



Town of Stowe VT 108 MOUNTAIN ROAD VILLAGE ROADWAY MASTER PLAN

APRIL 2018



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Acknowledgements

This project is the result of hard work by the Town of Stowe, Lamoille County Planning Commission, Vermont Agency of Transportation, VHB, and local stakeholders. The project team has been dedicated to creating a Master Plan which envisions a vibrant, highly accessible, and multi-modal Mountain Road Village District. The VT 108 Roadway Master Plan is attributed to the members of the project team listed below.

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Project Background and Vision

Mountain Road (VT 108) is a north-south route which connects downtown Stowe Village with Stowe Mountain Resort and eventually continues to the northern border with Canada in Berkshire, VT. The focus of this project is a 2,000 foot stretch of Mountain Road known as the Mountain Road Village (MRV) District from the bridge over the Little River to a point approximately 700 feet west of Cottage Club Road. Through the study area, VT 108 is a state-maintained major collector carrying approximately 8,000 vehicles per day. This section lies at the foot of the mountain and boasts popular destinations such as the Alchemist Brewery, Stoweflake Resort and Spa, Sun & Ski Inn, Picasso, the Stowe Recreation Path, and various local restaurants, inns, and shops.

The hub of activity in the Town of Stowe has long been centered around their historic village on VT 100 but growth and a desire to recognize other centers of activity led the Town to examine ways to expand the iconic Stowe character to the north along Mountain Road. In 2017, The Town of Stowe designated the MRV District as a village growth center which should be developed in a dense, concentrated, and accessible manner. An enticing streetscape, paired with a mix of land uses, multi-modal transportation facilities and safely flowing traffic are essential to a successful village district. In order to help realize this vision, the Town of Stowe enlisted the help of the Lamoille County Planning Commission (LCPC), Vermont Agency of Transportation (VTrans), and a consultant, VHB to prepare a Roadway Master Plan for the MRV District.

This plan is the culmination of months of effort by the project team and local district stakeholders and includes recommendations for the future development of the Mountain Road Village. Included in this plan are maps of current and proposed conditions, an analysis of the project intersections, and a description of the preferred set of improvements along with a phasing plan and cost estimates.



Mountain Road at Cottage Club Road

SCOPE & SCHEDULE

June 2017
Project Kick-Off Meeting with Project Team and Stakeholders.



June - August
Compile information and create basemaps of existing conditions and opportunities and constraints.

September
The project team hosted a Local Concerns Meeting to gather public input.



October - November
Preparation of a Draft Master Plan.

December
The project team hosted an Alternatives Presentation to gather public input on the draft plan.



February 2018
Completion of Final Report



VT 108 Roadway Master Plan

Project Area



The project area is the Mountain Road Village (outlined in yellow) along Mountain Road (VT 108) and encompasses approximately 2,000 feet of roadway and three project intersections. The extents of the project area are defined by the Mountain Road Village zoning district. This district is a designated village growth center. The three key intersections evaluated as part of this study are Mountain Road at Luce Hill Road, Cape Cod Road, and Cottage Club Road.

Existing Conditions Photos



Asphalt Sidewalk in front of Stoweflake, Looking East



Mountain Road at Luce Hill Road, Looking West



Roadway View at Picasso, Looking East

VT 108
Mountain Road Village



Stowe Recreation Path, Looking East



Roadway View at Stoweflake and Red Barn Shops, Looking West

Existing Conditions Within the Study Area



- | | | | |
|---|--|---|--|
| <ul style="list-style-type: none"> 2 ft Contours (VHB) 10 ft contours MRV Project Area (Town of Stowe) Parcel Boundary (VCGI) | <ul style="list-style-type: none"> Stowe Recreation Path (VHB) VSWI Wetlands (ANR) VHD River Corridor (ANR) | <ul style="list-style-type: none"> Roads (VCGI) Interstate US Highway State Highway Town Road | <ul style="list-style-type: none"> FEMA Flood Zones (FEMA) Floodway 100-Year Flood Zone 500-Year Flood Zone |
|---|--|---|--|

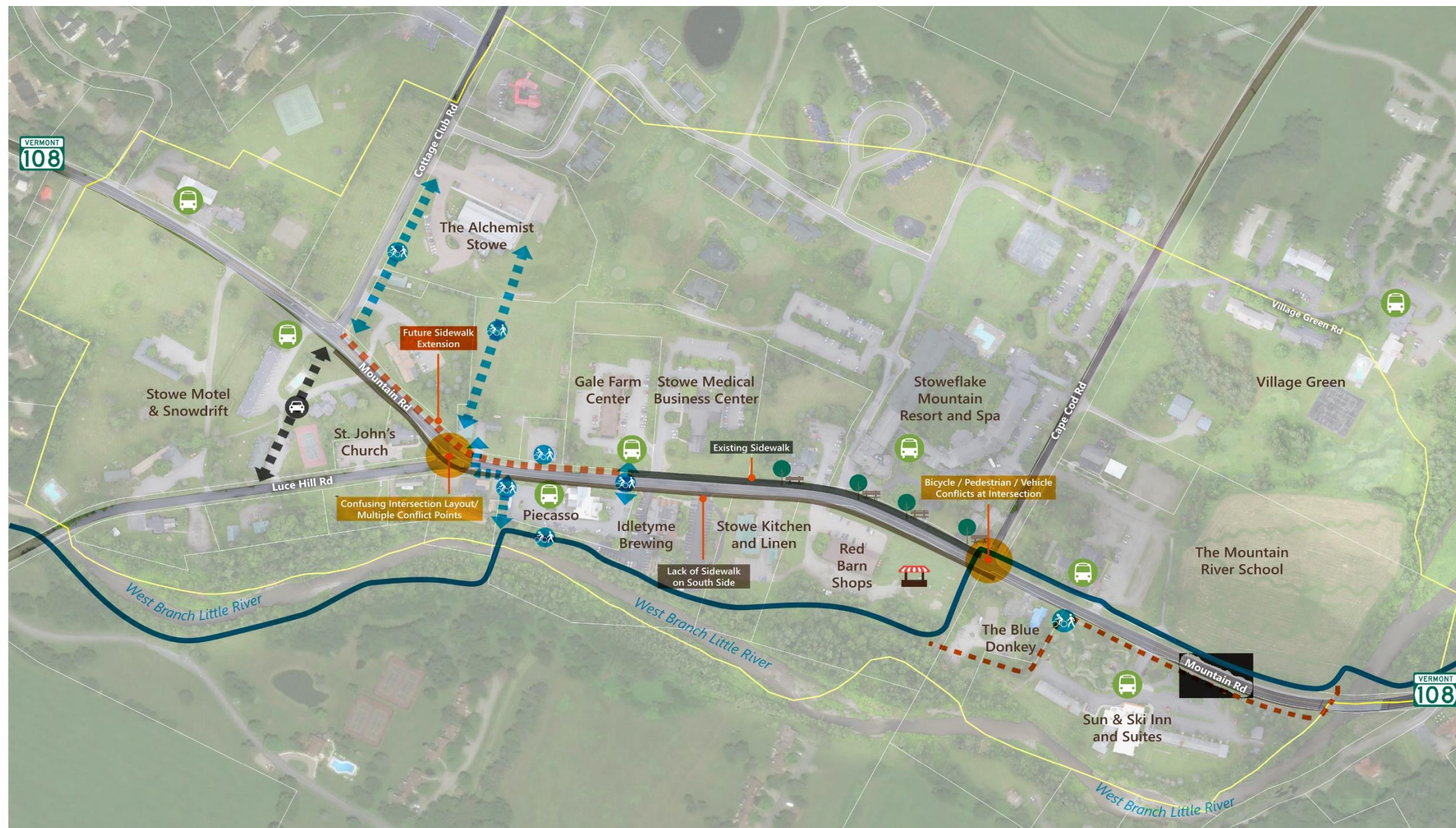
VT 108 Roadway Master Plan

Sources:
 ANR (Vermont Agency of Natural Resources, 2013-2015)
 FEMA (Federal Emergency Management Agency, 1974)
 Town of Stowe (2017)
 VCGI (Vermont Center for Geographic Information, 2017)
 VHD (Vermont Hydrography Dataset, 2013-2015)
 VHB (2017)

Stowe, VT Existing Condition Site Plan



Opportunities and Constraints Map



LEGEND

Existing Features

- Mountain Road Village District (MRV) Project Study Area
- GMT Bus Stop
- Pause Places/ Benches & Planters
- Farmers Market
- Stowe Recreation Path

Potential Features

- Possible Luce Hill Road Realignment
- Possible Bicycle/Pedestrian Connection
- Possible Stowe Recreation Path Alternate Route

Crash Data



Other Opportunities & Constraints

- Lack of connections between parking lots
- Poor access management (high driveway density)

The Opportunities and Constraints shown on this map were developed based on a review of previous studies, a site visit, and input from stakeholders. This map was then used as a basis for the development of the alternatives presented later in this report.

Development of the Roadway Master Plan

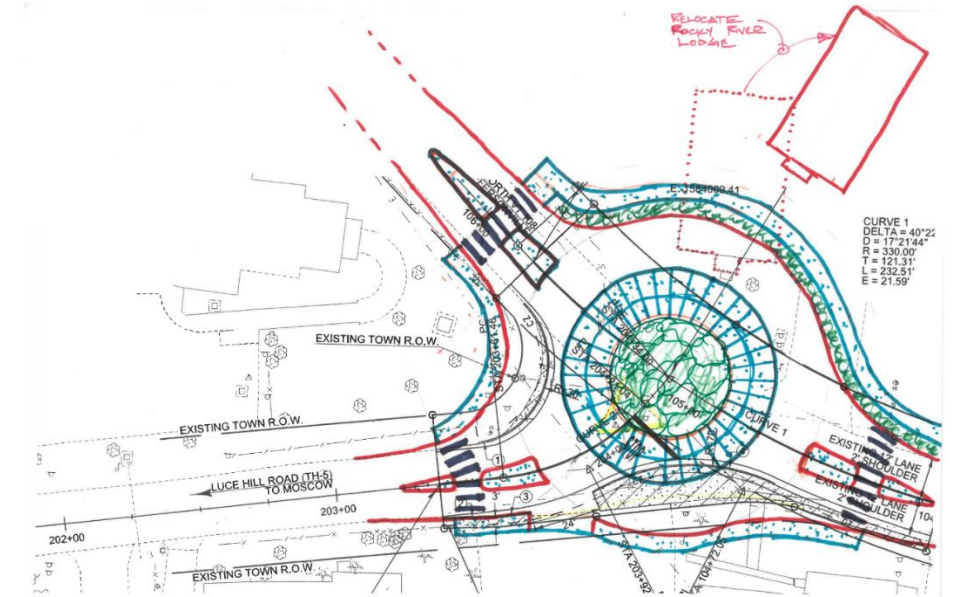
Using the vision set forth in the early stages of the project as a framework for design, the project team developed various design elements to be evaluated and adopted into the plan as the Town, local stakeholders, and the public saw fit.

Various alternatives were considered for inclusion in the plan including, but not limited to, a roundabout at Luce Hill Road or Cottage Club Road, the construction of a center turn-lane along the roadway, and multiple pedestrian connections throughout the project area.

Public Engagement

A robust public engagement process was seen as crucial to the success of the project. This idea was carried throughout the duration of the project and served as the impetus for inclusion of local business and property owners on the project Steering Committee as well as the public presentations at major milestones.

Two public meetings were held as part of this project. The first was a **Local Concerns Meeting** which was conducted at the onset of this project. This meeting allowed the project team to gauge public sentiment about potential issues and opportunities in the corridor and potential improvements they would like to see in this area. The second meeting was an **Alternatives Presentation Meeting** which focused on the draft improvement plan and provided a space for the public to provide feedback on the improvements before they were refined and finalized. Both of these meetings were held during Stowe Selectboard Meetings so that the Selectboard could remain informed, comment on the project, and ultimately endorse the preferred package of improvements.



Sketch Courtesy of Harry Shepard, Town of Stowe. June 2017



Screenshot of Traffic Simulation of VT 108 and Luce Hill Road



Preliminary CAD Layout of Proposed Improvements at VT 108 and Cape Cod Road

A	E	F	G	H	I	K	M	N	O	P	Q	R	S	T
1	Crash Type	Collision Direction	Weather	Road Group ID	Time of Day	Impairment	Involving	Road Characteristics	Road Condition	Surface Condition				
2	Property Damage Only	Head On	Cloudy	1.46	Night	Alcohol	None	Not at a Junction	None	Dry				
3	Property Damage Only	Rear End	Cloudy	1.46	Day	None	None	Not at a Junction	Road Surface Condition (wet, icy, snow, slush, etc)	Snow				
4	Property Damage Only	Single Vehicle Crash	Rain	1.6	Day	None	None	Not at a Junction	None	Wet				
5	Property Damage Only		Unknown	1.6	Day	None	None							
6	Property Damage Only	Rear End	Freezing Precipitation	1.66	Day	None	None	Not at a Junction		Snow				
7	Property Damage Only			1.67	Day	None	None	Other - Explain in Narrative	None	Dry				
8	Property Damage Only	Rear End	Cloudy	1.71	Day	None	None	T-Intersection	None	Dry				
9	Property Damage Only	Rear End	Cloudy	1.72	Day	Alcohol	None	T-Intersection	None	Dry				
10	Property Damage Only			1.72	Day	None	None							
11	Property Damage Only	Rear End	Cloudy	1.77	Day	None	None	Unknown	None	Dry				
12	Property Damage Only			1.8	Day	None	None							
13	Property Damage Only			1.84	Day	None	None							

Crash Data along VT 108 in the Project Study Area

Proposed Improvement Plan - Overview



The proposed improvements being recommended as part of this Roadway Master Plan include multi-modal enhancements such as traffic safety improvements at the intersection of Luce Hill Road and Mountain Road, new sidewalks and a mid-block crossing, and improved streetscaping. These improvements are the product of close coordination with Town staff, local stakeholders, and the public to identify which improvements are most needed and which would be best utilized by the community.

As part of this master plan, the possibility of the Town of Stowe reclassifying this segment of VT 108 as a Class 1 Town Highway was discussed. Using the VTrans Cost Analysis Tool for State Highway Reclassification, it was calculated that there would be a net cost for the Town. This option would require additional maintenance by the Town but would allow for greater flexibility with the design of the roadway and streetscape in the future. A more detailed description of revenue and costs associated with this option are provided later in this report.

This map shows an overview of improvements in the study area and the following pages provide a more detailed depiction of the improvements within each of the three identified segments. These improvements were approved unanimously by the Stowe Selectboard on December 12, 2017.

Proposed Improvements: Segment 1



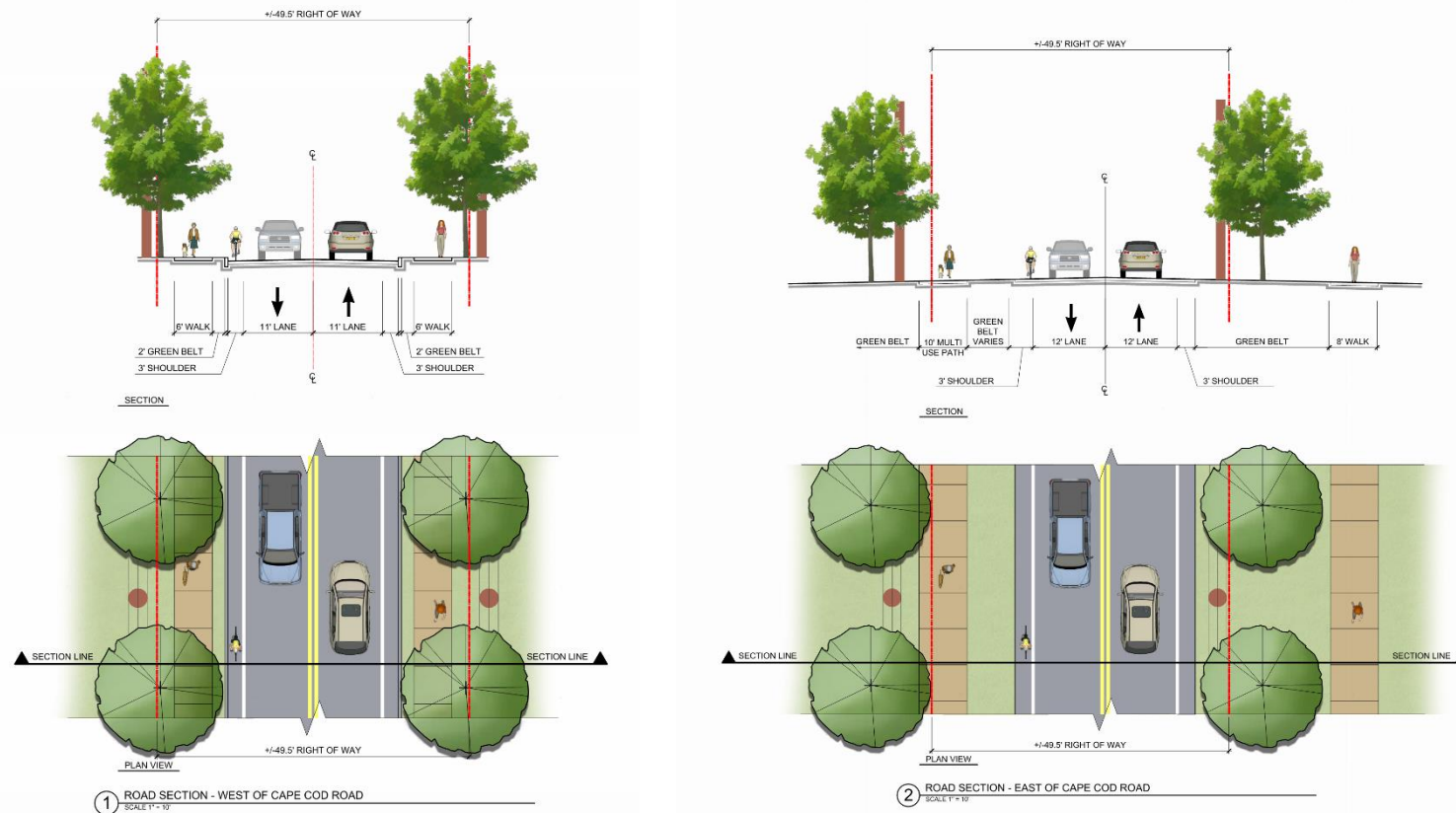
Proposed Improvements: Segment 2



Proposed Improvements: Segment 3



Proposed Roadway Cross Sections



The preferred cross-section varies slightly to the east and west of Cape Cod Road while staying mostly within the existing three-rod (49.5-foot) Right-of-Way (ROW). To the west of Cape Cod Road, Mountain Road is proposed to have two 11-foot travel lanes, three-foot paved shoulders, two-foot green belts, and six-foot sidewalks. To the east of Cottage Club Road, the existing alignment is proposed to stay in place with the addition of a ten-foot multi-use path on the south side. This new path is expected to extend outside of the current ROW and the construction would require easements or property acquisitions from the adjacent property owners.

Before: Existing Street View Looking East at Picasso



After: Perspective Sketch of Proposed Improvements

Intersection Traffic Analysis Results

The three project intersections were analyzed to quantify the current and future traffic conditions. The Level of Service (LOS) for each intersection is shown in the tables below. It is difficult to accurately represent the traffic on VT 108 due to its high variations in volumes depending on the time of year (e.g. leaf peepers, skiers, summer sports, school traffic, etc.). VHB worked closely with VTrans to develop a Design Hour Volume (DHV) which was agreed upon by all stakeholders to represent average traffic through the study area. This DHV represented volumes which, when modelled, seemed to depict relatively accurately the existing traffic issues in the area, particularly related to queuing at the intersection of Mountain Road and Luce Hill Road. Detailed reports of the traffic analysis can be found in the Appendix. Signal warrants were conducted at the intersection with Luce Hill Road and Cape Cod Road. The Four and Eight Hour Signal Warrants were met at the Luce Hill Road intersection. Copies of the warrants can be found in the Appendix.

AM Peak Hour	EXISTING			NO BUILD			SIGNALIZED (CONCURRENT PED)		
	2017			2037			2037		
	v/c*	Delay*	Delay*	v/c	Delay	LOS	v/c	Delay	LOS
Cape Cod Rd at Mountain Rd (VT 108)									
WB Left from Cape Cod Rd	0.49	17.8	C	0.69	27.6	D			
NB from Mountain Rd	0.31	0	-	0.37	0.0	-			
SB from Mountain Rd	0.08	2.2	A	0.10	2.6	A			
Cottage Club Rd at Mountain Rd (VT 108)									
WB from Cottage Club Rd	0.25	17.9	C	0.39	24.8	C			
NB from Mountain Rd	0.27	0.0	-	0.33	0.0	-			
SB Through from Mountain Rd	0.22	0.0	-	0.26	0.0	-			
SB Left from Mountain Rd	0.02	8.3	A	0.03	8.7	A			
Luce Hill Rd at Mountain Rd (VT 108)									
EB Left from Luce Hill Rd	0.17	16.0	C	0.23	18.2	C	0.43	11.8	B
EB Thru/Right from Luce Hill Rd	0.22	10.2	B	0.28	10.9	B			
NB Left from Mountain Rd	0.18	4.7	A	0.22	5.2	A	0.59	8.5	A
NB Through from Mountain Rd	0.16	0.0	-	0.20	0.0	-	0.37	6.0	A
SB Right from Mountain Rd	0.13	10.2	B	0.16	10.9	B	0.32	5.8	A
SB Through from Mountain Rd	0.10	0.0	-	0.19	0.0	-			
OVERALL				0.54	8.1	A			

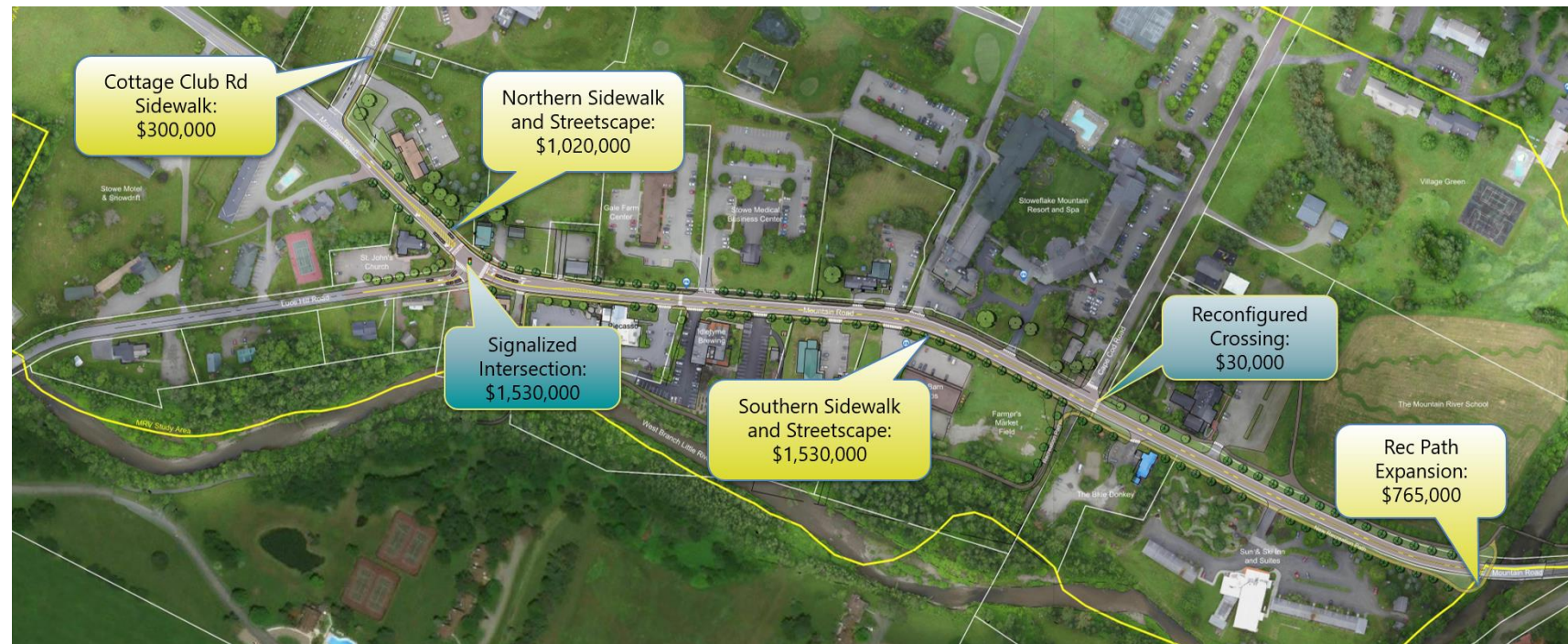
PM Peak Hour	EXISTING			NO BUILD			SIGNALIZED (CONCURRENT PED)		
	2017			2037			2037		
	v/c*	Delay*	Delay*	v/c	Delay	LOS	v/c	Delay	LOS
Cape Cod Rd at Mountain Rd (VT 108)									
WB Left from Cape Cod Rd	0.26	15.8	C	0.31	18.6	C			
NB from Mountain Rd	0.29	0	-	0.3	0	-			
SB from Mountain Rd	0.17	4.0	A	0.21	4.7	A			
Cottage Club Rd at Mountain Rd (VT 108)									
WB from Cottage Club Rd	0.38	24.6	C	0.51	33.3	D			
NB from Mountain Rd	0.27	0	-	0.30	0.0	-			
SB Through from Mountain Rd	0.34	0	-	0.39	0.0	-			
SB Left from Mountain Rd	0.02	8.3	A	0.02	8.5	A			
Luce Hill Rd at Mountain Rd (VT 108)									
EB Left from Luce Hill Rd	0.29	24.9	C	0.47	30.6	D	0.67	23.7	C
EB Thru/Right from Luce Hill Rd	0.29	12.7	B	0.34	13.9	B			
NB Left from Mountain Rd	0.17	4.6	A	0.20	5.0	A	0.66	16.9	B
NB Through from Mountain Rd	0.18	0.0	-	0.20	0.0	-	0.3	5.9	A
SB Right from Mountain Rd	0.25	10.7	B	0.29	11.2	B	0.61	9.3	A
SB Through from Mountain Rd	0.36	0.0	-	0.40	0.0	-			
OVERALL				0.66	12.8	B			

* Volume to capacity ratio
 * Delay expressed in seconds per vehicle
 ** Level of Service

What is Level of Service?

LOS is a standard measure of operational effectiveness for transportation facilities. LOS is defined by the Highway Capacity Manual, published by the Transportation Research Board. LOS is graded from LOS A (free flow conditions) to LOS F (congested conditions). For signalized intersections, it is based on the estimated average vehicle delay for all traffic at the intersection. LOS A represents little to no delay, or uncongested conditions, whereas LOS F indicates very congested conditions with long delays. In urbanized areas, overall LOS D or better is generally considered acceptable during the peak hours. LOS E conditions indicate an intersection that is operating at or near peak capacity, while intersections operation at LOS F cannot effectively serve peak demand.

Proposed Improvements Estimated Costs



The graphic above displays the proposed improvements with improvements shown in blue occurring at one of the project intersections and improvements in yellow are to occur outside of the curbline. For each design element, a cost has been estimated using recent VTrans bid tabulations, VTrans Bicycle and Pedestrian Program’s Report on Shared Use Path and Sidewalk Costs, as well as research of previous similar VHB projects. The costs presented below include material costs, engineering and design, mobilization, traffic control and a 25% contingency and it is assumed that each element will be constructed separately. Costs for Right-of-Way acquisition are estimated as 2% of the total cost for construction of the Recreation Path Expansion, Luce Hill intersection, and Mountain Road sidewalks. Using the VTrans Cost Analysis tool for State Highway Reclassification, it was calculated that the Town would generate \$8,070 in revenue for taking over the roadway as a Class 1 Town Highway. The associated yearly maintenance costs are estimated to be \$14,327 which yields a net cost of \$6,257 to the Town. The table below includes all material costs, an estimate for design, traffic control, mobilization, and contingency as well as a brief description of the anticipated time frame and required partners for implementation. Detailed calculations can be found in the Appendix.

Improvement	Description	Cost Estimate	Implementing Partners	Timeline
1. Cottage Club Road Sidewalk	Construct 5’ sidewalk on the east side of Cottage Club Rd from VT 108 to Mountainside Ave	\$300,000	Town of Stowe, Adjacent Property Owners	Long Term
2. Northern Sidewalk and Streetscape	Construct 5’ sidewalk and landscaped tree belt along the north side of VT 108 to Cottage Club Rd	\$1,020,000	Town of Stowe, VTrans, Adjacent Property Owners	Mid-Term
3. Signalized Intersection	Realign Luce Hill Rd and construct signalized intersection at the intersection with VT 108	\$1,530,000	Town of Stowe, VTrans, Adjacent Property Owners	Long-Term
4. Southern Sidewalk and Streetscape	Construct 5’ sidewalk and landscaped tree belt along the south side of VT 108 from Cape Cod Rd to Luce Hill Rd	\$1,530,000	Town of Stowe, VTrans, Adjacent Property Owners	Long-Term
5. Reconfigured Crossing	Replace existing crosswalk on VT 108 at Cape Cod Rd with new crossing on eastern side of the intersection and 20’ section of Stowe Rec Path	\$30,000	Town of Stowe, VTrans, Adjacent Property Owners	Short-Term
6. Rec Path Expansion	Construct expansion of Stowe Rec Path under West Branch Little River Bridge to connect with existing Rec Path alignment	\$765,000	Town of Stowe, VTrans, Adjacent Property Owners	Long-Term

