 MI TO JCT W US2	17	STEEL BEAM	Not	74.8	10	
NORTHFIELD	C3028	0.12 MI TO JCT W CL3 TH8	52	STEEL BM W TIMBER DK	Not	74.9	30	
MARSHFIELD	C3057	0.03 MI TO JCT W US2	27	ROLLED BEAM	Not	75.1	100	
WARREN	FAS 0188	0.3 MI E JCT. VT.100 N	5	CONCRETE SLAB	Not	75.3	1,020	
ROXBURY	C3035	0.15 MI TO JCT W C3 TH26	45	STEEL BM W TIMBER DK	Not	75.4	60	
BARRE CITY	C30GR	0.15 MI TO JCT W CL1 TH1	11	PONY TRUSS/BAILEY BR	Not	75.7	2,100	
ORANGE	C3013	0.1 MI TO JCT W CL2 TH1	24	STEEL BM W TIMBER DK	Not	75.7	30	
WATERBURY	C2001	0.01 MI TO JCT W VT100	5	STEEL BEAM	Functional	75.7	1,060	
NORTHFIELD	C3012	0.05 MI TO JCT W CL2 TH3	54	STL BM W/ TIMBER DK	Not	75.9	10	
NORTHFIELD	C30PL	0.02 MI TO JCT W UNION S	81	STL BM W/ TIMBER DK	Not	75.9	150	
NORTHFIELD	C2005	0.05 MI TO JCT W VT12	60	3 SPAN CONC. T-BEAM	Not	76	1,000	
BARRE CITY	BERLN	BERLIN STREET	9	STEEL BEAM	Functional	76.1	3,500	
NORTHFIELD	VT12	1.1 MI N JCT. VT.12A S	60	STEEL BEAM	Not	76.2	5,200	

Town Name	Route Name	Location	Bridge Number	Bridge Type	Deficiency S	Sufficiency Rating	Daily Traffic	Status
ROXBURY	C3027	0.35 MI TO JCT W VT12A	50	STEEL BM W TIMBER DK	Not	76.5	50	
WATERBURY	C3ARM	0.04 MI TO JCT W UNION	33	STEEL BEAM	Not	76.7	300	
BARRE TOWN	US302	1.5 MI W JCT. 110	9	STEEL BEAM	Not	76.8	7,000	
ROXBURY	C3011	0.01 MI TO JCT W C3 TH14	49	CONCRETE SLAB	Not	76.8	20	
BERLIN	C2002	0.4 MI TO JCT W CL2 TH7	4	CONCRETE T-BEAM	Functional	76.9	710	
BERLIN	C3051	0.02 MI TO JCT W CL2 TH8	25	WELDED PLATE GIRDER	Not	76.9	10	
NORTHFIELD	C3073	0.5 MI TO JCT W VT12A	53	STEEL BM W TIMBER DK	Functional	76.9	250	
CABOT	FAS 0249	3.9 MI E JCT. U.S.2	7	CONCRETE T-BEAM	Functional	77.1	1,500	
CALAIS	VT14	9.5 N JCT. U.S.2 E	82	CONCRETE T-BEAM	Structural	77.2	2,500	
WATERBURY	C2001	0.3 MI TO JCT W VT100	3	CONCRETE T-BEAM	Functional	77.6	1,060	
WILLIAMSTOWN	VT14	4.5 MI S JCT. U.S.302 E	60	CONCRETE T-BEAM	Not	77.6	4,400	
WORCESTER	C3003	0.18 MI TO JCT W VT12	30	ROLLED THRU BEAM	Functional	77.7	350	
FAYSTON	C2001	1.0 MI TO JCT W CL3 TH9	6	CONCRETE T-BEAM	Functional	77.8	500	
PLAINFIELD	C2002	0.45 MI TO JCT W C3 TH21	25	CONCRETE T-BEAM	Functional	77.9	270	
DUXBURY	C2001	0.2 MI TO JCT W CL3 TH12	6	STEEL BEAM	Not	78.3	370	
WATERBURY	C2002	0.02 MI TO JCT W VT100	36	CONCRETE T-BEAM	Functional	78.5	2,830	Candidate
WATERBURY	C2002	0.07 MI TO JCT W CL1 TH1	35	CONC. ENCAS STL BM	Not	78.6	3,300	
BARRE CITY	BROOK	BROOK STREET	5	CONCRETE T-BEAM	Not	79	1,800	
WATERBURY	VT100	I89 EXIT 10	197	STEEL BEAM	Not	79	13,400	
WATERBURY	C2001	0.05 MI TO JCT W CL3 TH6	4	STEEL BEAM	Not	79.2	1,060	
ROXBURY	VT12A	12.6 MI N JCT. VT.12 S	21	STEEL BEAM	Functional	79.3	570	
WORCESTER	FAS 0242	0.2 MI E JCT. VT.12	9	STEEL BEAM	Not	79.7	620	
BARRE CITY	C30MI	0.1 MI TO JCT W CL1 TH2	6	STEEL BEAM	Not	79.8	200	
PLAINFIELD	C2002	0.15 MI TO JCT W C3 TH21	24	CONCRETE T-BEAM	Not	79.9	362	
MONTPELIER	PIONR	PIONEER STREET	6	STEEL THRU TRUSS	Not	80	5,590	
PLAINFIELD	C2002	0.1 MI TO JCT W CL2 TH1	21	CONCRETE T-BEAM	Not	80	270	
BERLIN	C3016	0.1 MI TO JCT W VT12	30	PRESTRESSED CONC BOX	Not	80.2	30	
ROXBURY	C3011	0.6 MI TO JCT W CL3 TH12	52	CONT CONC SLAB	Functional	80.4	100	

			Bridge			Sufficiency	Daily	
Town Name	**Route Name**	**Location**	**Number**	**Bridge Type**	**Deficiency S**	**Rating**	**Traffic**	**Status**
WATERBURY	C3006	0.4 MI TO JCT W CL2 TH3	14	STEEL BEAM	Not	80.6	649	
MONTPELIER	USBR2	0.1 MI N JCT. U.S.2	0B2-2	CONT. STEEL BM	Not	80.7	11,200	
BARRE TOWN	VT63 - CONN	0.1 MI W JCT. VT.14	5	TWIN CELL R.C. BOX	Not	80.8	3,800	
MIDDLESEX	I89	0.8 MI S EXIT 9	044-4	TWIN CELL R.C. BOX	Not	80.9	24,300	Under Design
BARRE TOWN	US302	0.4 MI W JCT. VT.110	14	3 SPAN ROLLED BEAM	Not	81.5	7,000	
WATERBURY	C2001	0.5 MI TO JCT W CL2 TH3	2	STEEL BEAM	Not	81.5	1,060	
MARSHFIELD	C3049	0.04 MI TO JCT W US2	23	ROLLED BEAM	Not	81.6	400	
BARRE CITY	VT62	0.1 MI S JCT US 302	12	TWIN CELL R.C. BOX	Not	82	9,100	
FAYSTON	C3011	0.15 MI TO JCT W CL2 TH1	20	STEEL BEAM	Not	82	100	
WORCESTER	FAS 0242	1.0 MI E JCT. VT.12	6	CONCRETE SLAB	Not	82.3	520	
WARREN	FAS 0188	0.8 MI E JCT. VT.100 S	32	CONCRETE T-BEAM	Not	82.4	850	
MONTPELIER	I89	0.3 MI N EXIT 8	0042N	CONT. STEEL BEAM	Not	82.6	12,150	
MONTPELIER	I89	0.3 MI N EXIT 8	0042S	CONT. STEEL BEAM	Not	82.6	12,150	
BERLIN	C3027	0.08 MI TO JCT W US302	26	STEEL BEAM	Not	82.7	400	
BARRE CITY	BROOK	BROOK STREET	2	CONCRETE SLAB	Not	82.8	770	
NORTHFIELD	C3WAL	.01 MI TO JCT W WATER ST	83	CONT. STEEL BEAM	Not	82.8	1,500	
MIDDLESEX	C3010	0.01 MI TO JCT W VT12	36	STEEL BEAM	Not	82.9	200	
MARSHFIELD	US2	1.4 MI W JCT VT.232	80	CONCRETE SLAB	Not	83	5,600	
WARREN	C2004	0.08 MI TO JCT W VT100	30	CONCRETE T-BEAM	Not	83.5	2,000	
BARRE CITY	C30WI	@ JCT W1 US302	12	STEEL BEAM	Not	83.6	1,380	
BARRE CITY	VT14	0.5 MI S JCT. U.S.302 E	66	TWO SPAN STONE ARCH	Not	84.1	14,300	
MONTPELIER	USBR2	0.1 MI W JCT VT 12	0B2-1	CONC. ENCASED GIRDER	Not	84.3	6,000	
PLAINFIELD	C2001	0.01 MI TO JCT W US2	27	CONCRETE T-BEAM	Not	84.5	1,500	
WARREN	VT100	3.5 MI S JCT. VT.17	172	STEEL BEAM	Not	84.8	2,500	
WATERBURY	US2	0.1 MI E JCT VT.100 N	47	STEEL BEAM	Not	84.9	10,900	
WILLIAMSTOWN	C3025	AT THE JCT OF CL3 TH12	25	CONCRETE SLAB	Not	85.5	218	
MONTPELIER	LANGD	LANGDON STREET	11	STEEL PONY TRUSS	Not	85.9	1,320	
E. MONTPELIER	VT14	3.2 MI N JCT. U.S.2 E	72	ROLLED BEAM	Not	86	4,100	

Town Name	Route Name	Location	Bridge Number	Bridge Type	Deficiency S	Sufficiency Rating	Daily Traffic	Status
WATERBURY	I89	0.3 MI S EXIT 10	0046A	STEEL BEAM	Not	86	3,400	
CALAIS	VT14	7.6 MI N JCT. U.S.2 E	77	CONCRETE T-BEAM	Not	86.1	3,100	
MARSHFIELD	VT232	0.1 MI S JCT. U.S.2	5	ROLLED BEAM	Not	86.3	600	
BARRE CITY	C30PA	0.1 MI TO JCT W CL1 TH2	13	WELDED PLATE GIRDER	Not	86.4	1,003	
MIDDLESEX	I89	1.8 MI N EXIT 8	0043N	STEEL BEAM	Not	86.7	12,150	
MIDDLESEX	I89	I89 EXIT 9	0045N	STEEL BEAM	Not	87	11,575	Candidate
MIDDLESEX	I89	I89 EXIT 9	0045S	STEEL BEAM	Not	87	11,575	Candidate
FAYSTON	VT17	2.9 MI W JCT. VT.100	34	ROLLED BEAM	Not	87.1	1,000	
DUXBURY	VT100	0.6 MI S JCT US 2	193	MULTI PLT PIPE ARCH	Not	87.4	3,700	
FAYSTON	VT17	3.9 MI W JCT. VT.100	32	ROLLED BEAM	Not	87.4	1,000	
WAITSFIELD	C3015	0.1 MI TO JCT W VT100	25	CONT. STEEL BEAM	Not	87.5	800	
WILLIAMSTOWN	C3012	0.03 MI TO JCT W VT 14	22	CONCRETE SLAB	Not	87.5	310	
MORETOWN	VT100B	2.3 MI S JCT. U.S.2	7	2 SPAN WELDED GIRDER	Not	87.6	2,400	
MIDDLESEX	I89	1.8 MI N EXIT 8	0043S	STEEL BEAM	Not	87.7	12,150	
MONTPELIER	SCHOL	SCHOOL STREET	10	WELDED PLATE GIRDER	Not	88.2	2,700	
NORTHFIELD	C30VI	0.1 MI TO JCT NO.MAIN ST	84	WELDED PLATE GIRDER	Not	88.3	1,830	
MARSHFIELD	C3030	0.25 MI TO JCT W CL3 TH9	12	TIMBER BEAM	Not	88.8	20	
PLAINFIELD	US2	2.2 MI E JCT VT.14 N	75	WELDED PLATE GIRDER	Not	88.9	7,500	
WASHINGTON	C3067	0.02 MI TO JCT W VT110	27	CONCRETE SLAB	Not	88.9	500	
BERLIN	I89	I89 EXIT 7	0038S	CONT. STEEL BEAM	Functional	89	7,200	
BERLIN	TH18	0.5 MI N EXIT 7	00D39	CONT. WELDED PLT GR	Not	89.3	380	
WATERBURY	I89	1.5 MI N EXIT 10	0048N	STEEL BEAM	Not	89.8	11,850	
WATERBURY	I89	2.8 MI N EXIT 10	0050N	STEEL BEAM	Not	89.8	11,850	
WATERBURY	I89	2.8 MI N EXIT 10	0050S	STEEL BEAM	Not	89.8	11,850	
WORCESTER	C3021	@ JCT. W CL3 TH3	26	CONCRETE SLAB	Not	89.8	260	
WORCESTER	VT12	9.0 MI N JCT. U.S.2	81	CONCRETE T-BEAM	Not	90.1	1,400	
BARRE CITY	BLACKWELL	BLACKWELL STREET	10	WELDED PLATE GIRDER	Not	90.3	1,800	
MARSHFIELD	C3060	0.2 MI TO JCT W US2	28	ROLLED BEAM	Not	90.5	130	

			Bridge			Sufficiency	Daily	
Town Name	Route Name	Location	Number	Bridge Type	Deficiency S	Rating	Traffic	Status
BARRE TOWN	C3059	0.2 MI TO JCT W VT14	10	STEEL BEAM	Not	90.9	100	
NORTHFIELD	C3025	0.15 MI TO JCT W CL3 TH8	45	CONCRETE SLAB	Not	90.9	200	
WORCESTER	C3004	0.35 MI TO JCT W CL3 TH8	29	CONCRETE SLAB	Functional	90.9	10	
BERLIN	VT903 - CONN	0.8 MI W JCT US 302	1	WELDED PLATE CRV GIR	Functional	91	6,100	
MORETOWN	VT100B	1.6 MI N JCT. VT.100	4	2 SP CONT WELDED GIR	Not	91.1	2,400	
MONTPELIER	US2	0.1 MI E JCT U.S.302	62	3SP CONT STEEL BEAM	Not	91.5	11,500	
CALAIS	VT14	9.0 MI N JCT. U.S.2 E	81	CONCRETE T-BEAM	Not	91.8	2,500	
BARRE CITY	AYERS	AYERS STREET	8	STEEL BEAM	Not	92.3	1,700	
PLAINFIELD	C2002	0.36 MI TO JCT W C3 TH19	23	PRESTRESS CONC. SLAB	Not	92.8	270	
E. MONTPELIER	US2	1.0 MI W JCT. VT.14 S	70	WELDED PLATE GIRDERI	Not	92.9	8,600	
PLAINFIELD	C2002	0.25 MI TO JCT W C3 TH21	12	CONCRETE SLAB	Not	92.9	362	
BERLIN	I89	I89 EXIT 6	0036S	CONT. STEEL BEAM	Not	93	7,425	
BERLIN	I89	0.5 MI S EXIT 8	0040N	WELDED PLATE GIRDER	Not	93.1	9,850	Candidate
BERLIN	I89	0.5 MI S EXIT 8	0040S	WELDED PLATE GIRDER	Not	93.1	9,850	Candidate
BERLIN	I89	0.2 MI S EXIT 7	0037S	WELDED PLATE GIRDER	Not	93.3	7,200	
PLAINFIELD	C3029	0.01 MI TO JCT W CL2 TH2	26	CONCRETE SLAB	Not	93.8	20	
BERLIN	C3039	0.04 MI TO JCT W VT12	28	3 SPAN CONT. STL BM	Not	94	100	
NORTHFIELD	C3029	0.13 MI TO JCT W CL3 TH8	46	JACK ARCH	Not	94.5	70	
WATERBURY	I89	1.5 MI N EXIT 10	0048S	STEEL BEAM	Not	94.9	11,850	
BERLIN	C2002	@ MONT-BERLIN T/L	5	STEEL BEAM	Not	95	1,110	
BERLIN	I89	I89 EXIT 7	0038N	CONT. STEEL BEAM	Not	95	7,200	
MARSHFIELD	C3049	0.6 MI TO JCT W US2	24	ROLLED BEAM	Not	95	50	
WILLIAMSTOWN	I89	I89 EXIT 5	0035N	WELDED PLATE GIRDER	Not	95	6,700	
WILLIAMSTOWN	I89	I89 EXIT 5	0035S	WELDED PLATE GIRDER	Not	95	6,700	
NORTHFIELD	VT12	1.9 MI N JCT. VT.12A S	61	2SP CONT STEEL BEAM	Not	95.5	5,200	
BERLIN	VT12	1.8 MI S JCT. U.S.2	72	WELDED PLATE GIRDER	Not	95.9	4,000	
MIDDLESEX	VT936 - CONN	0.1 MI N JCT. U.S.2	1	STEEL BEAM	Not	96	4,000	
WORCESTER	VT12	10.7 MI N JCT. U.S.2	83	CONCRETE SLAB	Not	96.1	1,400	

Town Name	Route Name	Location	Bridge Number	Bridge Type	Deficiency S	Sufficiency Rating	Daily Traffic	Status
MONTPELIER	US2	0.5 MI W JCT VT.12 S	60	3 SPAN STEEL BEAM	Not	96.2	8,400	
WATERBURY	US2	0.2 M1 W JCT VT.100S	48	2 SPAN CURVE GIRDER	Not	96.3	7,500	
WARREN	VT100	5.7 MI S JCT. VT.17	169	3 SPAN ROLLED BEAM	Not	96.4	1,200	
DUXBURY	VT100	0.9 MI N JCT. VT.100B	187	STEEL BEAM	Not	96.5	3,900	
MONTPELIER	VT12	0.5 MI N JCT. U.S.2	73	STEEL BEAM	Not	96.8	4,300	
WILLIAMSTOWN	FAS 0205	0.2 MI E JCT VT 14	9	TWIN CELL R.C. BOX	Not	96.8	2,240	
WATERBURY	I89	1.6 MI N EXIT 10	0049N	STEEL BEAM	Not	96.9	11,850	
WATERBURY	I89	1.6 MI N EXIT 10	0049S	STEEL BEAM	Not	96.9	11,850	
BERLIN	I89	I89 EXIT 6	0036N	CONT. ROLLED BEAM	Not	97	7,325	
MIDDLESEX	US2	0.4MI E JCT VT 100 B	52	CONCRETE SLAB	Not	97	2,500	
BARRE CITY	VT62	0.2 MI S JCT US 302	11	STEEL BEAM	Not	97.1	9,100	
FAYSTON	VT17	3.8 MI W JCT. VT.100	33	CONCRETE SLAB	Not	97.2	1,000	
NORTHFIELD	C30WA	0.02 MI TO JCT W WALL ST	82	PRESTRESS CONC SLAB	Not	97.5	750	
BARRE CITY	SEMNY	SEMINARY STREET	4	CONCRETE SLAB	Not	97.7	3,500	
WARREN	VT100	7.4 MI S JCT. VT.17	167	STEEL BEAM	Not	97.9	970	
DUXBURY	VT100	0.2 MI S JCT US 2	194	R. C. BOX	Not	98.2	4,900	
MORETOWN	VT100B	0.1 MI S JCT. U.S.2	8	2SP CONT CURVED GIR	Not	98.3	2,900	
NORTHFIELD	C2003	0.05 MI TO JCT W C3 TH88	9	CONCRETE SLAB	Not	98.6	750	
BARRE TOWN	VT14	1.6 MI N JCT. U.S.302 W	67	STEEL CULVERT	Not	98.7	4,700	
MONTPELIER	C30GO	@ JCT W CL1 TH5	14	STEEL BEAM	Not	98.7	530	
MARSHFIELD	C3009	0.2 MI TO JCT W CL3 TH27	3	CONCRETE T-BEAM	Not	99	50	
NORTHFIELD	VT12A	4.1 MI S JCT. VT.12 N	30	WELDED PLATE GIRDER	Not	99	1,600	
ROXBURY	VT12A	12.0 MI N JCT. VT.12 S	20	CONCRETE SLAB	Not	99	570	
WORCESTER	VT12	7.5 MI N JCT. U.S.2	80	R.C. BOX CULVERT	Not	99.4	2,200	
FAYSTON	C3004	0.25 MI TO JCT W CL2 TH1	18	CONCRETE SLAB	Not	99.9	100	
WATERBURY	C2003	@ INTERS.OF US2	32	CONCRETE SLAB	Not	99.9	1,090	
MARSHFIELD	C3009	0.1 MI TO JCT W US2	2	CONCRETE T-BEAM	Not	100	100