Road Safety Audit Review

VT 15 and East Hill Rd, Wolcott

September 23, 2020

Vermont Agency of Transportation
Operations & Safety Bureau

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Operations & Safety Bureau

Road Safety Audit Review

RSAR Process

A road safety audit review (RSAR) is a formal examination of an existing road in which an independent, multi-disciplinary team (the audit team) reports on potential safety issues. According to the Federal Highway Administration (FHWA), the purpose of a RSAR is to determine which elements of the road may present a safety concern, to what extent and under what circumstances, as well as to identify opportunities to mitigate the identified safety concerns.

The RSAR process starts with a commencement meeting during which the audit team reviews data and gathers community concerns. A site inspection is then performed by the audit team. The site visit involves the identification of safety deficiencies as seen in the field by driving and walking the location. Following the site inspection, the audit team holds a post inspection meeting. It is during this meeting that the team members discuss their observations and identify safety issues. The team is to reach a consensus on the importance of each safety issue mentioned. Only those issues for which a consensus is reached are included in the RSAR findings which are presented in this report.

This report identifies safety concerns and proposes guidance. These issues and solutions are presented in a tabular format associated to a responsible entity for ease of reporting. The responsible entities are any groups who own a roadway feature or who are responsible for making an improvement or for initiating further studies. These could include for example, the Agency of Transportation (VTrans), the local town, the local police or the area Regional Planning Commission (RPC).

Location

The location of this RSAR is the intersection of VT 15 and East Hill Rd in Wolcott. This intersection is located at mile point 4.688 on VT 15. There is a private drive on the south side of VT 15 within the intersection that is located at mile point 4.679.

VT 15 is a minor arterial while East Hill Rd is a class III road.

Purpose of the RSAR

This RSAR was conducted at the request of the Town of Wolcott. The main safety concerns reported by the Town are high travel speeds and limited line of sight.

RSAR Participants

Mario Dupigny-Giroux from the Operations & Safety Bureau Data Unit, VTrans, was the RSAR coordinator.

The other participants were:

Rob Moore	Lamoille County Planning Commission (LCPC)
Nicholas Bredice	Highway & Safety VTrans
Michael Chrastina	Dist 8 VTrans
Jacqui DeMent	Policy and Planning VTrans
Bill Jenkins	Operations & Safety VTrans
Steffanie Lemieux	Operations & Safety VTrans
Erin Parizo	Highway & Safety VTrans
Dillan Cafferkey	Town of Wolcott (Road Foreman)
Lucian Gravel	Town of Wolcott (Road Commissioner)
Linda Martin	Town of Wolcott (Selectboard)

Information Reviewed

Geometry

VT 15 has 11-foot travel lanes and 4-foot shoulders. The intersection is located within a downhill, 10-degree horizontal curve on VT 15. Corner sight distances at this intersection are limited in both directions but is worst when looking east.

Paved Surface

The paved surface condition on VT 15 at the East Hill Rd intersection is rated as fair with the year of last work being 2014 (VTransparency).

East Hill Rd is paved for about one mile to the north from VT 15 and then turns into a gravel road.

Speed Limit

The speed limit on VT 15 within the RSAR area is 35 mph. The transition from 40 mph to 35 mph takes place, from the east, at mile point 4.800. From the west, the 35 mph speed limit zone begins at mile point 3.730. The first additional speed limit sign west of the intersection in the eastbound direction (going towards the intersection) is at mile point 4.430.

LCPC collected speed data with pneumatic tubes between July 27 and August 4, 2020. The study site was located 450 ft east of the East Hill Rd intersection. The results showed that the mean speed was 43.8 mph and that the 85th percentile speed of the traffic was 49.4 mph (meaning that 85% of the traffic travels at a speed of 49.4 mph or less). In addition, the range of speeds that encompasses the highest proportion of vehicles, called the 10-mph pace, was found to be between 36 and 45 mph.

Enforcement

The Town has a contract with the Sheriff for twenty hours of enforcement per week within the town.

Traffic Calming Devices

There are no known forms of traffic calming devices being used such as a speed cart.

Traffic Volumes

The 2018 Average Annual Daily Traffic (AADT) on VT 15 was 5100 vehicles per day. There is no formal data available for East Hill Rd. Traffic is said to be low.

The vehicle classification derived from the speed study done by LCPC shows that passenger vehicles represent the majority of the traffic on VT 15 with 86.6% and that single-unit trucks account for 10.5 % while tractor trailers and other heavy vehicles represent 2.7%.

Local representatives mentioned during the audit that snowplows and school buses were the most common large vehicles on East Hill Rd. They also mentioned that most local cars and trucks use alternate routes due to the limited corner sight distance and safety concerns.

The local representatives also mentioned that the private road on the south side of VT15 was sometimes used by anglers to access the river (although the owner tries to prevent people from using this road).

Traffic Control Devices

The curve is delineated with chevrons in both directions. A combination horizontal alignment/intersection sign (modified W1-10 with the intersecting road on the inside) is located in each direction in advance of the curve and of the intersection (at mile point 4.565 EB and at mile point 4.745 WB). The signs are 30” x 30” in size and of type IV sheeting. The chevrons have type IX sheeting according to the signs inventory.

Crash History

Crashes were reviewed for the period ranging from 2015 to 2019. During this period, a total of two crashes were reported in the VTrans database.

None of the two crashes were associated with a vehicle entering VT 15 from East Hill Rd or the intersection in general. One of the crashes happened just east of the intersection while there was a work zone. This crash resulted in a rear-end crash. The second crash was a single vehicle crash that took place when the road conditions were slippery due to black ice. The crash occurred while traveling westbound around the curve.

A summary table of the crash data is presented in Appendix A along with a collision diagram.

Local Safety Concerns

Local representatives indicated during the road safety audit that the poor line of sight for entering vehicles from East Hill Rd onto VT15 in both directions, but especially in the eastbound direction because of the horizontal and vertical curves, was the main concern,

They further explained that speeding on VT 15 made turning onto VT15 even more hazardous.

It was also mentioned that the intersection was dangerous to plow, because westbound vehicles did not see the plow until they were on top of it.

Finally, it was also mentioned that the Town had received complaints from residents that the intersection was difficult to see at night or during poor weather and that many of the reflectors on the guardrail had fallen off.

Past Projects

There are no known past projects.

Future Projects

The Town mentioned that it was planning to repave East Hill Rd.

Identified Safety Concerns

The RSAR herein has sought to identify potential safety hazards and physical features which may affect road user safety. However, it is possible that not every deficiency has been identified. It should further be recognized that the implementation of the guidance in this report might contribute to improve the level of safety of the facility reviewed but not necessarily remove all the risks.

The areas of safety concern identified by the audit team along with the potential safety enhancements suggested by the team are summarized in the table below. These concerns and remedial actions are further discussed in the section following the table.

In the table, the entities listed under the column called “Potential Responsibility” are suggested groups that could possibly implement some of the countermeasures. These groups (or any other entities not listed) are not obligated to implement the suggestions mentioned in this report. They are expected to evaluate the feasibility of the suggestions and determine how the suggestions fit within their current processes and priorities.

For each suggested countermeasure, its safety effectiveness is mentioned in the table if an industry measure is available or a brief description of its purpose is provided.

In formulating suggested remedial actions, time frames and costs were qualified as follows: Short term, < 1 year; mid-term 1-3 years; long term > 3 years; low cost, < $15,000; medium cost, $15,001 - $75,000; high cost, > $ 75,001.
The following safety concerns were identified by the audit team (the concerns are not necessarily listed in order of importance):

1. The corner sight distance is limited, especially when looking to the east.

2. Traveling speeds are high.

3. The intersection is difficult to see at night.

Potential Safety Enhancements Summary Table

	Safety Concerns						Potential Responsibility	Purpose/ Safety Payoff[1]	Time Frame	Cost
Safety Enhancement	1 Poor corner sight	2 High speed	3 Night visibili-ty	4	5	6				
Consider upsizing the two modified W1-10 curve signs from 30" x 30" to 36" x 36"	X						VTrans (Traffic Ops)	Bring to Standard, Make sign more visible	Short	Low
Consider adding an East Hill Rd street name plaque below the curve signs	X	X					VTrans (Traffic Ops)	Inform drivers of upcoming road, help slow traffic	Short	Low
Consider using type IX sheeting	X		X				VTrans (Traffic Ops)	Make signs more visible	Short	Low

[1] The CMF Clearinghouse explains that the star quality rating indicates the quality or confidence in the results of the study producing the CMF. The star rating is based on a scale (1 to 5), where a 5 indicates the highest or most reliable rating. The review process considers five categories for each study: study design, sample size, standard error, potential bias, and data source.

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Potential Safety Enhancements Summary Table

	Safety Concerns						Potential Responsibility	Purpose/ Safety Payoff[1]	Time Frame	Cost
Safety Enhancement	1 Poor corner sight	2 High speed	3 Night visibili-ty	4	5	6				
Consider removing the trees on the north side of VT 15 by the cemetery	X						VTrans (District 8) or Town depending on the ROW limits	See traffic better & enter road safely, 5% crash reduction[2]	Short	Low to Medium
Consider raising the grade on the East Hill Rd approach	X						Town	See traffic better & enter road safely	Mid to Long	Medium
Consider the periodic use of a speed cart		X					Town via Sheriff or District 8	45-73% reduction # of vehicles traveling 5 and 10 mph over the speed limit[3]	Short	Low

[2] Improve sight distance in 1 quadrant, page 8, https://cdn.ymaws.com/www.azace.org/resource/resmgr/imported/CrashReductionIntersectionIssueBrief.pdf
[3] https://safety.fhwa.dot.gov/speedmgt/ref_mats/rural_transition_speed_zones.cfm

Potential Safety Enhancements Summary Table

	Safety Concerns						Potential Responsibility	Purpose/ Safety Payoff[1]	Time Frame	Cost
Safety Enhancement	1 Poor corner sight	2 High speed	3 Night visibili-ty	4	5	6				
Consider the enforcement of the high-risk drivers (>=54 mph)		X					Town via contracts	Serve as deterrent	Short	Medium
Consider managing speeds using a portable speed radar feedback sign		X					Town	45-73% reduction # of vehicles traveling 5 and 10 mph over the speed limit, 5% crash reduction[4]	Short	Medium
Consider inspecting the guardrail sections & replacing the reflectors as needed			X				VTrans (District 8) with help from LCPC for inspection	Improve night visibility of intersec-tion	Short	Low

[4] http://www.cmfclearinghouse.org/detail.cfm?facid=6885

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	Safety Concerns						Potential Responsibility	Purpose/ Safety Payoff[1]	Time Frame	Cost
Safety Enhancement	1 Poor corner sight	2 High speed	3 Night visibili-ty	4	5	6				
Consider installing delineators along the guardrail			X				VTrans (Traffic Ops)	Improve night visibility of intersec-tion	Short	Low
Consider refreshing the white edgeline markings around the radii on East Hill Rd approach			X				Town	Improve night visibility of intersec-tion	Short	Low
Consider installing a 48” x 12” East Hill Rd street name sign			X				Town	Improve night visibility of intersec-tion	Short	Low

Discussion of Safety Concerns

This section lists and discusses the areas of safety concern identified by the audit team during the site inspection and from the analysis of available data. This section also reports the potential safety enhancements suggested by the audit team. The concerns are not listed in order of importance.

Concern: The corner sight distance is limited, especially when looking to the east

Discussion:

The corner sight distance to the left (looking east) is poor due to the crest and the horizontal curve. The available corner sight distance is estimated at about 250 – 330 ft.

The East Hill Rd approach is uphill towards VT 15. This makes a vehicle that is on East Hill Rd lower and hinders the ability of a motorist to see to the left.

The corner sight distance to the right (looking west) is reduced due to the trees. The available corner sight distance is estimated at about 370 - 410 ft.

Safety Enhancements:

Short Term

- Consider upsizing the two modified W1-10 curve signs from 30” x 30” to 36” x 36”

Making this change will bring the signs to standard. The MUTCD indicates that the minimum size for the combination horizontal alignment/intersection sign series on a conventional road is 36” x 36”.

- Consider adding an East Hill Rd street name plaque (W16-8P) below each curve sign

The street name plaque will help drivers recognize the approaching intersection. Familiar drivers who know about the corner sight distance deficiencies at this intersection might reduce their speed as they approach the intersection.

Because the intersection symbol is used in combination with the curve sign, providing an advisory speed to match the available corner sight distance as suggested by the American Association of State Highway and Transportation Officials (AASHTO) could be misleading and may not be effective.

- Consider using type IX sheeting

  According to the signs inventory, the existing sheeting is type IV. The chevrons within the curve have type IX sheeting.

- Consider removing the trees on the north side of VT 15 by the cemetery.

Mid Term to Long

- Consider raising the grade on the East Hill Rd approach to help improve the line of sight to the left

  During the road safety audit, the Town expressed willingness to make this improvement the next time East Hill Rd is paved. The Town did inquire during the audit if VTrans would be able to provide technical assistance. The District is a very good technical resource should the Town have questions. The Town will have to get any required permits and submit their engineers plan with a T19 S1111 permit application to work in the state right-of-way.

Concern: Traveling speeds are high

Discussion:

The speed limit in this section of VT 15 is 35 mph.

The speed data collected by LCPC about 450 ft east of East Hill Rd showed that the 85th percentile speed was 49.4 mph.

The corner sight distance to the east while on the East Hill Rd approach is estimated at around 250 – 330 ft.

The AASHTO Green Book suggests a corner sight distance of 555 ft when mainline traffic travels at 50 mph.

Safety Enhancements:

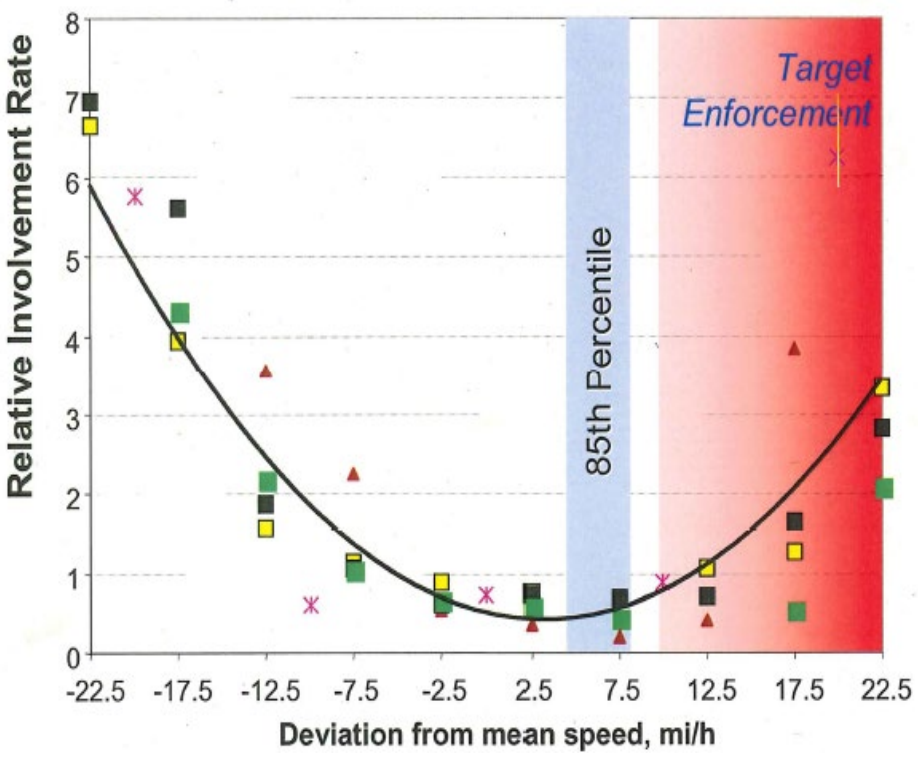
Enforcement related

Short Term

- Consider conducting recurring speed limit enforcement campaigns for the high-risk drivers (as per the discussion below, target drivers at or above 54 mph).

In doing this, consider the following concept suggested by the National Highway Traffic Safety Administration (NHTSA). As shown in the next graph, the crash involvement rate increases as traveling speeds deviate from the 85th percentile speed. This means that targeting motorists that are traveling above the 85th percentile speed will apprehend motorists that are more likely to cause a crash. Crash involvement starts to increase more drastically 5 mph above the 85th percentile speed or around the 90th percentile speed.

Targeted Enforcement Concept



Applying this concept to this section of VT 15 means that the focus should be put on vehicles that are traveling at or above 54 mph (5 mph above the 85th percentile).

Traffic Calming Related

Short Term

- Contact (Town) the Sheriff or the District and have them place a speed cart periodically.
- Consider (Town) installing a portable speed radar feedback sign that could be moved to two or three locations (the Town will have to make the request to VTrans and would be responsible for acquiring and maintaining the equipment).

  This could be done in conjunction with addressing speeding issues at the North Wolcott Rd intersection. The same speed radar feedback sign could be moved within the corridor to manage speeds at both intersections.

Concern: The intersection is difficult to see at night and during bad weather events.

Discussion:

It was reported that the Town received complaints from residents that the intersection was difficult to see at night or when the weather was poor.

Residents use the guardrail as a guide to turn into East Hill Rd at night. Because many of the reflectors on the guardrail have fallen off, making turns into East Hill Rd when it is dark or when it is hard to see the intersection has been reported to be more difficult.

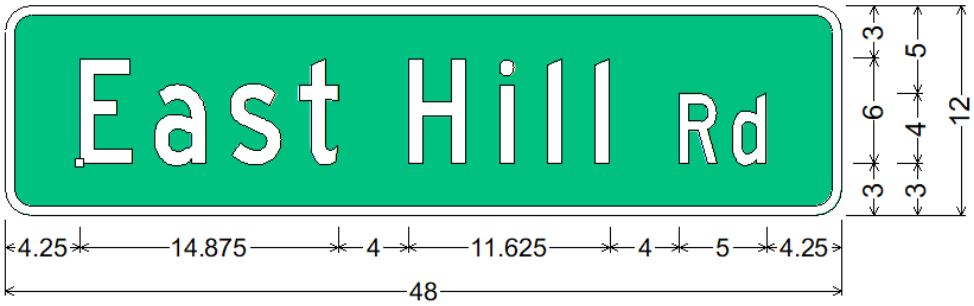
District 8 received a similar complaint concerning missing reflectors in fall 2019. District 8 inspected the guardrail sections in October 2019 and found a few triangular reflectors missing which they replace along with two green and one blue post reflectors.

Safety Enhancements:

Short Term

- Consider inspecting the guardrail sections (District & LCPC) and replacing (District) the reflectors inside the guardrail as needed.
- Consider (VTrans Traffic Ops) installing delineators along the guardrail to supplement the guardrail reflectors.
- Consider (Town) refreshing the white edgeline markings around the two radii on the East Hill Rd approach.
- Consider (Town) installing an updated East Hill Rd street name sign (D3-1) per MUTCD standards.

The new sign would be bigger (48” x 12” as shown on the detail below) and more visible. The sign should be installed on two posts.



1.500" Radius, 0.500" Border, White on, Green;
"East Hill Rd", C;

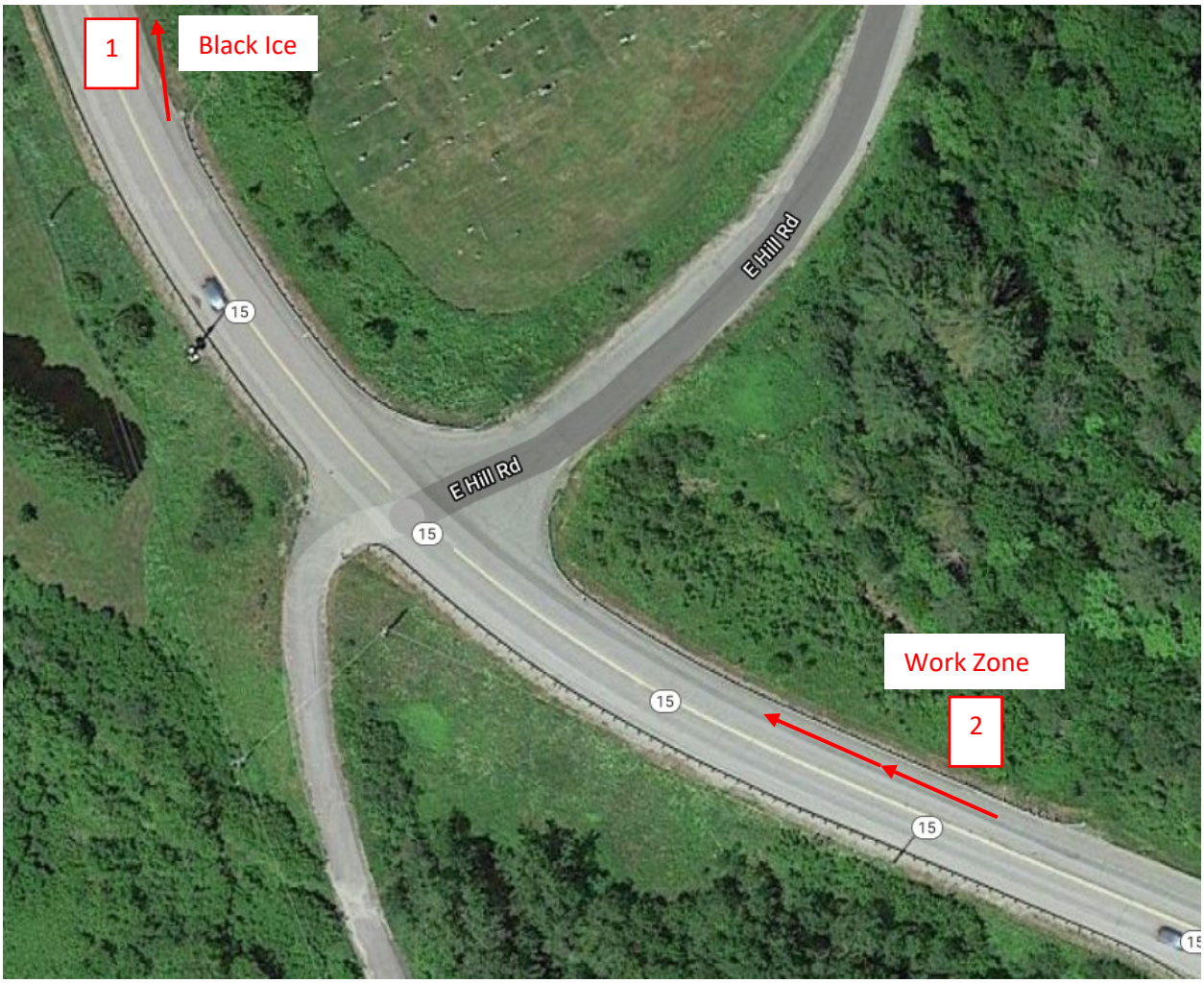
Appendix A

Crash Data

(2015 – 2019)

Crash Data 2015-2019

Crash #	Incident #	Date	Time	Weather	Contributing Circumstances	Collision Type	# Injuries	# Fatalities	Narrative
1	16LC005207	11/23/16	3:00	Sleet- Hail (Freezing Rain or Drizzle)	Driving too fast for conditions	Single Vehicle Crash	1	0	Investigation reveals that op 1 was traveling west on VT 15 when he lost control of his vehicle and could not navigate the turn. At the time of the crash the roads were slick and covered with black ice. The vehicle was down the embankment off of the west bound travel lane just west of the intersection of East Hill Rd.
2	19LC003748	08/05/19	16:12	Clear	Followed too closely-Inattention- No improper driving	Rear End	1	0	Operator #1 was WB and came over the hill and was slowing for the traffic in the construction zone. He came to a stop in the line of traffic and then the vehicles in front of him started to move. He started to move and looked down for a second and when he looked up the vehicle in front of him has stopped and he swerved to miss it and just hit the back drivers side bumper of the vehicle.


1
Black Ice
E Hill Rd
E Hill Rd
15
15
15
15
Work Zone
2