

***North Avenue / Route 127
Intersection and Bicycle / Pedestrian
Improvements***

***Scoping Study / Alternatives
Analysis***

January 2005



***Chittenden County
Metropolitan Planning
Organization***

*Communities working together
to meet Chittenden County's
transportation needs*



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Introduction

The purpose of this study is to investigate potential improvements at the North Ave./Route 127 intersection and along the North Avenue Corridor from Institute Road to Ethan Allen Parkway in Burlington, Vermont. The study defines issues, develops and evaluates options, and recommends prioritized solutions. The goal of the study is to identify a preferred alternate to improve safety, bicycle and pedestrian access, and road corridor design.

This section of the North Avenue corridor has characteristics of a minor urban arterial. It includes numerous commercial driveways, closely-spaced intersections with local streets, residential areas, limited bicycle and pedestrian facilities and a significant amount of traffic (10,000-16,000 vehicles per day). This area is further characterized by the presence of Burlington High School and the school at the North Alliance Church, adding to the need for safe and well-connected bicycle and pedestrian facilities.

Route 127 is a limited access principal arterial that connects to North Avenue with wide lanes and large radius slip ramps that favor mobility. This intersection was constructed in the 1960's and was the northern terminus of Route 127 at that time. Route 127 was later extended to the north, thus significantly reducing traffic at this intersection. Intersection characteristics at Route 127 and North Avenue resemble a limited access interchange.

The first part of this study summarizes past efforts to improve this intersection and states the existing corridor issues. Road structure and characteristics are described. Traffic accidents are reviewed and existing traffic performance is outlined. Existing resources present in this area are identified and evaluated. Summaries from the two public information meetings are presented based on survey comments that were collected as part of this study.

The second part of this study discusses suggestions for the study corridor and the five alternatives designed to address existing issues and needs. The long term intersection alternatives for this project are:

- Alternative 1 – No Action
- Alternative 2 – Remove Slip Ramp
- Alternative 3 – Tighten Slip Ramp
- Alternative 4 – Complete New Signal and Ramp
- Alternative 5 – Modern Roundabout

The report concludes with recommendations that satisfy the purpose and need of the project.

Purpose and Need Statement

Early in the process the project needs and goals are developed for review and comment. This statement serves as a guide to determine whether suggestions for improvements are appropriate and effective. The Purpose and Need for this project is summarized below.

Purpose

The purpose of the North Avenue / Route 127 Intersection and Bicycle / Pedestrian Improvement Project is to improve public safety, improve maintenance capabilities, provide suitable facilities for pedestrian and bicycle traffic, and maintain vehicular mobility.

Need

- ◆ Improved safety – Control speeds coming off the Route 127 ramp, and along the North Avenue corridor where existing pavement width encourages higher speeds.
- ◆ Accommodate pedestrians – Particularly those along the North Avenue corridor, to provide safe passage to and from the nearby schools.
- ◆ Consistent cross section – There are many variations in curb offset due to multiple spot improvements over the years. Pavement may be wider than necessary in some areas and may be narrowed.
- ◆ Bike accommodations – On-street, complimenting the city’s bike network plan and promoting alternative transportation.
- ◆ Intersection improvements – Heavy southbound lefts onto Route 127 in the morning and westbound rights onto North Avenue in the afternoon cause significant congestion.
- ◆ Investigate a minimal maintenance intersection alternative – The traffic signal at North Avenue and Route 127 requires regular maintenance, examine a roundabout alternative.
- ◆ Address changes in traffic patterns – Traffic patterns have changed significantly since the original intersection design (built before Route 127 was extended to the Heineberg Bridge).

Project Description and Location

Study Area

The study area is shown in Figure 1. The south end of the study area is located at the North Avenue intersection with Institute Road, the Burlington High School entrance. The north end of the study area is located at the North Avenue intersection with Ethan Allen Parkway. Recommendations in this study focus on the North Avenue and Route 127 Intersection and potential bicycle/pedestrian improvements along the corridor. A table of the intersections along North Avenue is listed below.

North Avenue Intersection With:	Intersection Control:	Distance North of Route 127 Int. (meters)	Distance South of Route 127 Int. (meters)
Institute Road	Traffic Signal	-	450
Route 127 - North Avenue Alliance Church	Traffic Signal	same	same
Saratoga Avenue	Stop Sign	250	-
Village Green and Killarney Drive	Stop Sign	360	-
Ethan Allen Parkway	Traffic Signal	430	-
Little Eagle Bay	Stop Sign	450	-

Table 1: North Avenue Corridor Intersections and Control Type.

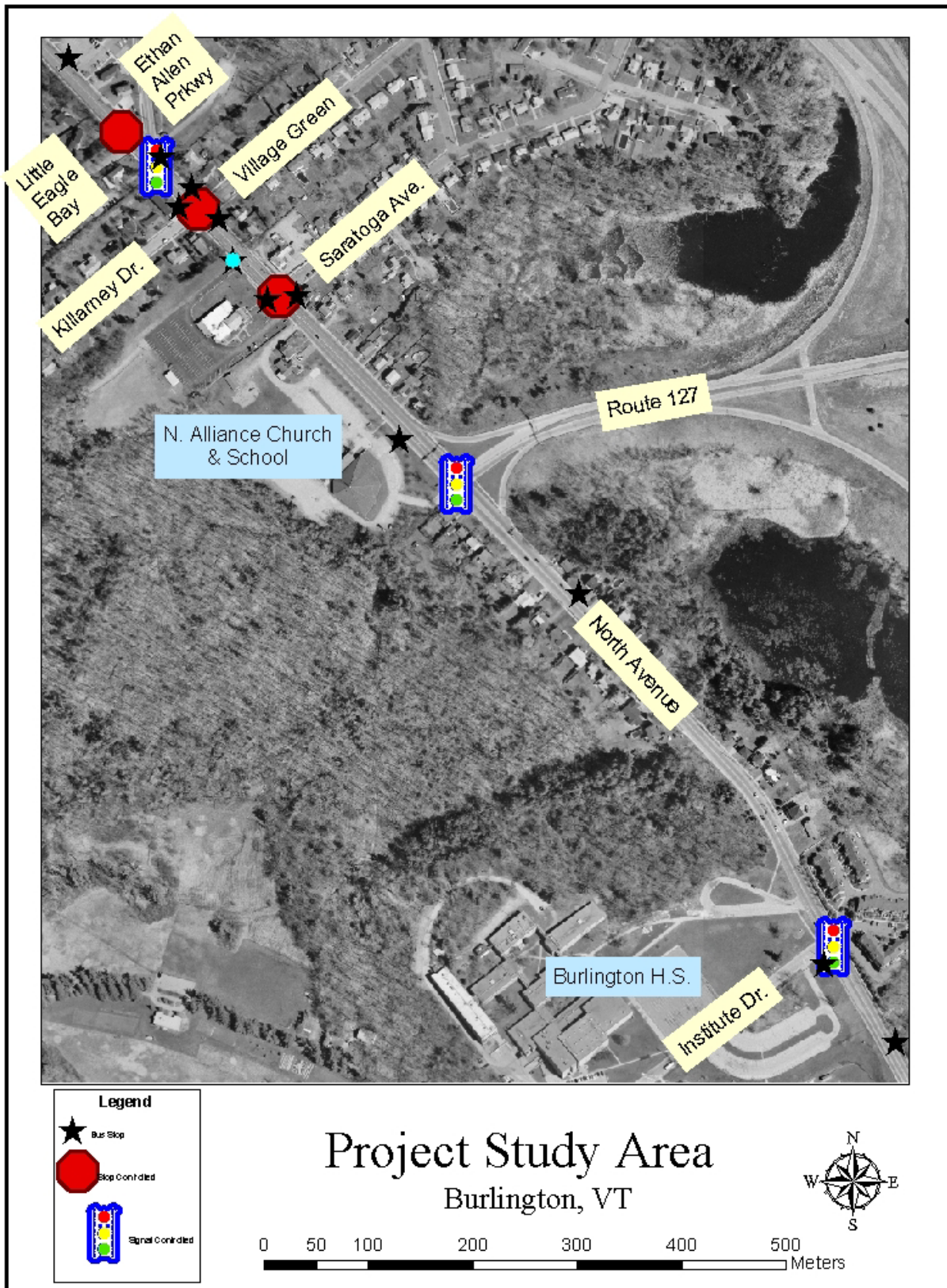
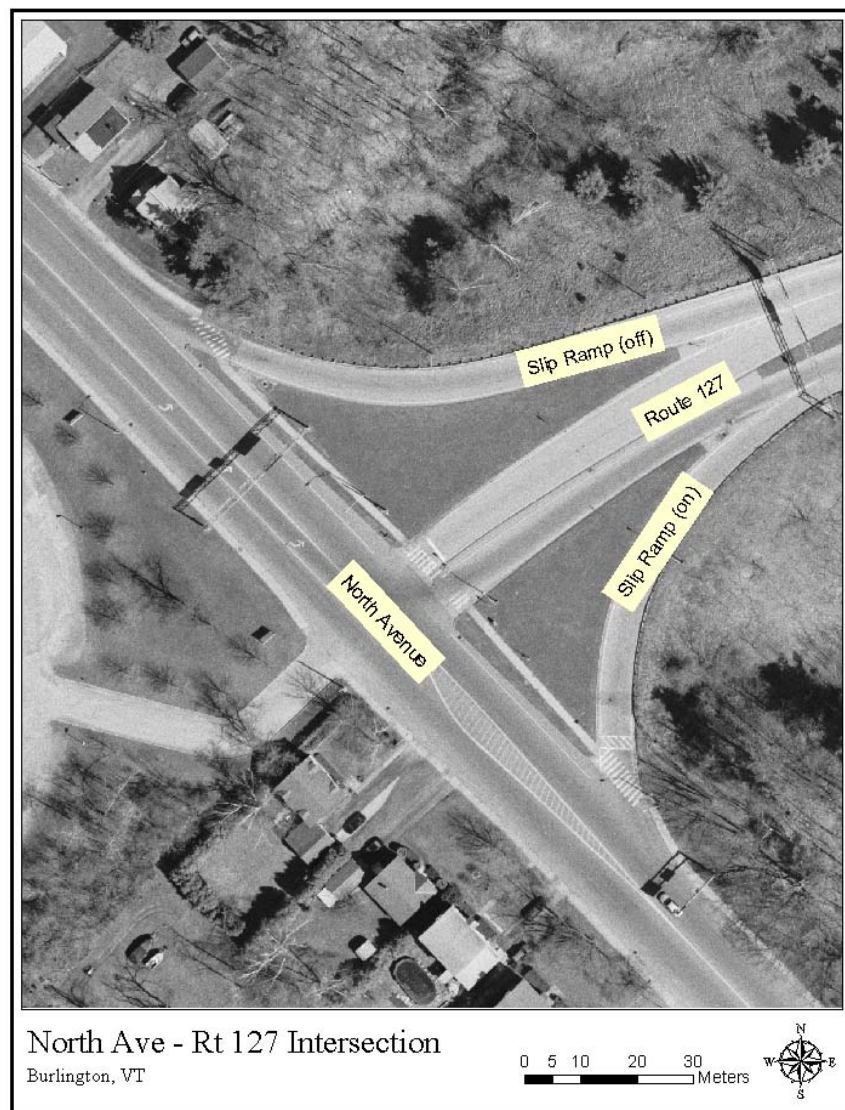


Figure 1: North Avenue / Route 127 Intersection and Bicycle / Pedestrian Improvements Study Area.

North Avenue and Route 127 Intersection

The North Avenue and Route 127 Intersection is a signalized 4-way intersection located approximately 2.9 kilometers north of downtown Burlington. The Route 127 approaches have separate left and right turning lanes; however, the right turn lane on the east approach is a slip lane traveling into its own lane on North Avenue. This intersection was designed in the 1960's when slip ramps were constructed with a large radius. North Avenue has historically had the right-of-way and the Route 127 and the Church/School driveway have been stop controlled. The City converted this intersection in the spring of 2003, from a 2-way stop control on Route 127 and the Church/School driveway, to a signalized intersection. This modification has allowed people leaving the Church/School driveway to have a protected exit.



Photograph 1: North Avenue and Route 127 currently intersect at a traffic signal. Slip ramps and wide lanes dominate the landscape.

North Avenue Corridor

The bicycle / pedestrian corridor reviewed for this study extends along North Avenue between Institute Road and Ethan Allen Parkway. The study corridor spans about one-half mile, approximately 460 meters south and 450 meters north of this intersection. It is a two-lane road south of the North Avenue / Route 127 Intersection and a 4-lane road north of the North Avenue / Route 127 Intersection. This corridor has been designated as a high-use bicycle area for commuters traveling to and from the Burlington area. The corridor is an important component of the Burlington bicycle network. It is an ideal location to support a growing bicycle network to connect with downtown Burlington and neighboring communities. Road widths throughout the study area change between sections of North Avenue. Table 2 summarizes the typical sections throughout the North Avenue study corridor.

Section	Existing Width (approx.)	Thru- lanes	Thru- lane width	Turning lanes	Turning lane width	Median or splitter width	Parking lanes	Parking lane width	Shoulder width
North approach to Institute Road	12.6	2	3.3	1	3.0	-	-	-	-
Institute Road to Rt.127 - at ledge	12.2	2	3.3				1	2.5	-
Institute Road to Rt.127 - houses both sides	12.6	2	3.3				2	2.5	-
Approach to Rt.127 (signal alt.)	16.2	2	3.3	1	3.3	-	-	-	-
Approach to Rt.127 (roundabout alt.)	16.2	2	3.3			3.0	-	-	-
Rt.127 to Saratoga Avenue	17.7	4	3.3				-	-	-
Approach to Ethan Allen Parkway	13.2	4	3.3				-	-	-

Table 2: Existing Typical Sections for the North Avenue Study Corridor (widths are in meters).



Photograph 2: Overhead highway directional signs create an atmosphere that North Avenue is a high-speed facility. Here, looking northbound, the existing sidewalk is located adjacent to North Avenue with no room for snow storage.

Project Background

In the spring of 2002 a petition was presented to the City of Burlington expressing concerns with the high speeds and inadequate pedestrian and bicycle safety at the intersection of North Avenue and Route 127.



Photograph 3: Looking southbound at the existing North Avenue / Route 127 Intersection (shown here before the traffic signal was added). Note the non-traditional wide lanes, a slip ramp that is designed for high speeds, and an inadequate network for bicycles and pedestrians.

Initial Public Traffic Calming Meeting

Prior to Dufresne-Henry's work on this project, a North Avenue Traffic Calming Public Meeting was held on March 4, 2002. Those in attendance were 28 people from the North Avenue Neighborhood and the Burlington DPW, brought together to discuss concerns and ideas for traffic calming in the study area. For the complete list of concerns and ideas identified by the public, see Appendix B.

Neighborhood concerns identified by the public include:

- ◆ Drivers currently travel at high speeds at the Route 127 off-ramp getting on North Avenue.
- ◆ Weaving traffic at the off-ramp is dangerous and problematic.
- ◆ Pedestrians cannot be seen as drivers come around the corner onto North Avenue because of limited sight distance.

- ◆ Drivers turning onto side streets during rush hour traffic (7-9 AM and 3-6 PM) cause traffic issues because drivers behind them either have to abruptly slow down or try to switch into the left lane quickly.
- ◆ Bike lanes are non-existent on North Avenue, so people ride on the sidewalk.
- ◆ The pedestrian crossing point of Route 127 and North Avenue is a major problem with snow buildup. This is true all the way to Saratoga Avenue.
- ◆ Left turns going northbound on North Ave. into the Church/School driveway cause back-ups and inappropriate lane usage because there is one center lane and no left turn lane.
- ◆ It is confusing when North Avenue goes from one lane to two lanes.
- ◆ The overhead signs make drivers feel like they are on an interstate and causes an increase in speed.

Neighborhood ideas for future traffic calming by the public include:

- ◆ Add signs at the off-ramp to indicate reduced speeds and weaving traffic.
- ◆ Replace the overhead signs with post mounted signs.
- ◆ Reduce traffic speed on the off ramp using speed bumps.
- ◆ Construct a roundabout at the off ramp from Route 127.
- ◆ Repaint the pavement striping on the road to indicate intended lane changes.
- ◆ Add more greenbelts.
- ◆ Add signals at the Killarney Drive and Village Green intersections.

Existing Conditions

Roadway

Route 127 is a principal arterial freeway. North Avenue is a minor arterial and the side streets are local streets. The Route 127 / North Avenue Intersection area and corridor is characterized as flat terrain with lanes between 3.0 meters and 5.6 meters.

The North Avenue corridor from Institute Road to Ethan Allen Parkway is also characterized as flat terrain. There is a curve and hill located just north of Institute Road, characterized by a ledge wall to the west of the roadway. Table 2 outlines the typical section widths.

Based on this information, and in accordance with the policy contained in the Vermont State Design Standards (October 1997) and the AASHTO Policy on Geometric Design of Highways and Streets (2001), Table 3 contains various design parameters which have been established for these roads.

Community Character

Numerous one family homes, residential side streets, schools (two) and an Elks Club exist along this North Avenue study corridor. Nearby historic features are located to the north of this study corridor. The existing roadway conditions in the project area are inconsistent with community wishes in regards to speed, safety, and characteristics of their neighborhood.



Photograph 4: This photograph, taken looking south on North Avenue from Ethan Allen Parkway, has a green space between the sidewalk and the street for snow storage. The driveways along this corridor sometimes add to conflicts and congestion.

PROJECT DESIGN CRITERIA

<u>Functional Class</u>		<u>Source</u>	
Route 127	Principal Arterial -	VTrans FAU Route Log	
North Avenue	Freeway Minor Arterial		
<u>Traffic Volumes</u>		<u>Source</u>	
2001 ADT(veh/day):		VTrans FAU Route Log	
Route 127 Ramp	10,100	Institute Road to Rte 127 Ramp Rte 127 ramp to Ethan Allen Parkway	
North Avenue (south)	9,600		
North Avenue (north)	16,200		
<u>Aid Designation</u>		<u>Source</u>	
Route 127 Off Ramp	FAU 5011	VTrans FAU Route Log	
North Avenue	FAU 5026	VTrans FAU Route Log	
<u>Typical Section</u>		<u>Source</u>	
Travel lanes	3.3 m	VT State Standards	
Bike lane	1.5 m	VT Ped & Bike Design Manual (DRAFT) & Burlington DPW	
Parking shoulder*	2.4 m		
Curbs	yes		
Sidewalks	Both sides	* parking shoulder cannot be marked, minimal use assumed	
Treebelt	If possible		
<u>Design Speed</u>			
Rte 127 off Ramp	30 kph		
North Avenue	50 kph		
Roundabout	40 kph		
<u>Sight Distance</u>		<u>Source</u>	
At yield - minor leg	25 m	AASHTO Exhibit 9-51	
At yield - major leg	45 m	AASHTO Exhibit 9-51	
Corner - left from minor	105 m	AASHTO Exhibit 9-55	
Corner - right from minor	95 m	AASHTO Exhibit 9-58	
Stopping	65 m	AASHTO Exhibit 7-1	
Decision - stop	155 m	AASHTO Exhibit 3-3	
Decision - path change	195 m	AASHTO Exhibit 3-3	
<u>Clear Zone</u>		0.5 m	curbed - VSS
<u>Level of Service</u>		D, or better	
<u>Roadway Lighting</u>		Yes	

Table 3: Design Criteria from the Vermont State Design Standards (October 1997) and AASHTO Policy on Geometric Design of Highways and Streets (2001).

Sight Distance

The existing pedestrian crossing sight distance on the northbound slip ramp is limited due to the existing geometry, guardrail and vegetation at this location; a vehicle has 40 to 50 meters of sight distance to see a pedestrian standing at the edge of the guardrail. The recommended stopping sight distance is 50-60 meters. The north, south and east bound approaches have adequate vehicle sight distance for pedestrians. The previous page outlines the sight distance design criteria.



Photograph 5: This photo shows the edge of guardrail adjacent to the north exiting slip ramp off Route 127 where there is a marked pedestrian crossing with limited sight distance..

Intersection Control

The intersection was stop controlled until the spring of 2003. At that time, the city installed a traffic signal at requested by the North Alliance Church and the local Neighborhood.

Existing Utilities

The following utilities are known to exist in the project area:

- ◆ Underground electric
- ◆ Overhead power, telephone and cable
- ◆ Gas
- ◆ Sanitary sewer
- ◆ Water
- ◆ Underground storm drainage (drop inlets and catch basins)

NOTE: Utility poles are located on the east side of North Avenue and follow the entire study corridor. In some areas of the corridor, utilities are located underground.

Right-of-Way

In the project area, North Avenue has a 20 to 22 meter right-of-way. The intersection with Route 127 right-of-way varies with each abutting property boundary. Refer to the plans for a location of the property boundaries.

Clear Zone

For curbed minor arterial urban and village streets, the clear zone is set to be approximately 0.5 meters outside of curbing and 1.0 meter outside of turning radii at intersections with side roads and driveways. These measurements are outlined in the VTrans State Standards.

Signing and Pavement Markings

The existing overhead signs at the Intersection are truss type overhead directional signs. Pavement markings in this corridor are consistent with VTrans standards.

Drainage

The existing corridor along North Avenue has a closed drainage system. This system discharges to the east just north of the off-ramp from Route 127. Runoff from Route 127 drains into large swales on either side of the roadway.

Intermodal Facilities

There is one Chittenden County Transportation Authority (CCTA) bus line that travels through the North Avenue Corridor. The route is called the North Avenue Route and travels on North Avenue Monday through Friday every 30 minutes. There are approximately 11 bus stops located on both sides of the study corridor. This bus allows access to the downtown Burlington Cherry Street bus terminal and to the northern city border of Burlington. A planned future connection may link Colchester to make this intersection a vital node in the alternative transportation system. Approximate bus stop locations are shown on the Project Study Area Map, Figure 1.

Resources

Environmental Sites

An environmental review was performed on this area to identify potential impacts to wetlands, water resources, rare, threatened and endangered species, fish and wildlife and prime agricultural soils. See memo in Appendix D dated June 19, 2003.

There is one wetland noted to the west of residences on North Avenue, south of the Route 127 intersection. It is located entirely to the west of the residences on North Avenue. The wetland is located within a sensitive area in which rare species are found. The second sensitive area is located to the East of the residences of North Avenue and to the south of Route 127 and its boundaries match closely with the floodplain for this area. Appendix D contains plans that outline the locations of the wetland, sensitive areas and floodplain. None of the alternatives presented in this report impact these areas.

No fish, wildlife or prime agricultural lands were identified in the study corridor.

Land and Conservation Fund (LWCF) Sites

The Vermont Agency of Natural Resources maintains a list of LWCF sites which have particular protection from impacts on projects which use Federal funding. None of the sites listed are directly in the area of study. However, there are eight sites near the study area which are listed in Appendix D.

Hazardous Material Sites

The Vermont Agency of Natural Resources maintains a list of hazardous materials sites. There are five hazardous material sites located within the project area. Details of these sites are listed in Appendix D.

Historic Sites and Structures

A report was prepared concerning the potential effect of the proposed project impacts to historic and archeological resources. This proposed project was found to have no effect on the historic resources in the project area. Refer to Appendix D for the complete report.

Archaeological Sites

An archeological resource assessment was prepared for this intersection improvement. The report is dated June 17, 2003 and is located in Appendix D in its entirety. A review of the National Registrar of Historic Places found no sites listed within the proposed project area.. There are three structures located at 914, 925 and 934 North Avenue that are listed on the State Register of Historic Places. These structures lie outside of the proposed project's area and therefore will not be disturbed by proposed project elements. No other archeological sites occur within the project area.

Water and Air Quality

Due to potential road reconstruction, stormwater drains may be added or relocated to capture water runoff and comply with state stormwater standards. If substantial reconstruction or expansion of the roadway occurs - a stormwater discharge permit and 401 water quality permit may be required. Typically, the threshold for requiring a permit is when 5000 square feet of new impervious area is added or fully reconstructed. The alternatives in this report that include full roadway reconstruction would need a stormwater discharge permit.

The proposed project alternatives will have no impact to or will minutely improve air quality in the project area, by improving efficiency and reducing the number of stopped vehicles.

Noise Sensitive Land Uses

In this particular project, noise has not been noted as a concern of the public. In the alternatives presented, noise levels vary since noise is reduced when the number and duration of stops and speed all decrease. Therefore, the lower operating speeds associated with the roundabout alternative would reduce noise levels in adjacent neighborhoods due to the reduction in stops and the reduction in speed. The signal alternatives would remain similar to the existing conditions. Land use in this area is not anticipated to change in the near future.

Traffic Operations and Performance

Safety Analysis

According to VTrans Accident Reports for the period 1997-2001 (5 years), 23 accidents and 13 injuries occurred in the project area. The Burlington Police Records indicate that 16 accidents occurred from January 2001 to November 2002. This discrepancy suggests that numerous smaller accidents occurred below the threshold for a reportable accident (an accident resulting in either an injury or greater than four thousand dollars worth of damage). No intersections within the North Avenue Corridor between Institute Road and Ethan Allen Parkway are classified as a High Accident Location (HAL). See Appendix F for VTrans and Burlington Police Department Accident Reports.

VTrans Accident History Reports On North Avenue, 1997 to 2001				
Location	Manner of Collision	Accidents	Injuries	Fatalities
Institute Road	Rear end	1	1	0
Institute Road	Other	2	1	0
Institute Road / Rt.127 Segment	Head on	1	1	1
Institute Road / Rt.127 Segment	Rear end	1	0	0
Institute Road / Rt.127 Segment	Other	2	1	0
Rt.127	Rear end	1	1	0
Rt.127	Other	1	1	0
Rt. 127 - Ethan Allen Pkwy Segment	Head on	1	1	0
Rt. 127 - Ethan Allen Pkwy Segment	Sideswipe / opposite direction	1	1	0
Rt. 127 - Ethan Allen Pkwy Segment	Sideswipe / same direction	1	0	0
Rt. 127 - Ethan Allen Pkwy Segment	Other	5	1	0
Ethan Allen Parkway	Rear end	2	2	0
Ethan Allen Parkway	Other	4	2	0
TOTAL ACCIDENT SUMMARY:		23	13	1

Table 3: VTrans Accident Report Summary, January 1997 to December 2001.

Burlington Police Department Accident History Reports on North Avenue, 2001 to 2001	
Location	Accidents
North Avenue at Rt. 127	3
North Avenue at Alliance Church	1
Rt. 127 at North Avenue	1
North Avenue and Route 127 Exit	4
Rt. 127 near North Avenue Exit	1
Rt. 127 between North Avenue	1
Rt. 127, NB north of North Avenue	1
Rt. 127 SB	1
Rt. 127 and North Avenue	1
Rt. 127 north of North Avenue Exit	1
Rt. 127 at North Avenue Exit	1
TOTAL ACCIDENT SUMMARY	16

Table 4: Burlington Police Department Accident Report Summary between Institute Drive and Ethan Allen Parkway on North Avenue, January 2001 to November 2002.

Existing Traffic

There are approximately 10,000 vehicles per day traveling on North Avenue south of Route 127 and 16,000 vehicles per day traveling on North Avenue north of Route 127.

Intersection traffic counts were performed by VTrans on the dates listed in Table 6. These counts were converted to the year 2004 and 2009 Design Hour Volumes based on the daily variation of a VTrans continuous count station on Route 127, Burlington. The percentage of trucks traveling north of this intersection is 4.2% and the number of trucks traveling south of this intersection is 3.3%.

North Avenue Intersection With:	Count Data Taken on:
Institute Drive	June 5, 2001
Route 127 - North Alliance Church	August 7, 2002
Saratoga Avenue	August 22, 2001
Village Green and Killarney Drive	None available
Ethan Allen Parkway	May 24, 2001

Table 5: Noted North Avenue Intersections and Dates of Traffic Counts performed by the CCMPO.

A figure of turning movement volumes for this corridor for 2004 PM peak hour volumes is located in Figure 2.

Burlington's North Avenue Corridor 2004 PM Peak Hour Volumes

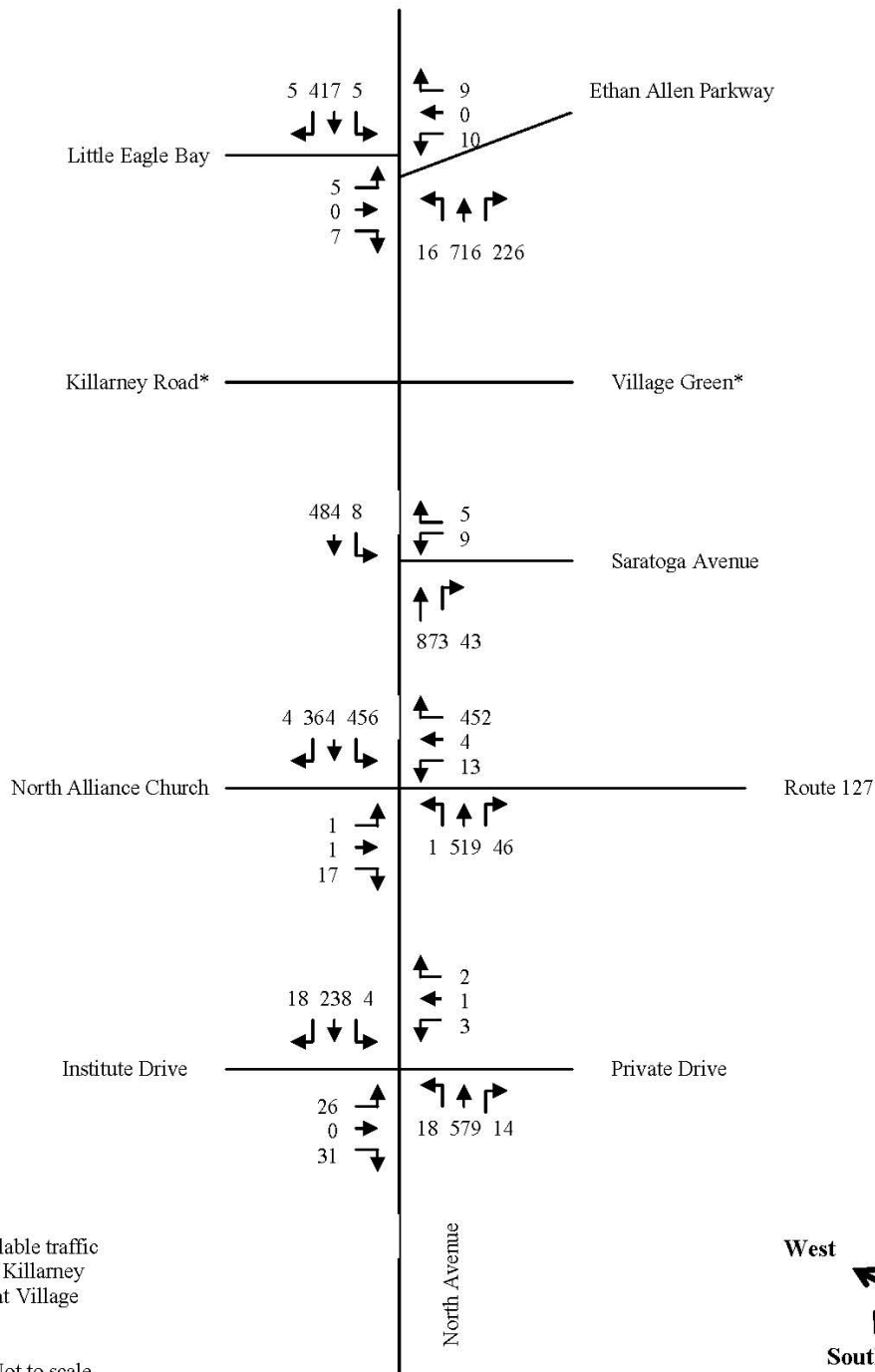


Figure 2: PM Peak Hour Turning Movements for the North Avenue Corridor, 2004 Adjusted Volumes.

Signal Warrants

A traffic signal at the North Avenue - Route 127 Intersection was warranted as determined by RSG and the Burlington Public Works during the fall of 2002. This initiative was requested twice over a six-month period, once by the North Alliance Church and once by the local Neighborhood. In the spring of 2003, Burlington Public Works used funds in their existing operating budget to purchase new signal heads and a controller. Existing poles and underground power was used to complete the signalized intersection.



Photograph 6: The Existing North Avenue / Route 127 signalized intersection looking northbound. Note the congestion with the Route 127 off-ramp integrating onto North Avenue. This photograph was taken during the PM Peak Hour.

Expected Traffic Volumes

Projected 2009 turning movements are exhibited in the following two diagrams for the AM and PM peak hours. These volumes were used to determine the expected delay time and Level of Service (LOS) for the existing intersection configuration.

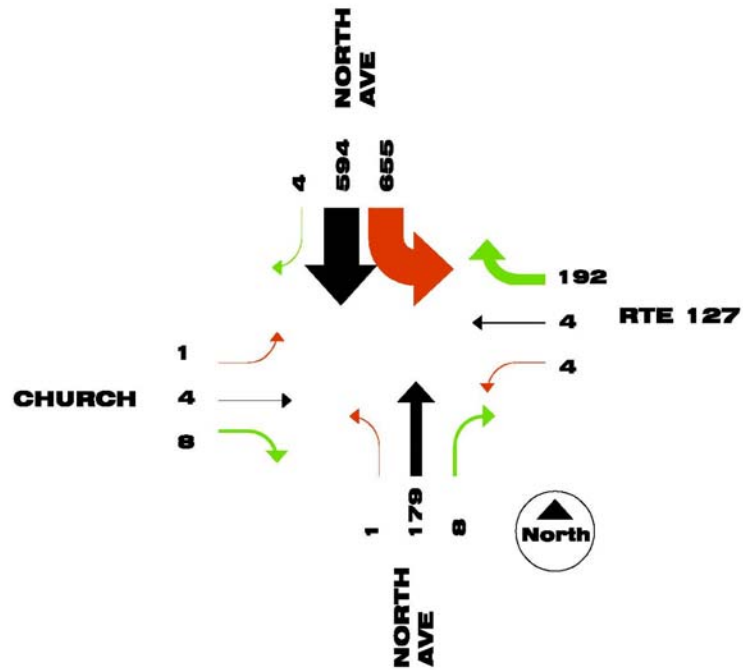


Figure 3: Intersection turning movements for the 2009 AM Peak Hour.

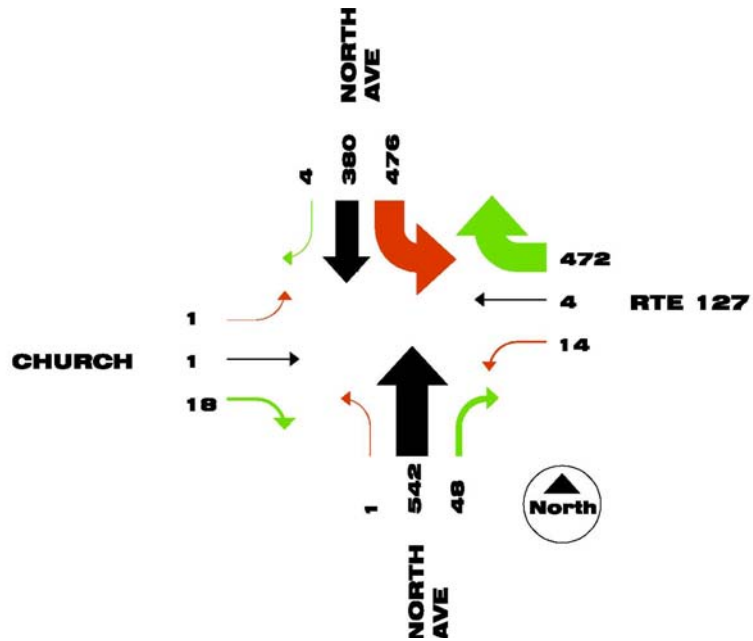


Figure 4: Intersection turning movements for the 2009 PM Peak Hour.

Long Term Intersection Alternatives Evaluation

The five alternatives for this intersection have been evaluated in the following sections:

- Alternative 1 – No Action
- Alternative 2 – Remove Slip Ramp
- Alternative 3 – Tighten Slip Ramp
- Alternative 4 – Complete New Signal and Ramp
- Alternative 5 – Modern Roundabout

This table summarizes the PM intersection delay time between the five established alternatives for the Route 127 and North Avenue Intersection.

2009 PM Delay					
Delay Times (sec) for Alternatives 1, 2, 3, 4 and 5					
Alternative	North Avenue Southbound North Approach	Church/School West Approach	North Avenue Northbound South Approach	Route 127 East Approach	Average (sec)
1 - No Action	3	10	11	1	5
2 - Remove Slip Ramp	27	11	9	10	15
3 - Tighten Slip Ramp	3	11	11	1	5
4 - Complete New Signal and Ramp	3	11	11	1	5
5 - Modern Roundabout	2	4	8	7	5

Table 6: Expected Delay times for Alternatives 1, 2, 3, 4 and 5 - 2009 DHV for the PM peak hour.

Alternative 1 – No Action

The No Action Alternative is a decision that would end further action following this study for the North Avenue corridor and intersection improvement. This alternative leaves the intersection in its current condition and it assumes that any normal maintenance would continue.

Order of Magnitude of Cost

The initial cost to “Do Nothing” is \$0. This does not include yearly signal maintenance, approximated between \$1000-\$3000.

Traffic Analysis

The following table summarizes the AM and PM control delay times and level of service at the North Avenue / Route 127 intersection for existing conditions.

Expected Level of Service (LOS)					
2009 Daily Hour Volume (DHV) Left Turn Lane on North Approach, with Slip-lane, and Permitted and Protected Left Turns					
	Group Lane	Control Delay		LOS	
		AM	PM	AM	PM
North Approach	R-T	1.8	1.4	A	A
	L	4.2	3.8	A	A
South Approach	R	0.0	0.0	A	A
	T-L	9.9	12.2	A	B
East Approach	R	0.2	0.5	A	A
	T-L	14.9	17.1	B	B
West Approach	R-T-L	11.5	10.4	B	B
Intersection		3.6	5.0	A	A

Table 7: Expected Level of Service for Existing Conditions/No Action Alternative - 2009 DHV for AM & PM at North Avenue / Route 127 Intersection.

Advantages

This alternative has no initial cost. This alternative has no construction or related traffic delays. The intersection will continue to function at a high level of service.

Disadvantages

This alternative does not satisfy the purpose and need statement for this project. It does not improve the existing known concerns that affect motorist, pedestrian or bicyclist mobility or safety such as the need for a wider sidewalk on the east side of North Avenue, improve access onto North Avenue or improve the sight distance deficiencies for the slip ramp.

Alternative 2 - Remove Slip Ramp

- ♦ Removing northbound slip ramp.
- ♦ Adding right turn lanes on the Rt. 127 approach.
- ♦ Adjusting signal equipment and operation for new right turns onto North Avenue going north.

Order of Magnitude of Cost

\$150,000 - This is the cost to remove the slip ramp. Yearly signal maintenance is approximated between \$1000-\$3000. No Right-of-Way cost is anticipated.

Traffic Analysis

The following table summarizes the AM and PM control delay times and level of service for the design year 2009. The complete analysis is located in Appendix E.

Expected Level of Service (LOS)					
2009 Daily Hour Volume (DHV)					
Left Turn Lane on North Approach, with No Slip-lane, and Permitted and Protected Left Turns					
	Group Lane	Control Delay		LOS	
		AM	PM	AM	PM
North Approach	R-T	5.0	5.6	A	A
	L	8.6	11.9	A	B
South Approach	R	0.0	0.0	A	A
	L-T	17.6	29.0	B	C
East Approach	R	5.8	10.7	A	B
	T-L	18.2	18.1	B	B
West Approach	R-T-L	13.6	10.0	B	B
Intersection		8.0	14.9	A	B

Table 8: Expected Level of Service for Remove Slip Ramp Alternative - 2009 DHV for AM & PM.

Advantages

- ◆ This option is initially less than any of the other alternatives.
- ◆ Traffic analysis indicates minor overall intersection delays for the AM and PM Peaks, at 5 and 12 seconds, respectively.
- ◆ By removing the slip ramp, high speeds and weaving conflicts are minimized.
- ◆ By completely removing this slip ramp, vehicles will be forced to go through the signalized intersection, slowing the right turning vehicles to a stop and allowing much safer pedestrian crossings.
- ◆ Creates larger gaps between vehicles off Route 127 which will improve access for vehicles entering and exiting their driveways near the slip ramp.
- ◆ Requires less construction and associated disturbance than the other alternatives.

Disadvantages

- ◆ With no slip lane, all northbound vehicles are forced to pass through the signal on the east approach.
- ◆ A signalized intersection has a higher number of conflicting traffic movements than a roundabout (32 versus 8 conflict points).
- ◆ This intersection has more pavement and less green space than the complete signalized or roundabout alternatives.
- ◆ This signalized intersection would not be upgraded with this alternative, thus, there would not be protected pedestrian phases at the North Avenue and Route 127 Intersection.
- ◆ A signalized intersection typically has lower potential capacity than a roundabout.
- ◆ Does not address the need for snow storage.
- ◆ Requires routine maintenance of the existing traffic signal.
- ◆ Does not provide a refuge for pedestrians crossing North Avenue.
- ◆ This intersection has more pavement and less green space than the complete signalized or roundabout alternatives.
- ◆ Signalized intersections have the potential for drivers to run red lights.
- ◆ Vehicles can drive at higher speeds when the signal is on the green phase.



Figure 5: Alternative 2 – Remove Slip Ramp

Alternative 3 - Tighten Slip Ramp

- ♦ Tighten radius of slip ramp.
- ♦ Relocate the crosswalk for increased visibility.

The Tighten Slip Ramp Alternative is designed to slow cars substantially that are traveling north onto North Avenue from Route 127. The geometry of the redesigned ramp is designed for 15 mph. The ramp will operate as a yield condition and the geometry promotes safer entry. Drivers entering at a more acute angle are provided a better view of North Avenue northbound traffic. The geometry also provides turning vehicles their own lane to enter on North Avenue.

Order of Magnitude of Cost

\$200,000 - This cost includes the removal and reconstruction of the slip ramp and the relocation of the North Avenue curb line. No Right-of-Way cost is anticipated.

Traffic Analysis

The following table summarizes the AM and PM control delay times and level of service for design year 2009 for the Tighten Slip Ramp Alternative. The complete traffic analysis is located in Appendix E. No change in the number of lanes or lane usage is proposed.

Expected Level of Service (LOS)					
2009 Daily Hour Volume (DHV)					
Left Turn Lane on North Approach, with Slip-lane, and Permitted and Protected Left Turns					
	Group Lane	Control Delay		LOS	
		AM	PM	AM	PM
North Approach	R-T	1.8	1.4	A	A
	L	5.3	4.1	A	A
South Approach	R	0.0	0.0	A	A
	T-L	10.8	12.2	B	B
East Approach	R	0.2	0.5	A	A
	T-L	16.5	18.6	B	B
West Approach	R-T-L	12.8	11.2	B	B
	Intersection	4.1	5.1	A	A

Table 9: Expected Level of Service for Complete New Signal and Ramp Alternative -- 2009 DHV for AM & PM.

Advantages

- ◆ This option is initially less than the roundabout or complete intersection redesign alternatives.
- ◆ By tightening the radius of the slip ramp, speeds and weaving conflicts are reduced.
- ◆ Improves access for vehicles entering and exiting their driveways near the slip ramp onto North Avenue due to slip ramp being moved.
- ◆ Requires less construction and associated disturbance than a roundabout or a complete intersection redesign.
- ◆ By relocating the crosswalk and tightening the radius of the slip ramp, the pedestrian crossing will be more visible and subsequently more safe.
- ◆ Signalizing an intersection is common practice in the state of Vermont so typical drivers will understand how it functions and how a traffic signal commonly works.
- ◆ Mobility for this turning movement is maintained.

Disadvantages

- ◆ Does not address the need for snow storage.
- ◆ Requires routine maintenance of the existing traffic signal.
- ◆ A signalized intersection has a higher number of conflicting traffic movements than a roundabout (32 versus 8 conflict points).
- ◆ Does not provide a refuge for pedestrians crossing North Avenue.
- ◆ This intersection has more pavement and less green space than the complete signalized or roundabout alternatives.
- ◆ A signalized intersection typically has lower potential capacity than the roundabout.
- ◆ Signalized intersections have the potential for drivers to run red lights.
- ◆ Vehicles can drive at higher speeds when the signal is on the green phase.
- ◆ There would be no protected pedestrian crossings with this alternative.



Figure 5: Alternative 3 - Tighten Slip Ramp

Alternative 4 - Complete New Signal and Ramp

- ◆ Tighten radius of slip ramp.
- ◆ Relocate the crosswalk for increased visibility.
- ◆ Provide a new traffic signal with protected pedestrian crossings.
- ◆ Narrow the travel lanes to 3.3 m (11 feet) and create wider greenbelts.

The complete signalization and redesigned slip ramp alternative will provide traffic calming due to narrower lanes, allow better weaving to the north, accommodate full pedestrian phasing, and provide additional snow storage. The realigned slip ramp is designed to slow cars to 20 kph (15 mph).

Order of Magnitude of Cost

\$300,000 - This cost includes reconstruction of the intersection and removal of the slip ramp. Yearly signal maintenance is approximated between \$1000-\$3000.

Traffic Analysis

Traffic analysis for this alternative is equivalent to the analysis for Alternative 3 – Tighten Slip Ramp. Refer to this report section for the AM and PM control delay times and level of service for design year 2009.

Advantages

- ◆ This option costs less initially than the roundabout alternative.
- ◆ Requires less construction and associated disturbance than a roundabout.
- ◆ By tightening the radius of the slip ramp, high speeds and weaving issues to the north are reduced.
- ◆ With a new traffic signal, all four legs of the intersection will have a protected pedestrian phase, improving the ability for pedestrians to cross.
- ◆ Traffic on the slip ramp is able to exit off of Route 127 easily and travel northbound at a moderate pace. Thus, maintaining adequate mobility for this turning movement.
- ◆ Signalizing an intersection is common practice in the state of Vermont so typical drivers will understand how it functions and how a traffic signal commonly works.
- ◆ Have a negligible increase in the average travel time.
- ◆ Addresses the need for a wider sidewalk & greenbelt for North Avenue on the east side to provide snow storage areas.

Disadvantages

- ◆ Requires routine maintenance for the traffic signal.
- ◆ A signalized intersection has a higher number of conflicting traffic movements.
- ◆ Does not provide a refuge for pedestrians crossing North Avenue.
- ◆ This intersection has more pavement and less green space.
- ◆ A signalized intersection typically has lower potential capacity than the roundabout.
- ◆ Signalized intersections have the potential for drivers to run red lights.
- ◆ Vehicles can drive at higher speeds when the signal is on the green phase.
- ◆ Pedestrians don't always use the protected phase of the signal.



Figure 6: Alternative 4 - Complete New Signal and Ramp.

Alternative 5 - Modern Roundabout

- ◆ Construct a roundabout with four approaches.
- ◆ Narrow the travel lanes to 3.3 m (11 feet) wide.
- ◆ Provide a wider sidewalk & greenbelt for the east side of North Avenue.

A modern roundabout is a circular traffic intersection that allows for continuous movement of traffic through the intersection at low speeds. These low speeds result in greater efficiency and lower accident rates. Modern roundabouts include these general characteristics:

- ◆ Priority is given to the traffic circling in the roundabout. Vehicles entering the roundabout must yield to those circulating in the roundabout.
- ◆ The design of the roundabout lowers vehicle speeds at the intersection.



Photograph 7: A one and two lane roundabout in Okemos, Michigan. This design is similar to Alternative E proposed here.

This alternative design is a hybrid of a single lane (NE & SE quadrant) and double lane (NW & SW quadrants) roundabout, which uses 2 lanes only where necessary. The two lane design for this alternative is to accommodate the high volumes of traffic going southbound onto Route 127 in the AM Peak hour.

The feasibility of snow plowing of roundabouts has been demonstrated in numerous instances, most notably Montpelier and Brattleboro, Vermont and Vail, Colorado. Bicyclists traveling in the roundabout can easily merge into a roundabout lane at low speeds, which precludes cars from attempting to pass the bicycle. Bicyclists may choose to leave the road and cross at the marked crossings.

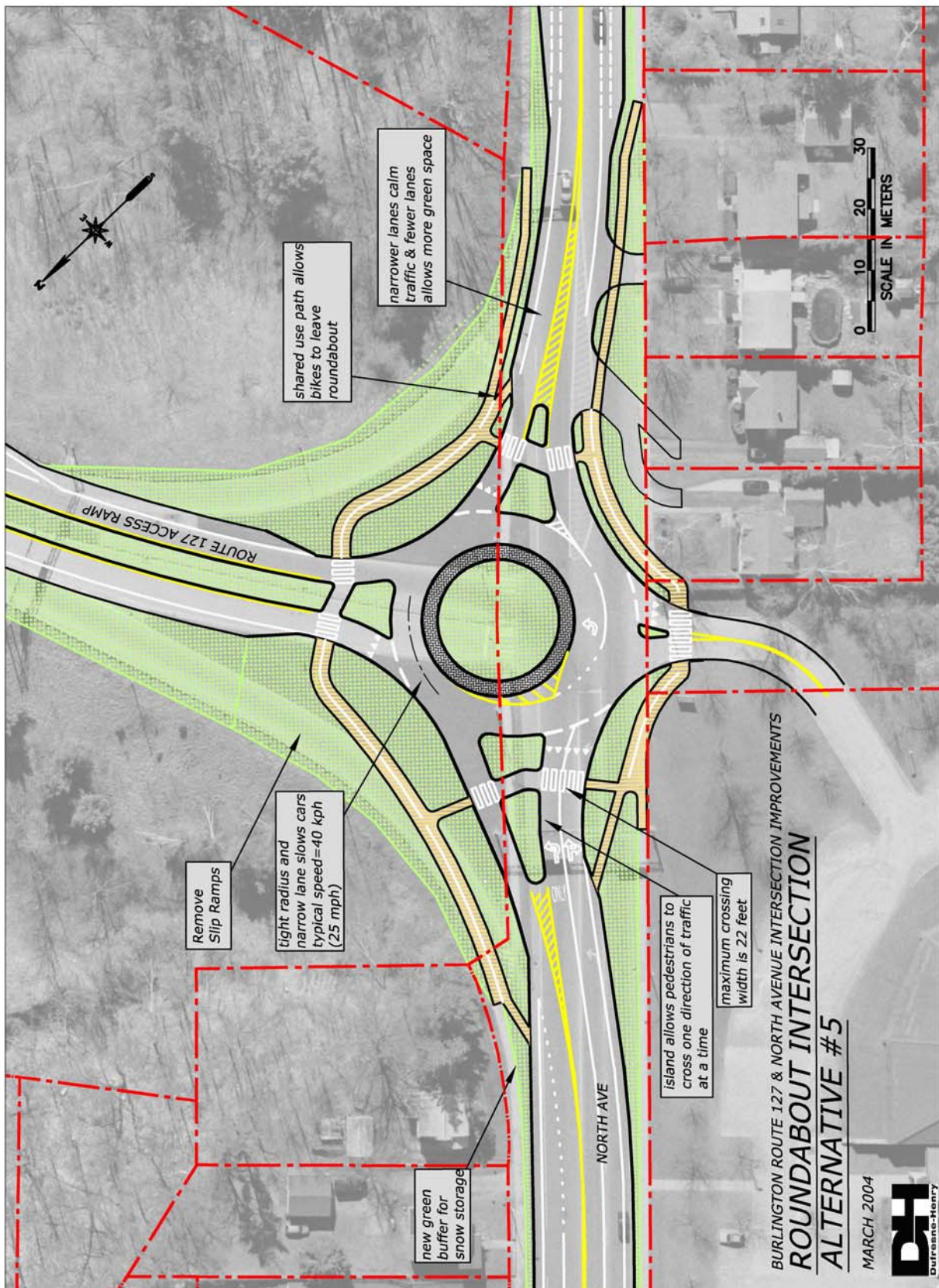


Figure 7: Alternative 5 - Modern Roundabout

Order of Magnitude of Cost

\$450,000 - This cost includes complete intersection reconstruction, new drainage, curbing, sidewalk, pavement markings and signage, lighting and landscaping.

Traffic Analysis

The following table summarizes the PM delay times and queue lengths for design years 2009. The complete RODEL analysis is located in Appendix E.

Expected Level of Service (LOS)					
2009 Daily Hour Volume (DHV)					
Modern Roundabout Alternative					
	Group Lane	Control Delay		LOS	
		AM	PM	AM	PM
North Approach	R-T-L	2.4	1.8	A	A
South Approach	R-T-L	4.8	8.4	A	A
East Approach	R-T-L	3.6	7.3	A	A
West Approach	R-T-L	6.0	4.2	A	A
Intersection		3.0	5.1	A	A

Table 10: Expected Level of Service for Roundabout 2/1/1/1 Lanes -- 2009 AM and PM Peak Hour.

Advantages

- ◆ Creates and provides a visual and practical traffic calming approach
- ◆ Landscaping can be incorporated into the central island of the roundabout and on the raised splitter islands. The resulting design creates a gateway into the northern neighborhoods.
- ◆ Delay is minimized to less than the existing condition.
- ◆ All intersection legs are allowed to operate simultaneously, which increases the capacity of the intersection.
- ◆ Visual clutter and maintenance costs are minimized due to no traffic signal equipment or overhead signal.
- ◆ Improves the pedestrian environment by providing splitter islands which act as pedestrian refuges. Pedestrians can cross one lane of traffic at a time as opposed to three or four lanes of traffic in a signalized condition.
- ◆ Pedestrian safety increases due to slower cars, shorter crossings, and looking in one direction to cross at a time.
- ◆ There is less pavement area in a roundabout intersection because fewer or no turning lanes are required for capacity.
- ◆ As a result of reducing the number and duration of stops, vehicles are more energy efficient, less air polluting, and reduce traffic noise levels, especially during non-peak hours.
- ◆ Fewer and less severe accidents are expected following installation. Typically 39% reduction of total crashes, 76% reduction of injury crashes and 89% reduction of fatal and incapacitating crashes (New York State DOT Roundabout Design Unit, Howard McCulloch, www.highwaysafety.org).

Disadvantages

- ◆ Roundabouts have a higher initial cost than a signalized intersection.
- ◆ There is low public acceptance before construction.
- ◆ Public education may be necessary for smooth transition and proper driver behavior.
- ◆ Traffic disruptions may be more significant during construction.
- ◆ The decision point for bicycles at the approach may be confusing.
- ◆ Trucks may be reluctant to use the truck apron.
- ◆ Does not have a protected pedestrian signal which may intimidate people with disabilities.
- ◆ Reduced opportunity for traffic gaps on North Avenue.

Evaluation Matrices

The future intersection improvement design process will encounter the need for various permits and applications as well as various funding sources. This matrix table, Table 12, summarizes the various impacts expected for the given alternatives. Table 13 is a comparative analysis between Alternatives 1, 4 and 5.

		PROJECT ALTERNATIVES				
EVALUATION MATRIX		Do Nothing	Remove Slip Ramp	Tighten the Slip Ramp	Complete New Signal and Ramp	Roundabout
Cost	~ Estimated Total ~	\$0	\$150,000	\$200,000	\$300,000	\$450,000
Impacts	Agricultural	No	No	No	No	No
	Archaeological	No	No	No	No	No
	Historic Structures, Sites and Districts	No	No	No	No	No
	Hazardous Materials	No	No	No	No	No
	Floodplain	No	No	No	No	No
	Fish and Wildlife	No	No	No	No	No
	Rare, Threatened and Endangered Species	No	No	No	No	No
	Public Lands - Section 4(f)	No	No	No	No	No
	LWCF - Section 6(f)	No	No	No	No	No
	Noise	No Change	No Change	No Change	No Change	Slight Decrease
Local and Regional Issues	Wetlands	No	No	No	No	No
	Right-of-way	No	No	No	No	No
	Satisfies Local Concerns	No	No	No	Yes	Yes
	Community Character	No	No	No	Yes	Yes
	Economic Impacts	No sig. change	No sig. change	No sig. change	No sig. change	No sig. change
	Conformance to Regional Transportation Plan	No	Yes	Yes	Yes	Yes
	Provides Traffic Calming	No	Minimal	Minimal	Yes	Yes
Permits	Satisfies Purpose and Need Statement	No	No	No	Yes	Yes
	VTrans Access Permit	No	Yes	Yes	Yes	Yes
	Act 250	No	No	No	Possible	Possible
	401 Water Quality	No	No	No	Possible	Possible
	404 COE Permit	No	No	No	No	No
	Stream Alteration	No	No	No	No	No
	Conditional Use Determination	No	No	No	No	No
	Stormwater Discharge	No	No	Possible	Yes	Yes
	Lakes and Ponds	No	No	No	No	No
Engineering	SHPO (Historic and Archaeological)	No	No	No	No	No
	Typical Section of North Avenue	1.5m sidewalks, no marked shoulders, 3.3+m travel lanes	1.5m sidewalks, no marked shoulders, 3.3+m travel lanes	1.5m sidewalks, no marked shoulders, 3.3+m travel lanes	1.5m sidewalks, 1.2m shoulders, 3.3m travel lanes	1.5m sidewalks, 1.2m shoulders, 3.3m travel lanes
	Curbs	Yes	Yes	Yes	Yes	Yes
	Drainage Improvements	Minor	Minor	Minor	Yes	Yes
	Posted Speed	55 kph (35 mph)	55 kph (35 mph)	55 kph (35 mph)	55 kph (35 mph)	40 kph (25 mph)

Table 11: Evaluation Matrix for Project Alternatives. The costs for each alternative are for 2004 construction and do not include final engineering.

Comparative Analysis						
Traffic Signal \$300,000		Modern Roundabout \$450,000			No Action \$0	
Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage	
Conventional Intersection	Signal Maintenance Cost	Speed is Always Controlled	Higher Initial Cost	No Capital Cost	Higher Maintenance Cost	
Cheaper	Lacks Design Appeal	Gateway to Northern Neighborhoods	Low Public Acceptance Before Construction	No Construction or Related Traffic Delays	Ignores Existing Known Concerns As:	
Less Construction Required	Lower Vehicle Capacity than Roundabout	High Vehical Capacity	Roundabout Education Needed		1. Sight Distance for Pedestrians at Ramp	
Ramp Speed Reduced	Red Light Running is a Hazard	Expected Safety Improvements	Traffic Disruptions During Construction		2. Need for Snow Storage	
Protected Ped Signal Phase	Higher Speeds on Green Phase	Delay is Minimized			3. Community Character / Aesthetics	
	Higher Maintenance Cost	High Public Acceptance after Construction			4. Existing High Speeds	
	Pedestrians Don't Always Use Signal	Low Maintenance			5. Bicycle Access	
		Shorter Distance Crossing Road			6. Access to Church	
		Less Pavement Area			7. Peds Crossing North Avenue	
		More Energy Efficient and Less Polluting				

Table 12: Comparative Analysis for three alternatives: Complete New Signal and Ramp, Modern Roundabout and the No Action Alternative.

Long Term Bicycle and Pedestrian Corridor Alternatives Evaluation

In addition to the intersection analysis, Dufresne-Henry studied the need for bike and pedestrian facilities along North Avenue between Institute Road and Ethan Allen Parkway. The corridor is split into the North Section and the South Section for evaluation purposes.

South Section

Two suitable cross-sections were developed to fit within the existing curb to curb width south of the Route 127 - North Avenue intersection (currently between 13 and 17 m wide). These two cross-sections are: the Parking Alternative with Bike Lanes and the No Parking Alternative with Wide Curb Lanes.

Multiple cross-sections for this southern section of North Avenue were considered. These included variations on the location of parking and green spaces, different traveled way road widths, and bicycle route opportunities. All of these options would require significant changes and cost - moving the curb, adding shared use paths, or an additional sidewalk. The two alternatives stated here accomplish the two fundamental goals of calming traffic and creating a safer bicycle corridor.

Parking Alternative with Bike Lanes

Advantages

- ♦ Exclusive bike lanes north and south
- ♦ Allows on street parking
- ♦ Green strip is ample for snow storage
- ♦ Narrowed travel lanes to 3 m

Disadvantages

- ♦ Impervious pavement is approx. 14 m wide

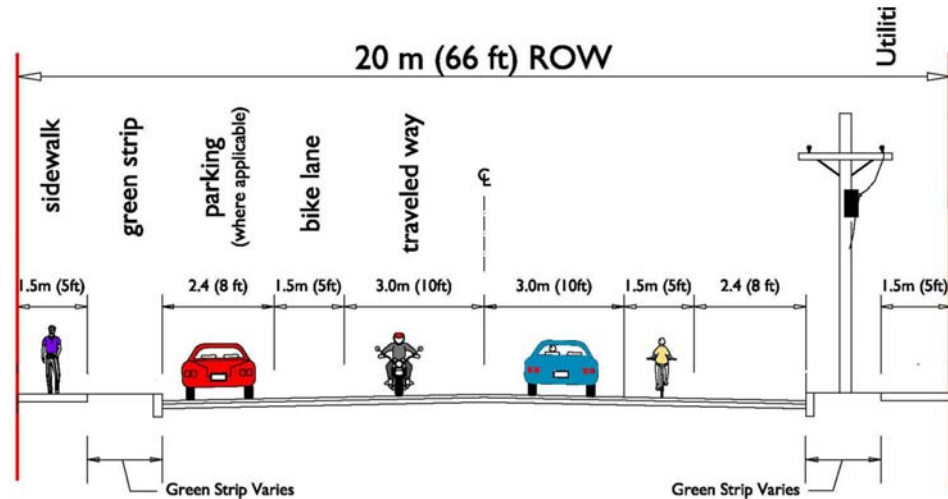


Figure 8: Proposed Southern Cross Section - Parking Alternative with Bike Lanes.

No Parking Alternative with Wide Curb Lanes Advantages

- ◆ Provides abundant room for snow storage
- ◆ Allows more green space and buffer to homes
- ◆ Calms traffic by narrowing road width to approx. 9 m
- ◆ Bicyclists share wide curb lanes

Disadvantages

- ◆ Requires moving curbs to narrow road width
- ◆ Parking is not allowed on street
- ◆ Higher cost associated with this alternative

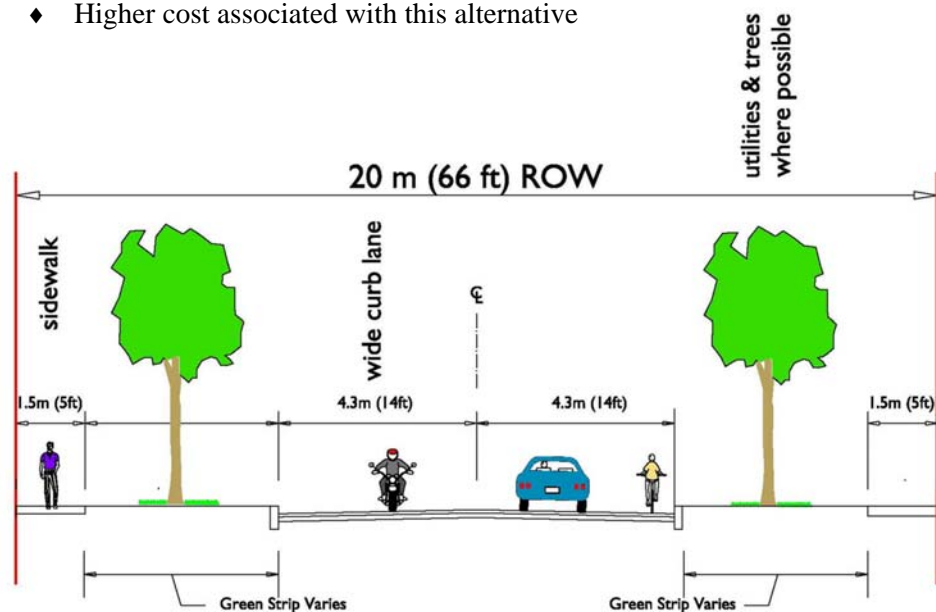


Figure 9: Proposed Southern Cross Section - No Parking Alternative with Wide Curb Lanes.

North Section

The ideal solution between Saratoga Avenue and Ethan Allen Parkway is to widen the road to have four foot shoulders. However, this would require significant area changes and cost – moving the curb, relocating overhead power, phone and cable TV lines, and rebuilding the storm drain system. In addition, sidewalks would have to be moved into adjoining front lawns, requiring right-of-way.

Another alternative considered was a “road diet.” A “road diet” refers to reducing the number of lanes by converting some of them into left-turn or bus-only lanes and allowing more space for bicycling, parking, and pedestrians. In a preliminary capacity analysis, using 2002 volumes, the signalized intersection requires four lanes of traffic. In addition, this option will not accomplish the goal of bicycle access to Leddy Park and the shopping center.

A less disruptive solution to provide a safer bicycle route is to widen the existing sidewalks to a minimum of eight feet on this northern road segment. A transition could exist southbound from the 4- 3.3 m (11 feet) lanes with no shoulder to a wider sidewalk, or shared use path, to the southern section of this study area. This alternative is not consistent, nor a permanent solution to support the goal of a bicycle corridor. Other drawbacks of this alternative include:

- ◆ It is inconsistent with the need for a continuous on-road facility.
- ◆ No bicycle facilities exist north of Ethan Allen Parkway.

Additional study is needed for this element to be addressed adequately. Thus, it is recommend that the segment of North Avenue - from Saratoga Avenue to the Ethan Allen Shopping Center - be studied separately and comprehensively, so that the best roadway, intersection, bicycle and pedestrian solutions can be devised. Future corridor improvements may look at extending the bike accessible shoulder as necessary. A “share the road” concept is more appropriate until the study mentioned is performed.

Public Input Meeting Summaries

The Burlington Department of Public Works (DPW) held two public meetings in association with this study in October 2003 and March 2004 that focused on identifying alternatives and gathering public input. The purpose of the first meeting was to gather input into the development of the project. The purpose of the second meeting was to gather a larger public turnout and to identify their preferred alternative. The following are meeting descriptions that highlight the main points.

Public Information Meeting - October 2003

The Burlington Public Works Department (DPW), Chittenden County Metropolitan Planning Organization (CCMPO) and Dufresne-Henry held a public information meeting on October 21, 2003 that focused on the North Avenue - Route 127 Intersection Improvement project. Dufresne-Henry provided an overview of the project, highlighting suggested improvements to the North Avenue corridor and North Avenue - Route 127 Intersection. Approximately 40 people attended the meeting including residents from the North Avenue area and a Burlington High School class. It was located at the North Alliance Church. Minutes from this meeting are included in Appendix A.

A survey was distributed and collected to summarize comments from those in attendance at the meeting. The first part of the survey summary results were obtained from a survey of those attending this meeting. Respondents included 14 adult surveys and 22 student surveys submitted to the consultant (DH). The following summary and comments compile the 14 adult surveys. Refer to Appendix A for full document survey summary results and comments.

- ◆ The most important design criteria is enhancing pedestrian mobility and safety, followed closely by providing traffic calming. Removing the slip lane from Route 127 to North Ave received average consideration. Minimizing vehicular delay and minimizing cost appeared to be the least important design criteria.
- ◆ Alternative 4 (Complete New Signal and Ramp) and Alternative 5 (Modern Roundabout) each received seven (7) votes, out of 14 total votes.
- ◆ The No Action Alternative received no votes.
- ◆ Votes regarding the North Ave corridor appear to show a preference for the Traffic calming alternative (wide curb lane with no parking) which received 9 votes. There were 4 votes for maintaining parking and the striped bike lane alternative (a total of 13 votes were submitted for this question). One of the votes for maintaining the parking suggested to alternate the parking and increased green space from side to side. This alternative would still allow parking, an expanse of snow storage and bike lanes on both sides.

One comment suggested that they would like to see the plan for a road diet and another comment would like to see bike lanes on both sides of the road.

The following summary and comments compile the 22 high school student surveys that were collected at the first Public Information Meeting.

- ◆ Providing enhanced pedestrian mobility and safety appeared to be the most important design criteria from the student's perspective. Providing traffic calming appeared to be the second most important design criteria followed by minimizing vehicular delay. Removing the slip lane from Route 127 to North Ave and minimizing cost appeared to be the least important design criteria.
- ◆ Alternative 1 (Permanent Signal, revise slip lane) appeared to be the most preferred alternative receiving 13 out of 22 votes.
- ◆ Alternative 2 (Install Roundabout) appeared to be the second preferred alternative. This alternative received 9 out of 22 votes.
- ◆ The Do Nothing Alternative: (return to an unsignalized intersection) received no votes.
- ◆ Votes regarding the North Ave corridor appeared to favor the maintain parking and adding a striped bike lane. There were 14 out of 20 votes for this alternative. The traffic calming alternative received 5 out of 20 votes and the Do nothing alternative received 1 out of 20 votes.

Citizens were concerned with the lack of wide publicity for the first public meeting. In response, a second public meeting was advertised to a greater extent and held in March 2004.

Public Information Meeting - March 2004

The second public meeting focused on identifying a preferred alternative for the North Avenue - Route 127 intersection. The Burlington DPW presented an overview of the project history and outlined the purpose of the meeting. Dufresne-Henry provided details on the proposed intersection alternatives. The meeting was attended by approximately 50 residents from along or near North Avenue and citizens from Burlington at the North Alliance Church. Minutes from this meeting are included in Appendix A.

Attendees from this meeting filled out a survey from the Burlington DPW both at and following the meeting to collect people's preferred alternative. Tabulated results are as follows. Refer to Appendix A for the survey and the complete summary results.

- ◆ The two significant issues for this study area identified in the survey were:
 - 1) Reduce speed on the slip ramp, and
 - 2) Pedestrians traveling north/south
- ◆ The Alternative most favored by the survey was Alternative 4: Complete Signal and Ramp. This alternative was followed by a tie between Alternative 3: Tighten Slip Ramp and Alternative 5: Modern Roundabout.

Conclusions and Recommendations

Based on public input and discussions of the project committee, Alternative #3: Tighten Slip Ramp Intersection is the preferred alternative. The following are reasons for selecting this alternative:

- ◆ Provides new intersection geometry to control vehicle travel speed and improve existing sight distances.
- ◆ Widens greenbelt north of the intersection on the east side.
- ◆ Does not preclude the future installation of new traffic signal equipment.
- ◆ Addresses major concerns, speed on slip ramp, improves pedestrian access North/South.
- ◆ Provides a moderate cost, making it easier to obtain the necessary project funding.
- ◆ Has a base of public support, for a more moderate approach at addressing the issues originally identified (a balance between commuting traffic, and the needs of the neighborhood).
- ◆ Expressed public concerns with roundabout reducing traffic gaps for entering traffic on North Avenue.

The Burlington Public Works Commission supported the Burlington Public Works Office's preferred alternative at a meeting on July 7, 2004. Documentation regarding these decisions is located in Appendix C.

Additional study is needed for the bicycle/pedestrian element to be addressed adequately. It was determined early in this study that North Avenue Corridor - from Saratoga Avenue to the Ethan Allen Shopping Center - be studied separately and comprehensively, to devise the best roadway, intersection, bicycle and pedestrian solutions.