Interstate 89 Exit 19, St. Albans South State Highway & Vermont Route 104

Intersection Scoping Study

Town of St. Albans, Vermont

Completed:
May 2002

Prepared for:

NORTHWEST REGIONAL PLANNING COMMISSION
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INTRODUCTION

The Exit 19 / St. Albans South State Highway (SASSH) / Route 104 intersection in St. Albans, Vermont has been identified as a substandard intersection by the Vermont Agency of Transportation (VTrans) and the Northwest Regional Planning Commission (NRPC). The NRPC obtained the services of Lamoureux & Dickinson Consulting Engineers, Inc. in an effort to identify the most appropriate improvement alternative for the intersection. Figure 1 is an orthophoto showing the location of this intersection

Approximately 1,300 vehicles currently (year 2001) travel through this intersection during the afternoon peak hour on an average day. It is estimated that by the year 2016 approximately 1,850 vehicles will be traveling through this all-way stop controlled intersection during the afternoon peak hour. Based on the functional class and traffic volumes on VT Route 104 and the SASSH, this intersection qualifies for all three types of investment categories (reconstruction, rehabilitation or preservation) according to VTrans' Level of Improvement Policy.

This Scoping Report begins with a Purpose and Need Statement for the project followed by a presentation of the information collected about the existing intersection which was obtained in the field, from local and state officials and from relevant State agencies. Various alternatives are then presented which were developed to address the needs of the intersection. Finally, a recommended alternative is identified.

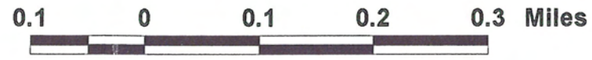

Figure 1

VT Route 104 / SASSH Intersection Location Plan

PURPOSE AND NEED STATEMENT

Purpose

The purpose of the Exit 19 / SASSH / Route 104 intersection project is to improve the safety of the intersection for vehicles, bicycles and pedestrians while providing an adequate capacity for all users.

Need

The intersection is considered deficient based on its poor levels of service and limited multi-modal capabilities.

Poor Level of Service - This intersection provides access to Interstate 89 via Exit 19 located immediately east of the intersection. It serves two major travel routes; west along the SASSH to and from South Main Street (U.S. Route 7) in the City of St. Albans, and north along Route 104 to and from Vt. Routes 36 and 105 north and east of the City. The intersection also provides access to a growing commercial area located adjacent to it along Route 104. Traffic volumes and conflicting turning movements are heavy during both morning and afternoon peak hours resulting in an overall level of service F for the intersection.

Limited Multi-Modal Capabilities - The intersection is very unfriendly for pedestrians and bicyclists. Minimal shoulders on Route 104 do not provide sufficient space for bicyclists and pedestrians to safely travel outside of the travel way. Additionally, the SASSH is a limited-access highway on which pedestrian and bicycle travel are prohibited. Ongoing residential and commercial development in the area of the intersection is resulting in increased multi-modal trips in this immediate area.

EXISTING CONDITIONS

Design Speed

The posted speed limit on Route 104 is 45 mph in the vicinity of this intersection. The posted speed limit on the SASSH is 50 mph.

Functional Classification

VTrans' functional classification of Route 104 through this intersection is as a rural major collector. The SASSH is classified as an urban principal arterial west of Route 104 and a rural minor arterial east of Route 104.

FIGURE 2
Eastbound View of Intersection

Traffic Volumes

A twelve hour turning movement count was performed by the VTrans at this intersection on August 8, 2000. Additionally, 7-day automatic traffic recorder counts (recording hourly traffic volumes) were performed during August 2000 on both Routes 104 and the SASSH north and west of the intersection, respectively. Data from these counts was used to calculate year 2000 annual average daily traffic volumes (AADT) on each of the four approaches to the intersection (Table 1).

Table 1 - 2000 AADT

SASSH		Route 104	
East	West	North	South
11,160 vpd	6,900 vpd	8,500 vpd	5,790 vpd

Horizontal Alignment

VT Route 104 and the SASSH intersect at approximately a 90 degree angle. There are no apparent horizontal curves on either roadway in the vicinity of the intersection.

Clear Zones

The recommended clear zone for new construction and reconstruction projects on uncurbed urban principal arterials with volumes such as those on the SASSH is 16' for fill slopes. The volumes on the south approach of Route 104 warrant a 14' clear zone on fill slopes. The north approach volumes warrant a 16' clear zone.

Where necessary to avoid or minimize disturbance to historic, archaeological, scenic, natural or other resources, the clear zone can be reduced to 10' without a design exception. On curbed principal arterials and collector streets, a 1½' horizontal offset to obstructions from face of curb should be provided. This dimension should be increased to 3' near turning radii at intersections.

Hydraulic Information

Presently storm water is collected via grassed swales along both Route 104 and the SASSH. Route 104 drains away from the intersection in both directions. The drainage from the south side of the Interstate ramps crosses under Route 104 through a culvert located approximately 20' south of the intersection. Drainage from the north side of the Interstate ramps and the northeast side of Route 104 crosses under Route 104 through a culvert located approximately 315' north of the intersection. This drainage continues southwest and crosses to the south side of the SASSH through a culvert located approximately 580' west of the intersection.

Residential and Commercial Drives

The northern access to the Wagon Wheel Truck Stop is located approximately 200' south of the intersection on the east side of Route 104. The proposed drive for the proposed Milk and Maple factory store and convenience mart will be located approximately 650' north of the intersection, again on the east side of Route 104. St. Albans South State Highway is a limited access roadway with no access points.

Right of Way Information

Historical right-of-way information indicates that VT Route 104 has a 99' (6 rod) right-of-way. St. Albans South State Highway appears to have a 200' right-of-way. Both are owned and maintained by the State of Vermont (VTrans).

Roadway Width

Both Route 104 approaches to this intersection consist of 11' exclusive left-turn lanes plus 11' thru / right-turn lanes. Both approaches have 2' paved shoulders and single departure lanes. The west approach of the SASSH has two approach lanes (a 12' left/thru lane plus a 12' thru/right lane with a 6' paved shoulder) and two departure lanes. The two departure lanes merge into one west of the intersection. The east approach (Interstate 89 Exit 19) also has two approach lanes (15' shared left/thru lane plus a 13' shared thru/right lane with a 3' paved / 3' gravel shoulder) and two departure lanes. The center departure lane leads to the northbound on-ramp, and is relatively lightly traveled. The outside departure lane leads to the southbound on-ramp, and is much more heavily utilized..

VTrans' design standards recommend 12' lane widths for higher speed, free flowing principal arterials such as Route 104 and the SASSH. It also recommends 11' widths for lanes adjacent to painted islands. The recommended lane width for rural collectors such as Route 104 is 11'.

To accommodate shared use of uncurbed urban principal arterials and rural collector roadways by bicycles, the VTrans recommends 3' paved shoulders be provided.

Sight Distances

Available intersection sight distances on all four approaches exceed the VTrans recommendation of 495' for a posted speed limit of 45 mph, and 550' for a posted speed of 50 mph.

Sign Inventory

All four approaches have stop signs on both sides at the stopbars. There are island signs and object markers at both ends of the raised medians on all four approaches. Full sets of route signs exist prior to the intersection on the northbound, southbound and westbound approaches. The signs are missing from the posts on the eastbound approach. Route confirmation signs exist in all four directions leaving the intersection.

Surrounding Land Use

The four corner parcels directly adjacent to the intersection are currently vacant. The northeast corner parcel is the site of a proposed St. Albans Milk and Maple project; a 20,000 sq. ft. convenience mart

and multi-use commercial building. That project will access onto Route 104 north of the intersection. The Wagon Wheel Truck Stop is located southeast of the intersection on Route 104, and the Colins-Perley Sports Center is slightly further south on the west.

Terrain

Route 104 and the SASSH both traverse level terrain in the vicinity of this intersection. The grade of the SASSH begins to rise towards the I-89 access ramps on the east approach as can be seen in Figure 2.

Utilities

Utility poles with overhead wires (CVPS and Verizon) terminate south of the intersection at the Wagon Wheel. There is an additional pole on the southwest corner of the intersection which serves as the electrical service for the existing flashing beacon at the intersection. There are buried gas lines which pass through the intersection.

Vertical Alignment

The SASSH is relatively flat in the vicinity of this intersection. When northbound on Route 104, there is a slight uphill grade just before the intersection and a slight downhill grade just beyond the intersection.

Accidents

Accident data for the five year period from 1995-1999 was obtained from VTrans. During this period, 3 accidents were reported on Route 104 at this intersection. One driver was exceeding the authorized speed limit which resulted in a rear-end collision. The other two accidents were the result of the failure to yield the right-of-way which resulted in a right-angle broadside accidents. No accidents were reported on the SASSH in the vicinity of this intersection during this five-year time period.

The calculated accident rate for this intersection is 0.132 accidents per million vehicles; which is below the statewide average of 0.264 acc/mv for this type of intersection.

Intersection Capacity & Levels of Service

The capacity of the intersection and its existing level of service rating was determined by performing a multi-way stop intersection capacity analysis using the procedures outlined in Chapter 10 of the *Highway Capacity Manual (HCM)*[1]. The criteria for levels of service at intersections are outlined in Table 2.

Table 2 Intersection Level of Service Criteria

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

To perform this analysis, the observed peak hour traffic volumes observed in the August 2000 turning movement count were adjusted to reflect design hour conditions (30th highest hour on an annual basis) during the year 2001. The results of this analysis revealed that the intersection operates at level of service F, with overall delays exceeding 95 seconds per vehicle during design hour volume (DHV) conditions.

Traffic Signal Warrants

An analysis of the warrants for signalization was performed using the same turning movement count data, with the only difference being that the observed data was adjusted to average weekday conditions as required by the *Manual on Uniform Traffic Control Devices (MUTCD)*[2]. The *MUTCD* contains eight warrants, any one of which if satisfied, an be used to justify the installation of a traffic signal. It is important to note, however, that satisfying one or more warrants does not constitute a requirement to install a traffic signal. Warrants 1-3 relate to the volumes of traffic passing through the intersection

1 Highway Capacity Manual, Transportation Research Board, 2000

2 Manual on Uniform Traffic Control Devices, Federal Highway Administration, 2000

during different time periods. The analysis found all three to be satisfied. The remaining warrants, including Warrant 7 - Crash Experience, were not satisfied or did not pertain to this intersection.

RESOURCE INFORMATION

Wetlands and Water Resources

Both the U.S. Army Corps of Engineers (COE) and the Vermont Agency of Natural Resources (ANR) have jurisdiction over wetlands. Improvements at this intersection would require a COE General Permit if greater than 3,000 sq. ft. of wetlands under their jurisdiction are impacted. Wetlands typically under COE jurisdiction do not include roadside ditches, cultivated croplands or isolated wetlands not adjacent to streams, rivers and lakes. The ANR regulates Class 2 wetlands and the 50' buffer zone which surrounds them. Any impact to a Class 2 wetland requires a Conditional Use Determination from the ANR.

In the immediate area of the project, the closest wetland shown on the Vermont significant (Class 1 and 2) wetlands maps is located approximately 3,000' to the south. At the intersection itself, the only apparent wetland areas are those which are located in existing roadside ditches. These wetland ditches do not appear to be contiguous to the significant wetland located to the south.

Martha Abair, Senior Project Manager for the Army Corps of Engineers, has been contacted for a review of the project area for a determination on the presence of any wetlands which the Corps would have jurisdiction over. April Moulaert, the District Wetlands Ecologist for the Agency of Natural Resources Water Quality Division, has also been contacted for her input on the presence of significant wetlands in the vicinity of the intersection.

Significant Plant and Animal Species

GIS mapping of significant and/or endangered plant and animal habitat areas do not show any critical habitats in the immediate area of this project.

Lawrence Garland, District Wildlife Biologist for the Agency of Natural Resources Department of Fish and Wildlife has been contacted to determine if any fish or wildlife issues exist within the project area of this intersection. Everett Marshall from the Nongame and Natural Heritage Program of the Department of Fish and Wildlife has also been contacted regarding occurrences of significant natural communities of rare, threatened or endangered animals or plants in the project area.

Land and Water Conservation Fund Sites

No projects included on the Vermont's Land and Water Conservation Fund List of funded projects (1965-1995) are located adjacent to or in the vicinity of the intersection.

Hazardous Materials Sites

The Active Vermont Hazardous Waste Sites list published for the last quarter of 2000 by the Vermont Hazardous Waste Management Division was reviewed. No sites within the anticipated project limits were identified on that list. Reported spill locations and identified leaking underground storage tank locations were also researched.

A search of known spill locations, underground storage tank locations and leaking underground storage tank locations was also performed in the immediate vicinity of the anticipated project area. One accident-related fuel spill occurred in 1997 at Exit 19. Small spills of sludge material (1992), diesel fuel (1998), oily waste (1997) and industrial waste (1992) have occurred at the nearby Wagon Wheel Truck Stop. The Wagon Wheel Truck Stop is also the location of 10 registered underground storage tanks (gasoline, diesel & waste oil). The closest identified leaking underground storage tank is located on Thorpe Avenue approximately ½ mile to the northwest.

Historic Sites and Structures

There are no identified historic sites or structures located in the proximity of this intersection.

Archaeological Sites

Within the existing roadway rights-of-way there is little potential for adverse effect on prehistoric or historic cultural resources from any proposed intersection modifications. Most of this area was previously disturbed for roadway, drainage and slope construction. It is possible that undisturbed ground could exist on the four corner parcels adjacent to the intersection. If improvements affect those areas, they might require further archaeological evaluation prior to obtaining a categorical exclusion statement for the project.

Agricultural Lands

The Department of Agriculture, Food and Markets has been contacted for a determination on whether there are primary agriculture soils located within the project area. To the extent that the improvements at this intersection remain within existing highway right-of-ways, there would not be any impacts on agricultural soils.

Drinking Water Sources

An examination of State GIS mapping of public drinking water supplies, shows that the Wagon Wheel Truck Stop has a drilled well. Municipal water is also shown as serving this area.

TRAFFIC GROWTH PROJECTIONS

Background Traffic Data

A twelve hour turning movement count was performed by the VTrans at this intersection on August 8, 2000. Additionally, 7-day automatic traffic recorder (ATR) counts (recording hourly traffic volumes) were performed during August 2000 on both Routes 104 (ATR station F-198) and the SASSH (ATR station F-195) north and west of the intersection, respectively. Data from these counts can be used to estimate future traffic volumes through the use of growth factors and other data published by VTrans[3]. VTrans scoping study procedures[4] call for developing 5 and 15 year traffic projections for intersection projects.

The first step in developing future traffic projections is to identify an appropriate growth rate. Recent (1990 to date) traffic volumes (AADT's) were examined at the two above ATR locations, and regression analyses performed using the available data. VTrans has also developed statewide growth rates for primary and secondary rural highways based on similar regression analyses. Table 3 presents a comparison of the resulting annual growth rates.

Table 3 Annual Growth Rate Projections

	Route 104 (north)	SASSH (west)
Statewide CTC Analysis	1.8%	1.8%
CTC F029 (Route 7 - Georgia)	2.5%	2.5%
Local ATR Analysis	4.3%	2.7%

In a recent traffic impact analysis which was performed for the proposed St. Albans Milk & Maple project, it was noted that several nearby developments, in addition to the Milk & Maple, have recently been approved. Combined (including the Milk & Maple), these developments suggest that this intersection will experience higher, rather than lower, growth rates over the next 3-5 years. With

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3 Continuous Traffic Counter Grouping Study & Regression Analysis - Based on 1999 Traffic Data, Vermont Agency of Transportation, September 2000

4 Project Development Process, Vermont Agency of Transportation, 1998

respect to the longer-term, however, it is unlikely that this area will be able to sustain high annual growth rates in the 4% range over a 15-year period. With these considerations in mind, we selected a 3.0% annual growth rate as being appropriate for this intersection. This resulted in the traffic projections shown in Table 4.

Table 4 AADT and DHV Projections

	Route 104 (north)		SASSH (west)	
	AADT (vpd)	DHV (vph)	AADT (vpd)	DHV (vph)
Existing (2001)	8,800	1,046	7,100	899
5-Year Projection (2006)	10,000	1,197	8,100	1,030
15-Year Projection (2016)	12,600	1,501	10,200	1,291

ALTERNATIVES

Introduction

Possible solutions were discussed with the NRPC to address the problems being encountered at this intersection. At this meeting, various alternatives were discussed. It was agreed to examine three alternatives; a "no-build" alternative, a signalization alternative plus a roundabout alternative. Accordingly, after the above meeting, three basic alternatives were developed. The following provides a full description of each alternative, with plan view sketches included for each.

Alternative A (NO-BUILD)

The do-nothing alternative would retain existing conditions, except that future traffic congestion conditions and delays would continue to increase. Multi-way stop analyses were performed for projected 2006 DHV conditions. It found that the overall intersection delay would increase to over 4 minutes (266 seconds) per vehicle. At this level, it can be reasonably anticipated that traffic safety would also be impacted by motorists becoming impatient. This alternative is obviously the least costly option, but is not responsive at all to the purpose and need statement for this project. Figure 3 shows a sketch of the existing geometric conditions at the intersection.

Alternative B (SIGNALIZATION)

The basic intent of this alternative is to modify the traffic control at this intersection from multi-way stop to signalized. On the surface, it would appear that this intersection already has sufficient geometrics (e.g. numbers of lanes, queue storage, etc.) to permit signalization. However, the results of several initial capacity analyses indicated that if existing geometrics are retained, the intersection would have insufficient capacity to accommodate projected 2016 design hour volumes. For the purpose of those analyses, the results of which are shown in Table 5, the computer program *SIGNAL2000* was allowed to optimize the signal phasing sequence (two-phase with westbound advance green), left-turn treatment (permitted), and the individual approach green times.

Table 5 Signalized Capacity Analyses Results*
Existing Geometrics

	2006 DHV	2016 DHV
Route 104		
Southbound Approach	C (27)	F (97)
Northbound Approach	B (19)	C (27)
SASSH		
Westbound Approach	C (26)	F (490)
Eastbound Approach	C (34)	F (117)
OVERALL	C (27)	F (274)

* level of service and average delay in seconds per vehicle

With poor levels of service forecasted for a 15-year intersection design life, the next step was to identify the additional geometric improvements which would be needed to maintain desired levels of service (D or better for an overall intersection rating). Through several iterations, it was found that additional right-turn lanes would be required on both SASSH approaches (east & west) plus on the northbound Route 104 approach. It was also felt that high traffic speeds on both SASSH and Route 104 warranted protected left-turn phasing for safety reasons. Table 6 presents the results of capacity analyses with those improvements. Figure 4 shows a sketch of the proposed geometrics for a signalized intersection.

Table 6 Signalized Capacity Analyses Results*
Improved Geometrics

	2006 DHV	2016 DHV
Route 104		
Southbound Approach	D (43)	E (58)
Northbound Approach	D (37)	D (53)
SASSH		
Westbound Approach	C (33)	C (35)
Eastbound Approach	C (30)	E (61)
OVERALL	C (35)	D (47)

* level of service and average delay in seconds per vehicle

Figure 3

EXISTING CONDITIONS

VT RTE 104/I-89 EXIT 19/
ST ALBANS STATE HIGHWAY
INTERSECTION SCOPING STUDY

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ST. ALBANS, VERMONT

N

0 40 80 120 160 200
+/- 1" = 40' (APPROX)

BASE MAP AND ORTHOPHOTO PREPARED BY:
MAPMAKER PHOTOGRAMMETRIC SERVICES

Figure 4

SIGNALIZATION ALTERNATIVE

VT RTE 104/I-89 EXIT 19/ ST ALBANS STATE HIGHWAY INTERSECTION SCOPING STUDY

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600' CENTERLINE SHIFT

200' TAPER

185' ADDITIONAL STORAGE FOR DECELERATION

150' STORAGE

ST. ALBANS SOUTH STATE HIGHWAY

GUARDRAIL RELOCATION NECESSARY

VT ROUTE 104

ADVANCE DETECTION LOOPS NECESSARY TO CLEAR RAMPS DUE TO INADEQUATE TURN-LANE STORAGE LENGTHS

150' STORAGE (185' ADDITIONAL STORAGE NEEDED FOR DECELERATION)

200' TAPER

I-89 EXIT 19

SB OFF-RAMP

NB OFF-RAMP

SB ON-RAMP

NB ON-RAMP

CULVERT EXTENSION NECESSARY

125' STORAGE

137' ADDITIONAL STORAGE FOR DECELERATION

VT ROUTE 104

GRADING WILL BE AN ISSUE AT THE WAGON WHEEL ENTRANCES

200' TAPER

540' CENTERLINE SHIFT TO SOUTH

ST. ALBANS, VERMONT

N

0 40 80 120 160 200

+/- 1" = 40' (APPROX)

BASE MAP AND ORTHOPHOTO PREPARED BY:
MAPMAKER PHOTOGRAMMETRIC SERVICES

Even with the additional lanes, though, signalization of this intersection will create operational problems due to excessively long queue lengths, particularly on the westbound approach from Exit 19. Queue lengths on that approach are projected to extend over 600'. In comparison, the northbound and southbound off-ramps merge only 330' from the intersection. This means that not only will the queuing extend back onto the off-ramps, but it also sets up a difficult weave maneuver where the off-ramps merge .

While a detailed cost estimate was not developed for this alternative, it is believed that construction costs would be in the range of $800,000 - $1,000,000 due to the extensive roadway widening and pavement overlay which would be required to construct the new lanes.

Alternative C (ROUNDABOUT)

This alternative involves the construction of a 206 foot diameter, 2-lane roundabout at this intersection. The center of the roundabout would be a 110 foot diameter landscaped circular island. To the outside of that, the travel lane has been designed to be 45 feet wide to allow a WB-67 size truck to negotiate the roundabout side by side with a passenger vehicle with no encroachment. A 3' wide shoulder would be provided on the approach and departure lanes as well as on the outside of the travel lane in the roundabout to accommodate experienced bicyclists. Curbed entrance islands would slow and guide vehicles as they approach the roundabout. Additional right-of-way would be required at each of the four corners for grading. Figure 5 shows the proposed geometry for a roundabout at this intersection. Sidewalks and crosswalks could be provided surrounding the roundabout to accommodate pedestrians and less experienced bicyclists. This would require additional right-of-way.

The computer program *SIDRA (ver. 5.20)* was used to analyze the capacity and levels of service of a roundabout at this intersection. Table 7 presents the results of these analyses. While a one-lane roundabout was found to provide adequate capacity for 2006 DHV conditions, it was determined that a two-lane roundabout would be required to provide desired levels of service under 2016 DHV conditions. For the two-lane scenario, the outer approach lane on all four approaches was designated as an exclusive right-turn lane.

Figure 5

ROUNDABOUT ALTERNATIVE

VT RTE 104/I-89 EXIT 19/ ST ALBANS STATE HIGHWAY INTERSECTION SCOPING STUDY

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ST. ALBANS, VERMONT

N

0 40 80 120 160 200

+/- 1" = 40' (APPROX)

BASE MAP AND ORTHOPHOTO PREPARED BY:
MAPMAKER PHOTOGRAMMETRIC SERVICES

Table 7 Roundabout Capacity Analyses Results*

	2006 DHV	2016 DHV	
	1-lane		2-lane
Route 104			
Southbound Approach	D (26)	D (28)	D (28)
Northbound Approach	C (21)	F (55)	C (20)
SASSH			
Westbound Approach	C (19)	F (87)	C (16)
Eastbound Approach	C (25)	F (84)	C (24)
OVERALL	C (22)	F (73)	C (21)

* level of service and average delay in seconds per vehicle

Maximum queue lengths for projected 2016 DHV conditions and the two-lane roundabout are much more manageable. On the westbound approach from Exit 19, the 95% queue length equals 145'. On the southbound Route 104 approach, it equals 282', on the northbound Route 104 approach it equals, 66', and on the eastbound SASSH highway approach, it equals 241'. These are all within available storage capacities of the approaches, and will not necessitate extensive approach widening or reconstruction outside of the immediate intersection area.

While a detailed cost estimate was not developed for this alternative, it is believed that construction costs would be in the range of $400,000 - $600,000.

ALTERNATIVES PRESENTATION MEETINGS

These alternatives were presented to the Northwest Regional Planning Commission TAC on July 12, 2001. The minutes from this meeting are included in Appendix C. The TAC indicated that they would like to see pedestrian accommodations for northbound / southbound travel as well as low landscaping and improved lighting for the intersection. These items should be included during the design of the preferred alternative.

A draft report was presented to the Town officials at a meeting held on August 7, 2001. The minutes from this meeting are included in Appendix C. There were several questions about the general operation and design of a roundabout (e.g. drainage, plowing, curb cut restrictions, and police enforcement).

RECOMMENDATION

Based on the information presented in this study, the No-Build alternative (Alternative A) does not address the traffic congestion and multi-modal issues which presently exist and therefore does not meet the purpose and need statement. Signalization (Alternative B) is not a preferable alternative due to the less than desireable levels of service on the southbound Route 104 and eastbound SASSH approaches and the long queue lengths on the westbound approach which will cause conflicts at the Interstate ramps. This alternative also involves extensive approach work thereby making it the most expensive alternative.

Alternative C, a two-lane roundabout, is the recommended alternative. This alternative has the potential to provide the best levels of service with the shortest queue lengths. Bicycle and pedestrian accommodations could be easily incorporated into the final design for the roundabout if desired. It is also anticipated that this alternative would be less costly to construct than signalization for this intersection.

Bicycle accommodations should include a bike path outside the roundabout with ramps from the roadway approaches up to the path. The design should also incorporate low landscaping and improved lighting for the intersection. It is recommended that public informational meetings be held in the area to educate the public (motorists, truckers, bicyclists and pedestrians) on the use of roundabouts.