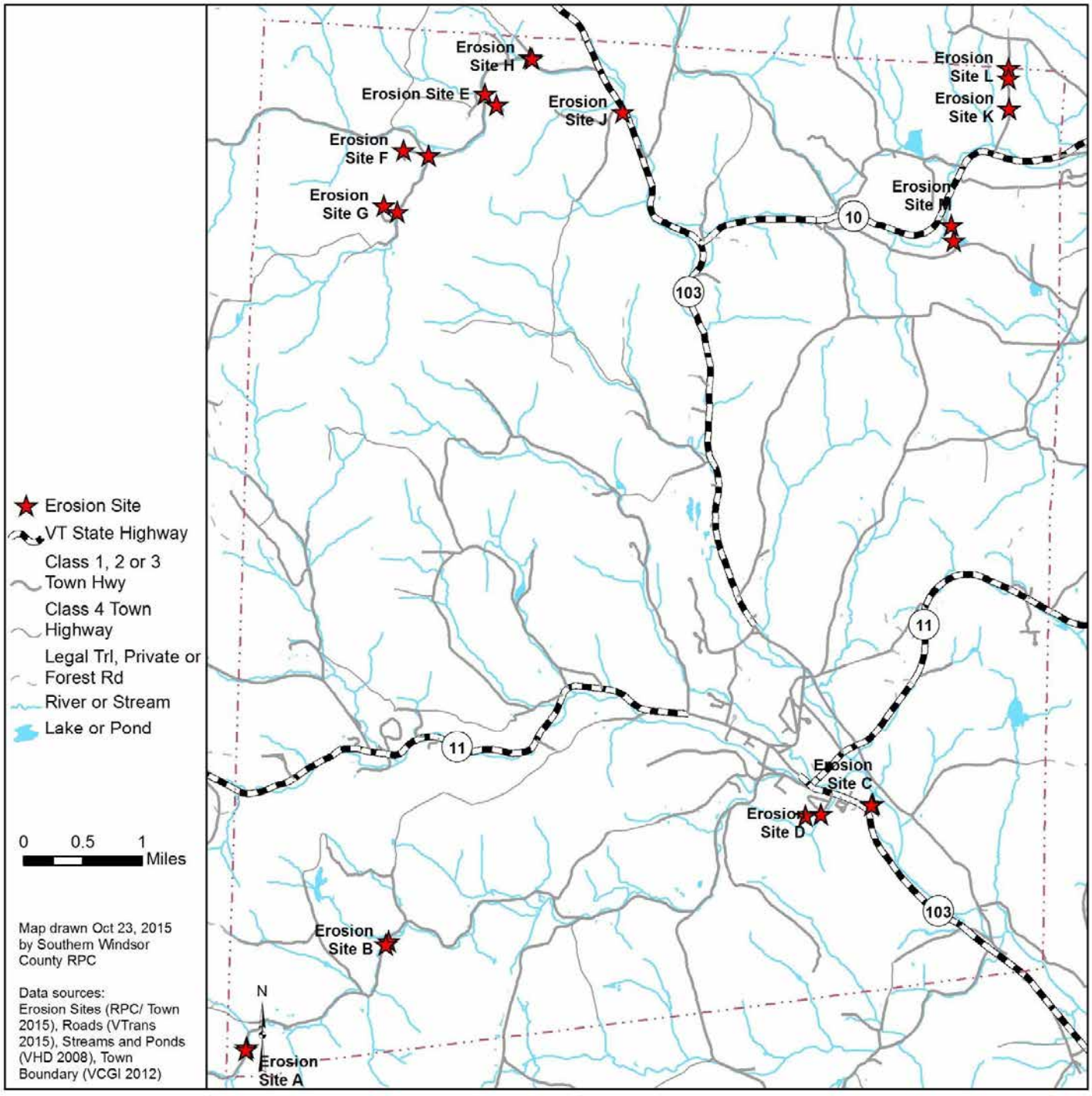
Town of Chester Road Erosion Inventory 2015

Completed by Southern Windsor County Regional Planning Commission and the Town of Chester

Fieldwork completed October 2015
Report last revised January 19, 2016

Funded by Vermont Better Backroads Program, Vermont Transportation Planning Initiative (TPI) and Town of Chester



ABOUT THIS INVENTORY AND REPORT

Chester is a small town of 3,154 people in Windsor County, Vermont, generally located between the Green Mountains to the west and the Connecticut River Valley to the east. The eight man road crew maintains 90 miles of town roads (class 1, 2 and 3), 66 bridges, and 704 culverts. The town has a mixture of valley flat river valleys alongside very steep hills. The town also has a variety of materials under the roads which affect how they function, including glacial till, sandy soils, and clay.

The town has had several major flooding events recently which affected many roadways in town – particularly Tropical Storm Irene in 2011 and the July 2014 storm (4 inches of rain in one hour). Other historical storms with major road impacts include 1973 and 1996. In addition to the typical fluvial and inundation flooding events, the town also experiences road damage following ice jams, beaver dam failure and landslides. Efforts are made to mitigate for all these events where possible. The road inventory identifies places which are particularly prone to these issues.

This report was completed in conjunction with a Road Inventory Update for the Town of Chester. The inventory fieldwork was completed in October 2015 by Katharine Otto (Southern Windsor County Regional Planning Commission) and Graham Kennedy (Town Public Works Director). The inventory and report was funded by the Vermont Better Backroads Program, Vermont Transportation Planning Initiative (TPI) and Town of Chester. An update to the Town Bridge and Culvert Inventory was also completed in 2015 and corresponds with this road inventory.

This report focuses on the 12 major road erosion sites that were identified in these inventories. For further information about other sites:

- 2015 Town of Chester Road Inventory – Available from Town Garage, Town office and Southern Windsor County Regional Planning Commission. See Appendices A and B for summary maps
- 2015 Town of Chester Bridge and Culvert Inventory – Available online at www.vtculverts.org. Also available from Town Garage, Town office and Southern Windsor County Regional Planning Commission. See Appendix C for summary map.

SUMMARY OF MAJOR ROAD EROSION SITES

The process for choosing the "major erosion sites" included:

1. Town Road Inventory - Assessing conditions of all roadways in town through fieldwork (see Appendix C summary map)
2. Compare results of Road Inventory to the ANR's Road Erosion Risk data released in 2014 (see Appendix D for summary map) and Town Bridge and Culvert Inventory (see Appendix C for summary map).
3. Revisit any sites where one of the following was identified:
    a. High or medium erosion issue was identified in Town Road Inventory; or
    b. High or medium road erosion risk identified in ANR data
4. Write up summary for any major erosion sites identified through the fieldwork. Note: Not all sites identified in stage 3 were considered major. "Non-major" sites include those where relatively simple grading and ditching could make significant strides in addressing the issues.
5. Revise the road inventory as needed following the additional fieldwork to reflect some of the comments about future work needed to address roadway needs of non-major erosion sites.

Site ID	Project Name/ Location	Quick Description	Priority	Estimated Total Cost	Estimated Budget Year	For more info see
A	Popple Dungeon Vertical Wall	River and road very close. Temporary fix of concrete blocks in vertical wall will not last	Low	Needs engineering to estimate cost	Unknown	Page 5
B	Popple Dungeon Flood Chute	Flood chute overwhelms culvert and roadway	Medium	Needs engineering to estimate cost. Set aside $175k in Structures Grant for engineering and construction. Intermediate fix of $5,000 needed during wait for full funds	2021	Page 8
C	Treatment Plant Road	Williams River flood chute	Low	Unknown	Unknown	Page 12
D	Marshall (unpaved)	Water from steep road overwhelms residential development at bottom	High	Needs engineering to estimate cost. Set aside $30k for scoping	2016	Page 14
E	Murdoch	Very steep road with water quality issue	Medium	$12,444	2019	Page 16
F	Miner	Very steep road with ditch issues	Medium	$7,047	2017	Page 20
G	Pleines	Very steep road with water quality issues	Medium	$10,258	2018	Page 23
H	Smokeshire	Road undermining next to stream	High	Needs engineering to estimate cost. Approx $3,000 could implement an intermediate fix	2016	Page 26
J	Whitmore Brook Culverts	Double culvert needs to be replaced	Medium	Needs hydraulics study to estimate cost. Could be around $10,000	2020	Page 29
K	Gould Fields	Fields adjacent to road causing road erosion	Medium	$1,792	2016	Page 32
L	Gould townline	Very steep and narrow road with road erosion	Low	Unknown	Unknown	Page 35
M	Mineral Springs Road	Very steep road with drainage issues	Medium	$3,676	2016	Page 37

See map on report cover page for locations

*Note: The following roads are not included in this inventory, despite having major erosion issues:

- Grafton Road – There are various stages on engineering on various sites. These sites are all high priority, but too complex for this inventory.
- Scullin Road – No options other than relocating the road. It is only a matter of time before the road falls into the river again.

BUDGET FOR DITCH IMPROVEMENTS

In 2015 Chester completed a project on Popple Dungeon Road with ditch improvements, including stone lining. Using information from that project, it is estimated that it costs approximately $1,325 per 100 feet. (13 tons of stone per 100 feet, with current cost of stone at $11.31 per ton.) The following roads were identified as needing significant work on ditches - ditching is currently in poor or severe condition.

Road	Type	Mileage	Total Estimated Cost for Ditch Improvements
Brooks Road	Paved	0.25	$17,490
Davidson Hill Road	Paved	0.89	$62,264
Farrar Road	Paved	1.01	$70,660
Gould Road	Paved	0.75	$52,470
Marshall Road*	Paved	0.20	$14,207
Bargfrede Road	Unpaved	0.04	$2,798
High Street*	Unpaved	0.49	$34,080
Popple Dungeon Road*	Unpaved	3.32	$231,957
Total		*6.95*	*$485,926*

* Because these sections are not for the entire road, these locations use estimated mileage (using GIS) rather than official VTrans mileage

BUDGET FOR PROJECTS WITH ESTIMATED COSTS

The town has budgeted for three types of costs:

- Construction – where good estimates for construction costs are known
- Maintenance – "Miscellaneous Erosion Control" – for stone lining ditches in areas which are not identified with major erosion or water quality issues. These sites may have minor water quality or erosion issues identified – and these will be prioritized over all other road segments. This is a potential new town budget line item to be added in 2016.
- Scoping/ Engineering – for sites where construction costs are not know. It is assumed that construction costs for those sites will be added to the budget in future years once costs are better understood.

For more information about potential funding sources, see appendix E – Funding matrix.

Year	Total Cost	Projects	Type	Potential Funding Sources	Town funds	Grant funds
2016	$5,468	Gould Fields and Mineral Springs	Construction	Better Backroads		$5,468
2016	$10,000	Erosion Control Misc	Maintenance	Town funds	$10,000	
2016	$30,000	Marshall Road Erosion and stormwater in development below road	Scoping	Transportation Alternatives	$6,000	$24,000
2016	$175,000	Grafton Road	Construction	Structures Grant	$35,000	$140,000
2016	$5,000	Popple Dungeon Flood Chute - intermediate fix (lining culvert)	Construction	Town funds	$5,000	
2016	$3,000	Smokeshire Road - intermediate fix	Construction	Town funds	$3,000	
2017	$10,000	Erosion Control Misc	Maintenance	Town funds	$10,000	
2017	$7,047	Miner Road	Construction	Better Backroads		$7,047
2018	$10,000	Erosion Control Misc	Maintenance	Town funds	$10,000	
2018	$10,258	Pleines Road	Construction	Better Backroads		$10,258
2019	$10,000	Erosion Control Misc	Maintenance	Town funds	$10,000	
2019	$12,444	Murdoch Road	Construction	Better Backroads		$12,444
2020	$10,000	Erosion Control Misc	Maintenance	Town funds	$10,000	
2020	$10,000	Replace Whitmore Brook double culverts	Construction	Better Backroads		$10,000
2021	$10,000	Erosion Control Misc	Maintenance	Town funds	$10,000	
2021	$175,000	Popple Dungeon Flood Chute - long term fix	Engineering and Construction	Structures Grant	$35,000	$140,000
TOTAL	*$493,217*				*$144,000*	*$349,217*

USEFUL CONTACTS AND INFO FOR PROJECTS

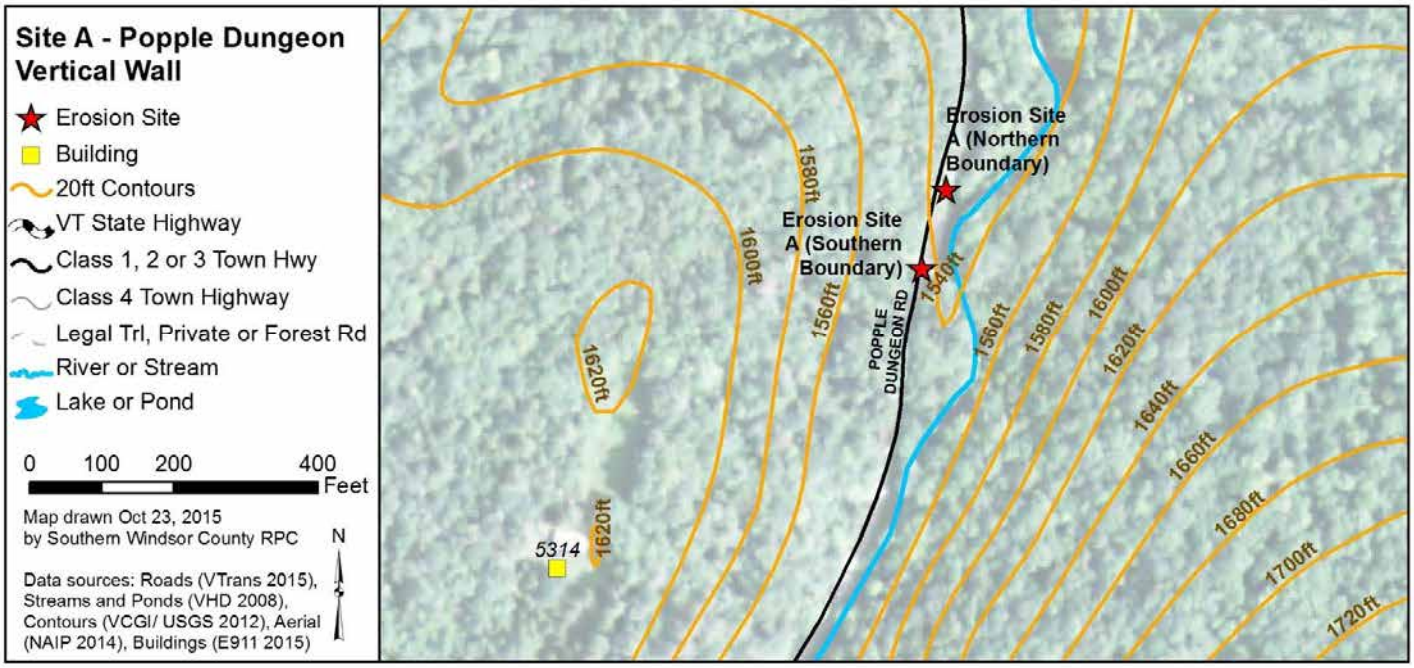
- John Alexander – VTrans District 2 Project Manager. john.alexander@vermont.gov 802-251-2004
- Marc Pickering – VTrans District 2 Tech. Marc.pickering@vermont.gov 802-251-2002
- Todd Menees – ANR River Management Engineer. todd.menees@vermont.gov 802-786-5921
- Army Corp of Engineers - Unknown
- Project Dig Safe for identifying buried cable or utilities – 1-888-DIG-SAFE
- VTrans Hydraulics
    - Study Request – Go to http://apps.vtrans.vermont.gov/HydraulicsStudyRequest/HydraulicStudyRequest.aspx
    - Hydraulics Manual (due to be updated soon) - http://vtransengineering.vermont.gov/sites/aot_program_development/files/documents/environmental/EnviroHydraulicsManual1998.pdf
- Vermont Better Backroads Program
    - For technical assistance contact Alan May. Alan.may@vermont.gov 802-828-4585
    - Better Backroads Manual http://vtransengineering.vermont.gov/bureaus/mab/better-back-roads
- Vermont Local Roads Program
    - For technical assistance go to http://vermontlocalroads.org/assistance
    - Variety of trainings and resources at http://vermontlocalroads.org/
- Vermont Standards and Specifications for Erosion Prevention and Sediment Control 2006 - http://www.vtwaterquality.org/stormwater/htm/documents/sw_vt_standards_and_specifications_2006_updated_2_20_2008.pdf
- Town of Chester Road and Bridge Standards 2013 (using 2013 State model)
- Southern Windsor County Regional Planning Commission – Katharine Otto – Transportation Planner kotto@swcrpc.org 802-674-9201
- ANR Road Erosion Risk Map. Available online from http://anrmaps.vermont.gov/websites/anra5/ (Appendix D of this report)
- Funding Sources Matrix created by SWCRPC (Appendix E of this report)
- Watershed Sizes as Guidance in Stream Alteration Regulations (from http://www.watershedmanagement.vt.gov/rivers/htm/rv_management.htm) (Appendix F of this report)

SITE A – POPPLE DUNGEON VERTICAL WALL

Road Name: Popple Dungeon Road **TH Number:** TH-10 **TH Class:** 3 unpaved
Priority Rank: Low (Five or more years out)

GPS Coordinates:
Northern boundary – N 43.22613 W 72.68206
Southern boundary – N 43.22583 W 72.68219

Site Map



Description of problem

- Stream right next to the road on a river bend.
- Road has issues with flash flooding (most recently 2011 and 2014) and beaver dams (every few years).
- Currently has 6ft concrete blocks to keep the bank vertical (160ft long, 14ft high), but that is not good hydrologically and not a permanent fix.
- Road washes out regularly and the existing concrete blocks will eventually fail.
- Site also needs guard rails, but there currently is not sufficient space.

While there are several other similar sites on Popple Dungeon Road, this one is taller and closer to the road than the others. This site also already has a temporary fix that will not last through another big rain event.

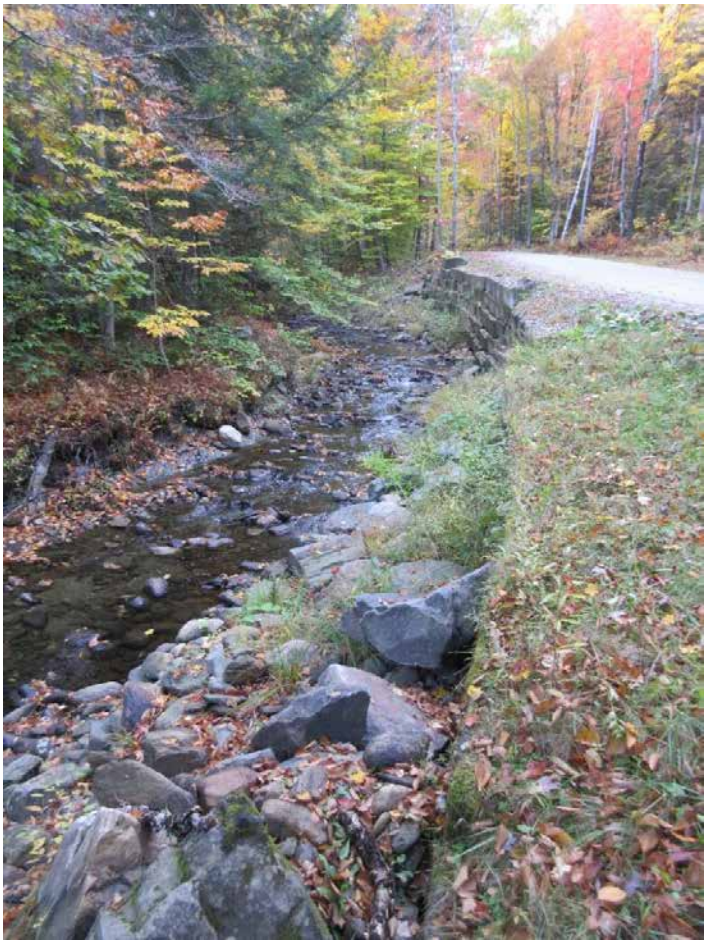
Water quality problem?	X	Yes		No
Waterbody affected?	X	Yes		No

Proposed solution
Unknown solution because:

- Road and river right next to each other with a vertical wall that is not good hydrologically.
- Cannot move the road much laterally – not much space in existing ROW, would need to raise the road and move utilities

Further Engineering needed?	X	Yes		No
VTrans Hydraulics Study needed?	X	Yes		No

Site Photos



Top left: Looking west (upstream) across the site
Top right: Looking west (upstream) from the site
Bottom Left: Looking east (downstream) across the site

Top: Looking west up road

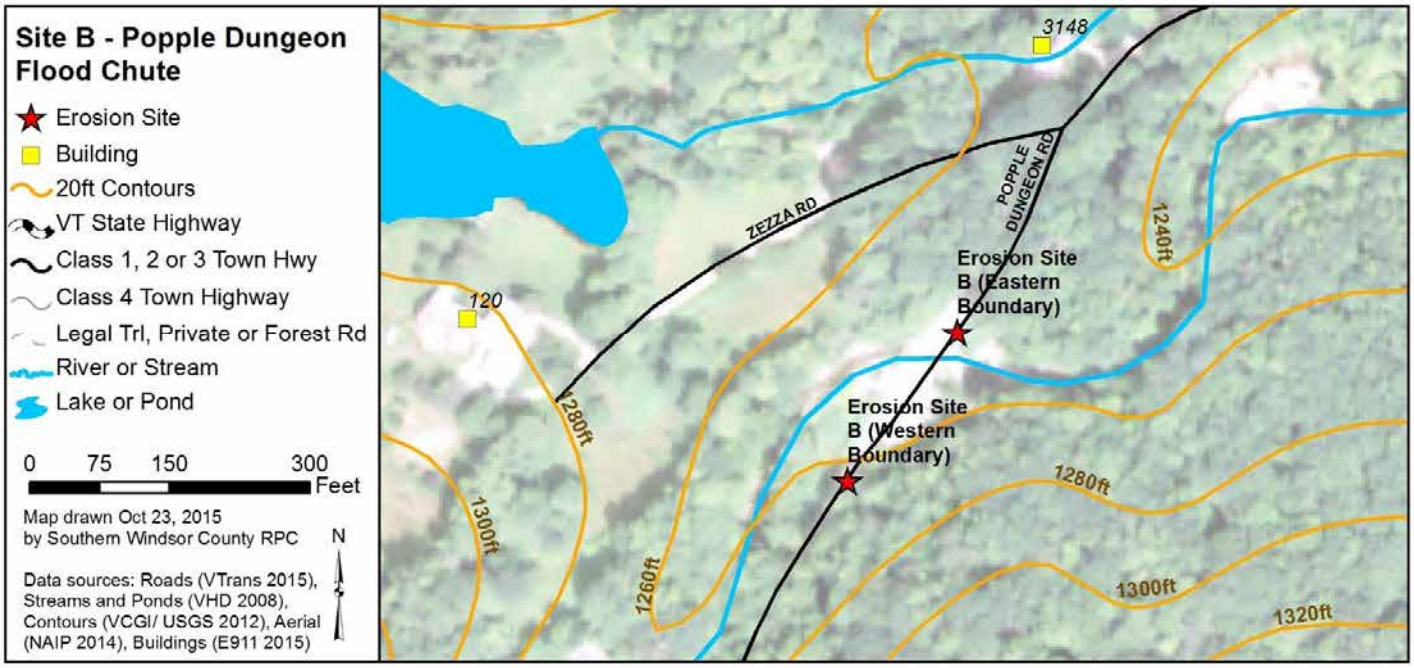
Bottom: Looking east down road.

SITE B – POPPLE DUNGEON FLOOD CHUTE

Road Name: Popple Dungeon Road **TH Number:** TH-10 **TH Class:** 3 unpaved
Priority Rank: Medium (Within 5 years)

GPS Coordinates:
Western boundary – N 43.23868 W 72.65886
Eastern boundary – N 43.23912 W 72.65842

Site Map



Description of problem

- During major rain events and the resulting fluvial erosion, an approximately 100ft section of road repeatedly washes away as it becomes the flood chute (most recently in 1996, 2011 and 2014).
- The river approaches the current large elliptical multi-plated culvert at an angle.
- Each time the river creates the flood chute fill is needed for a section of roadway 120ft long, 20ft high and 60ft in width.
- It is currently a squashed 11ft corrugated culvert. It has a rusted out base, so water is now undermining underneath and to the sides of the culvert. It is also perched – which causes a barrier for aquatic organism passage.

Water quality problem?	X	Yes		No
Waterbody affected?	X	Yes		No

Proposed solution

A 80-100ft long bridge or very large box culvert might alleviate the issue. Would probably cost $500,000 - $750,000.

Further Engineering needed?	X	Yes		No
VTrans Hydraulics Study needed?	X	Yes		No

Site Photos

Top: Looking west across the site. Treeline marks edge of flood chute.

Bottom: Looking east across the site. Flood chute extends from where to the photographer is standing to the treeline/ just beyond the truck.

Top: Looking at upstream end of culvert.

Bottom: Looking at downstream end of culvert

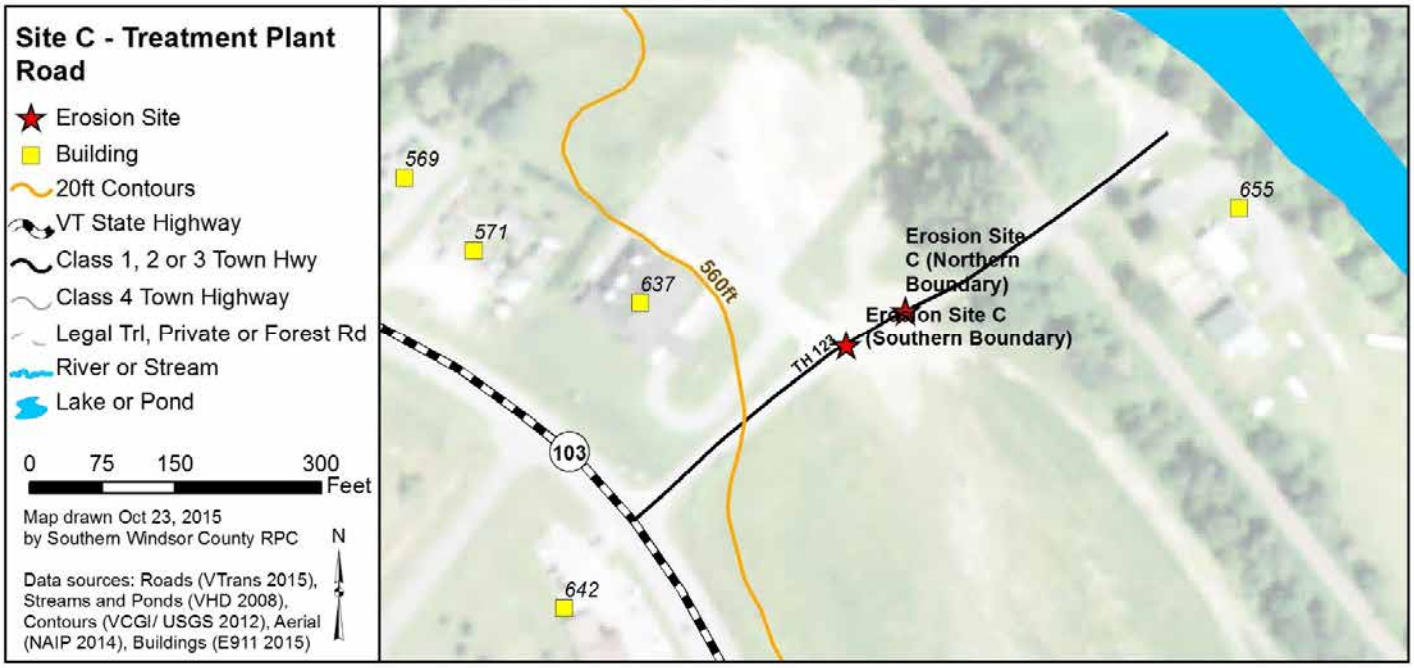
Top: Looking downstream from site

SITE C – TREATMENT PLANT ROAD

Road Name: Treatment Plant Road **TH Number:** TH-123 **TH Class:** 3 paved
Priority Rank: Low (Five or more years out)

GPS Coordinates:
Northern boundary – N 43.25586 W 72.57761
Southern boundary – N 43.25577 W 72.57784

Site Map



Description of problem

- Williams River creates a flood chute in extreme rain events that cuts across the Ball Field and Sewer Plant Road. This happened in both 2011 and 2014.
- The river would overwhelm anything you put in – culverts, bridges, etc – so instead the highway department has used a temporary fix. The temporary fix is an unpaved section within the paved road, just filled with crushed gravel after each event to restore the roadway.
- This road is important as it serves the town sewer plant.

Water quality problem?	X*	Yes		No
Waterbody affected?	X*	Yes		No

*Water quality and waterbodies affected – but only in major storms where there are far larger issues.

Proposed solution
No solution proposed

Further Engineering needed?		Yes	X	No
VTrans Hydraulics Study needed?		Yes	X	No

Site Photos

Top: Flood chute site looking east toward field.

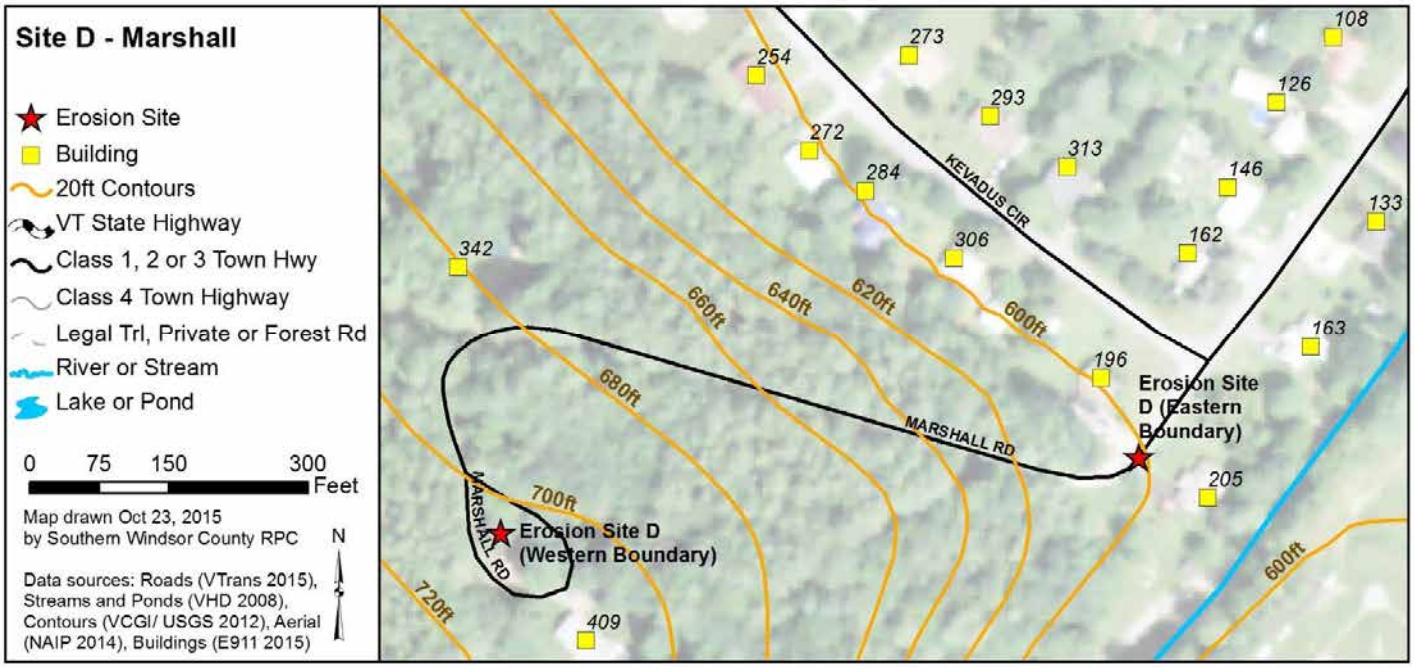
Bottom: Flood chute site looking west toward ball field and parking area

SITE D – MARSHALL (UNPAVED)

Road Name: Marshall Road **TH Number:** TH-100 **TH Class:** 3 unpaved
Priority Rank: High (within next few years)

GPS Coordinates:
Western boundary – N 43.25443 W 72.58888
Eastern boundary – N 43.25466 W 72.58630

Site Map



Description of problem

- Water runs down a steep hill onto the residential development below (Marshall Road and Kevadus Circle).
- From about halfway down the hill the unpaved roadway has been graded with a cross-slope so that:
  - 90% of the water drains into the ditch on the south side which then runs into a chute which flows into a stream. This chute has a good amount of distance and grass between the roadway and the stream to prevent water quality issues.
  - 10% of the water drains into the ditch on the north side which then runs through a short amount of very steep woodland into the residential development below. This development does not have any storm water capacity and the water table is very close to the surface there.

Water quality problem?	[ ]	Yes	[X]	No
Waterbody affected?	[ ]	Yes	[X]	No

Proposed solution

The relatively small 10% of water than ends on the residential development would not be an issue if there was adequate stormwater drainage. Therefore installing storm drains and improving drainage on Kevadus Circle and the paved section of Marshall Road is the proposed solution. Costs are unknown as further engineering is needed.

Further Engineering needed?	[X]	Yes	[ ]	No
VTrans Hydraulics Study needed?	[ ]	Yes	[X]	No

Site Photos

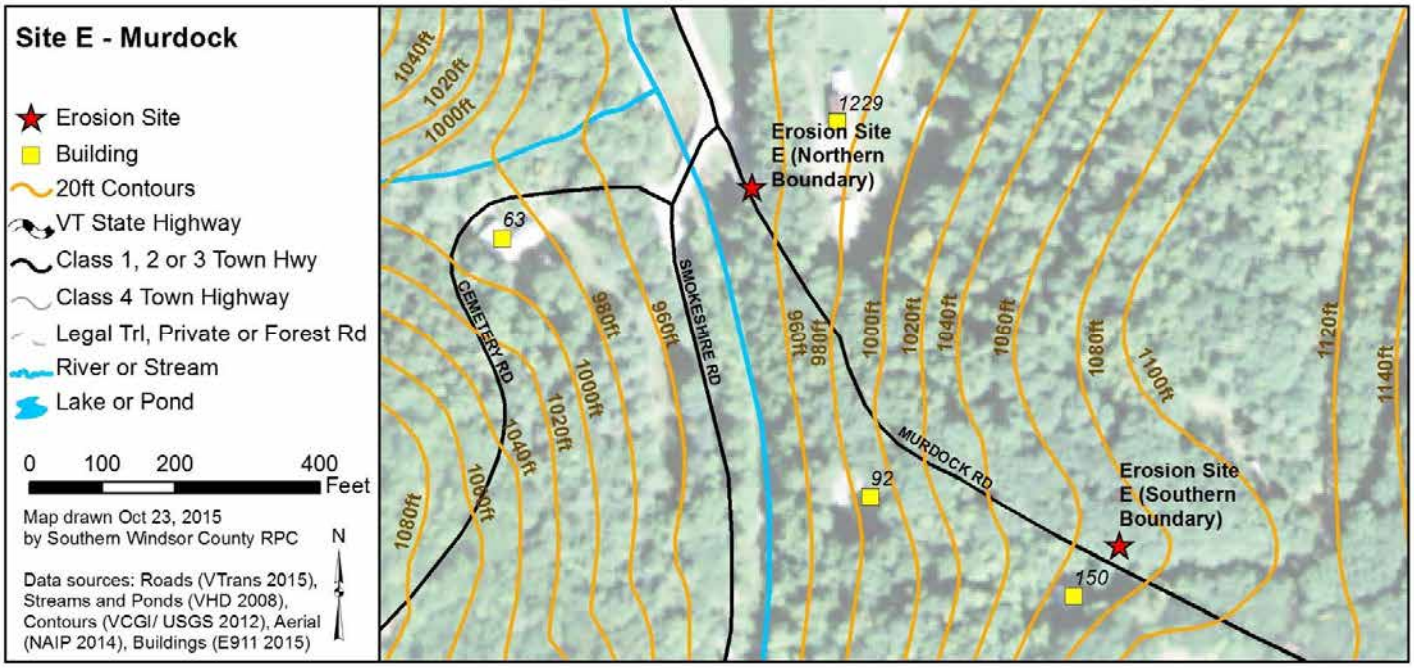
Top left: Chute that connects base of unpaved road to the nearby stream.
Top right: Ditch on south side of Marshall Road that carries approx. 90% of road runoff
Bottom: Looking down unpaved Marshall Road toward paved Marshall Road (just before red truck)

SITE E – MURDOCH

Road Name: Murdoch Road **TH Number:** TH-14 **TH Class:** 3 unpaved
Priority Rank: Medium (within next 5 years)

GPS Coordinates:
Northern boundary – N 43.34247 W 72.64256
Southern boundary – N 43.34112 W 72.64066

Site Map



Description of problem

- Very steep roadway where ditches are easily overwhelmed.
- Small berm (half a foot) on the downslope side keeps the road together, but cannot last forever.
- Sheets of water go over the road and the side of the road straight into the stream causing a water quality issue

Water quality problem?	X	Yes		No
Waterbody affected?	X	Yes		No

Proposed solution
Reinforce the downslope side of the road with riprap. Need to keep the trees in place, but the trees would cause issues for large rock.

Repair cost estimate
It would be approximately 3 days of work for a 4 man crew.

Labor	**Rate**	**# Hours**	**Total (Rate x Hours)**
3 days of a 4 man crew	$42.00	96	$4,032.00
		Labor Total	**$4,032.00**
Equipment	**Rate**	**# Hours**	**Total (Rate x Hours)**
1 Small Truck	$40.00	24	$960.00
1 Loader	$40.00	24	$960.00
1 Excavator	$18.00	24	$432.00
1 Grader	$60.00	1	$60.00

		Equipment Total	**$2,412.00**
Materials	**Rate**	**Amount**	**Total (Rate x Amount)**
Rip-rap			$6,000.00
		Materials Total	**$6,000.00**
Miscellaneous	**Rate**	**Mileage**	**Total (Rate x Amount)**
None			$0.00
		Miscellaneous Total	**$0.00**
		Grand Total	**$11,484.00**

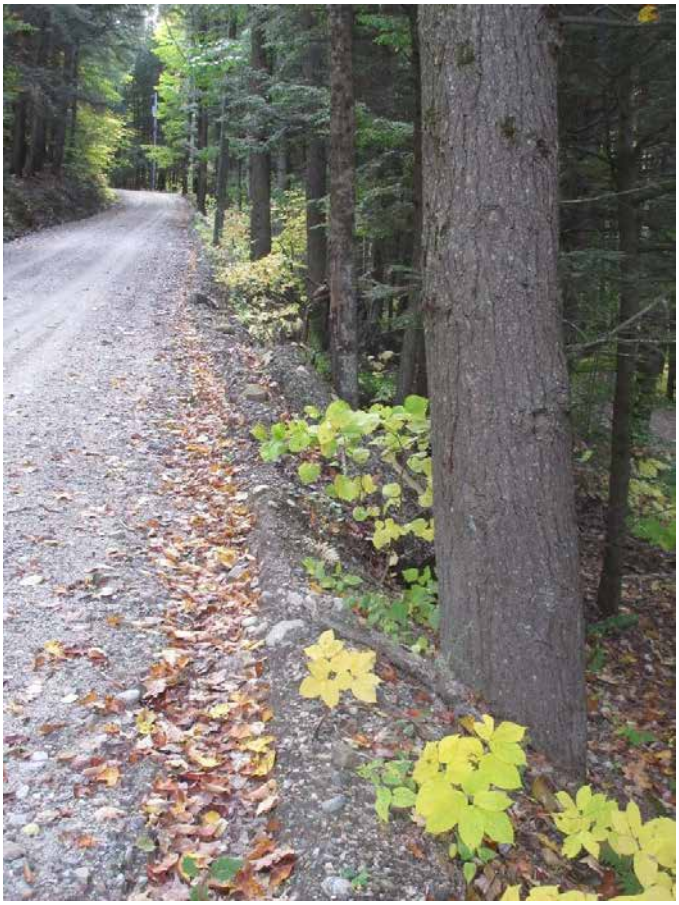
Further Engineering needed?		Yes	X	No
VTrans Hydraulics Study needed?		Yes	X	No

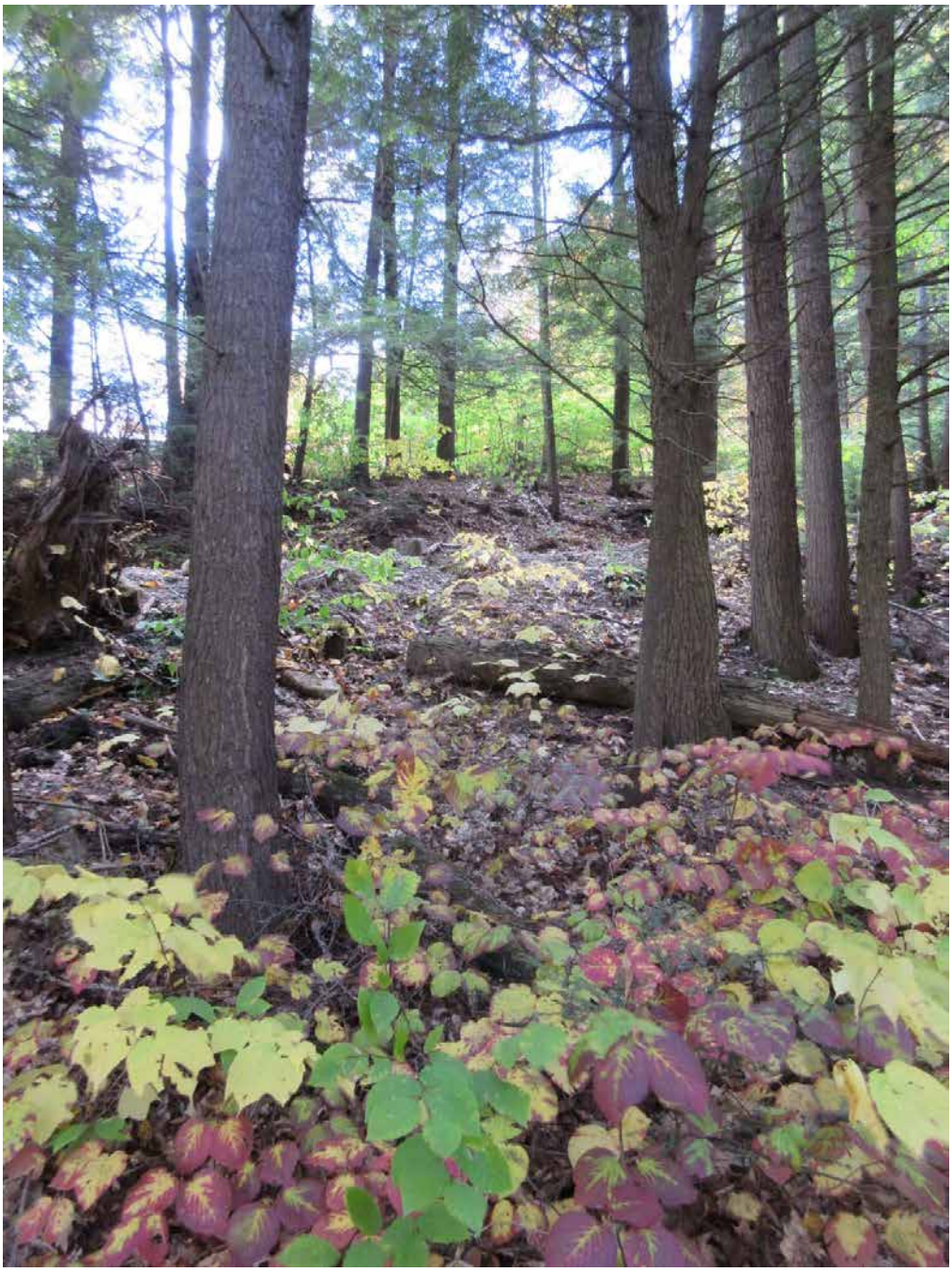
Site Photos

Top: Looking down Murdoch Road

Bottom Left: Looking up along the upslope side of the road.

Bottom Right: Looking up the downslope side of the road which includes a small berm.





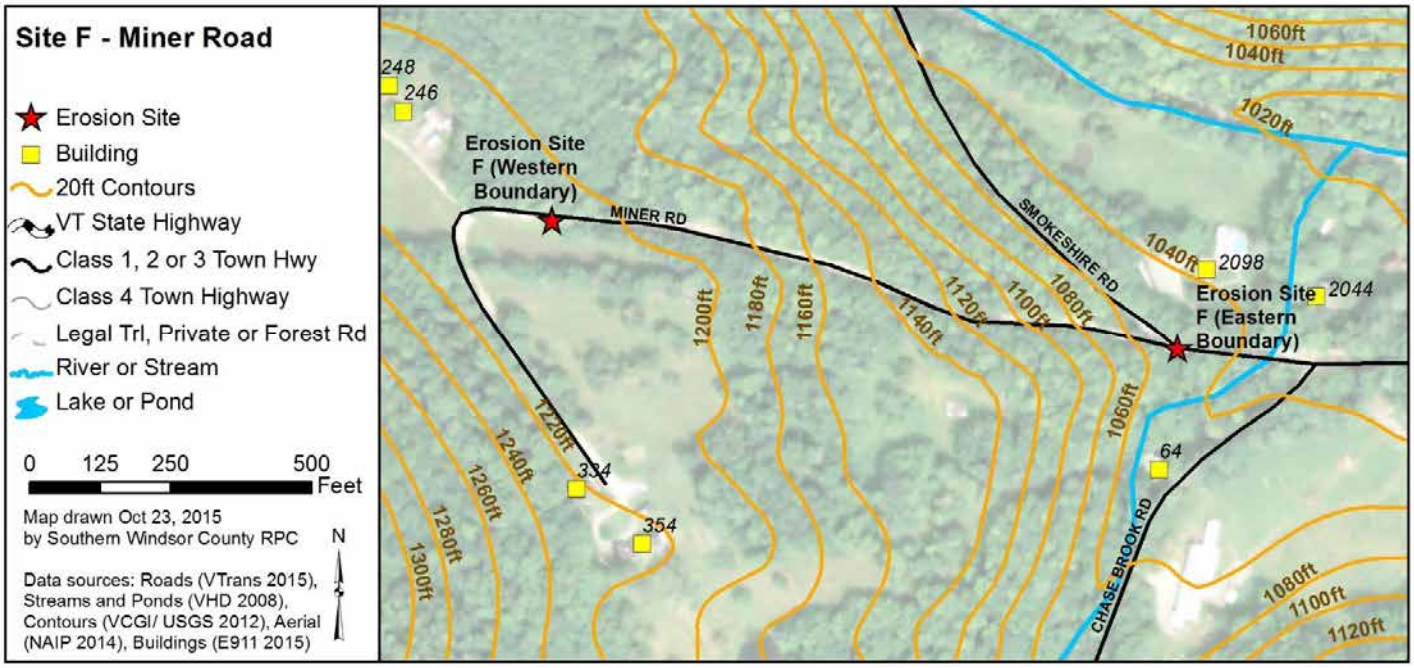
Steep cross-slope of roadway. Roadway cuts through the hillside around where the red arrow is

SITE F - MINER

Road Name: Miner Road **TH Number:** TH-11 **TH Class:** 3 unpaved
Priority Rank: Medium (within next 5 years)

GPS Coordinates:
Western boundary – N 43.33561 W 72.65615
Eastern boundary – N 43.33499 W 72.65197

Site Map



Description of problem

- Very steep roadway.
- Ditches need improvement.
- Area does not have a water quality issue as the water leeches into the woods before it reaches the closest stream.

Water quality problem?		Yes	X	No
Waterbody affected?		Yes	X	No

Proposed solution
Install stone lined ditches. Culverts should already be adequately sized

Repair cost estimate
It would be approximately 2 days of work for a 4 man crew.

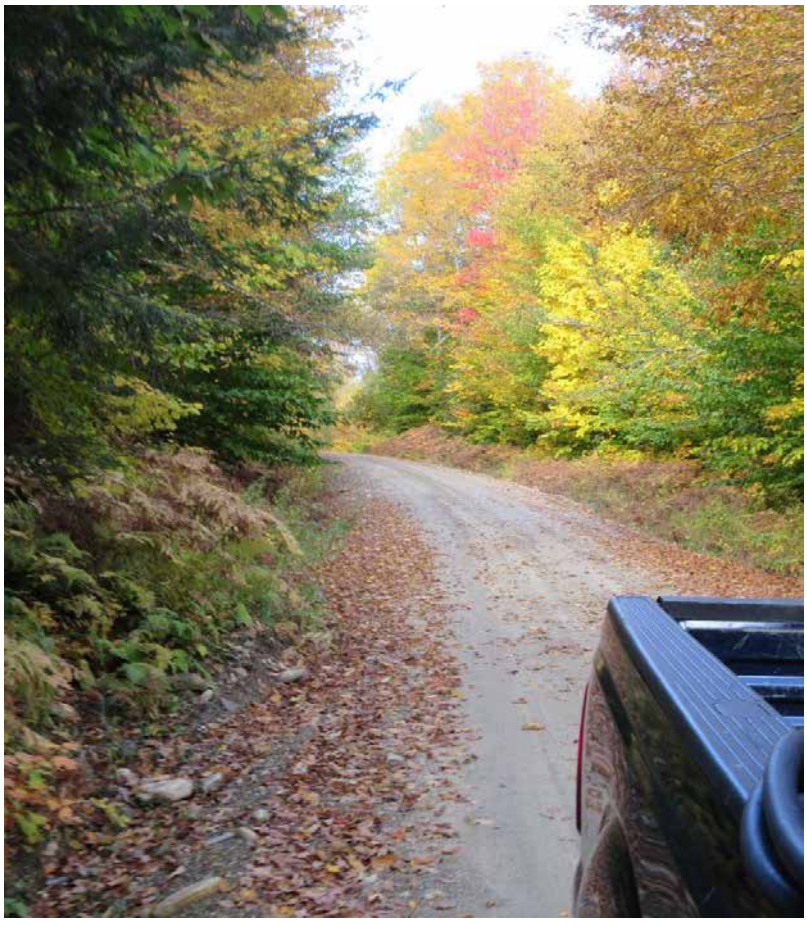
Labor	**Rate**	**# Hours**	**Total (Rate x Hours)**
2 days of a 4 man crew	$42.00	64	$2,688.00
		Labor Total	**$2,688.00**
Equipment	**Rate**	**Amount**	**Total (Rate x Hours)**
3 Big trucks	$60.00	48	$2,880.00
1 Excavator	$18.00	16	$288.00
1 Grader	$60.00	1	$60.00
		Equipment Total	**$3,228.00**
Materials	**Rate**	**Amount**	**Total (Rate x Amount)**
7 inch stone	$11.31	100	$1,131.00

		Materials Total	**$1,131.00**
Miscellaneous	**Rate**	**Mileage**	**Total (Rate x Amount)**
None			$0.00
		Miscellaneous Total	**$0.00**
		Grand Total	**$7,047.00**

Further Engineering needed?		Yes	X	No
VTrans Hydraulics Study needed?		Yes	X	No

Site Photos

Top: Looking down Miner Road.



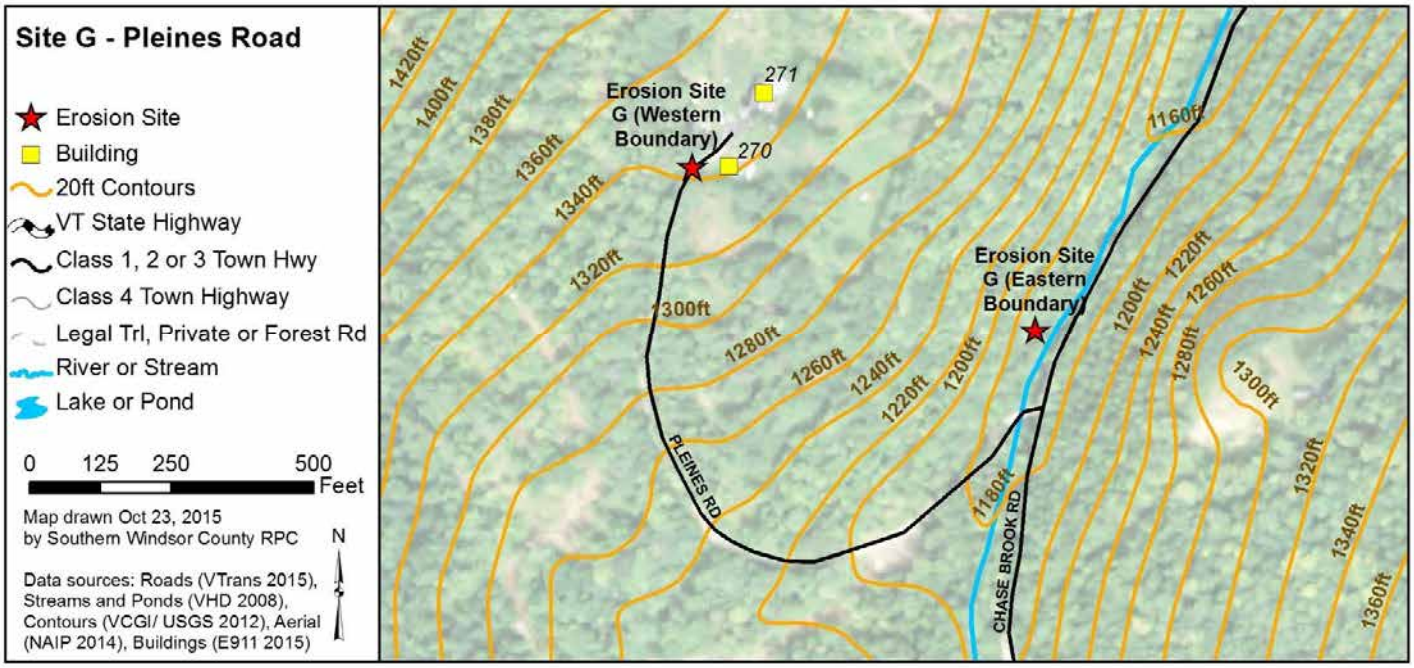
Bottom: Looking up Miner Road

SITE G - PLEINES

Road Name: Pleines Road **TH Number:** TH-13 **TH Class:** 3 unpaved
Priority Rank: Medium (within next 5 years)

GPS Coordinates:
Western boundary – N 43.32885 W 72.65945
Eastern boundary – N 43.32807 W 72.65717

Site Map



Description of problem

- Very steep roadway.
- Ditches need improvement.
- Area has water quality issue because the water flows straight from the road into the adjacent stream.

Water quality problem?	X	Yes		No
Waterbody affected?	X	Yes		No

Proposed solution
Stone lined ditches with turnouts. Existing culverts should be okay.

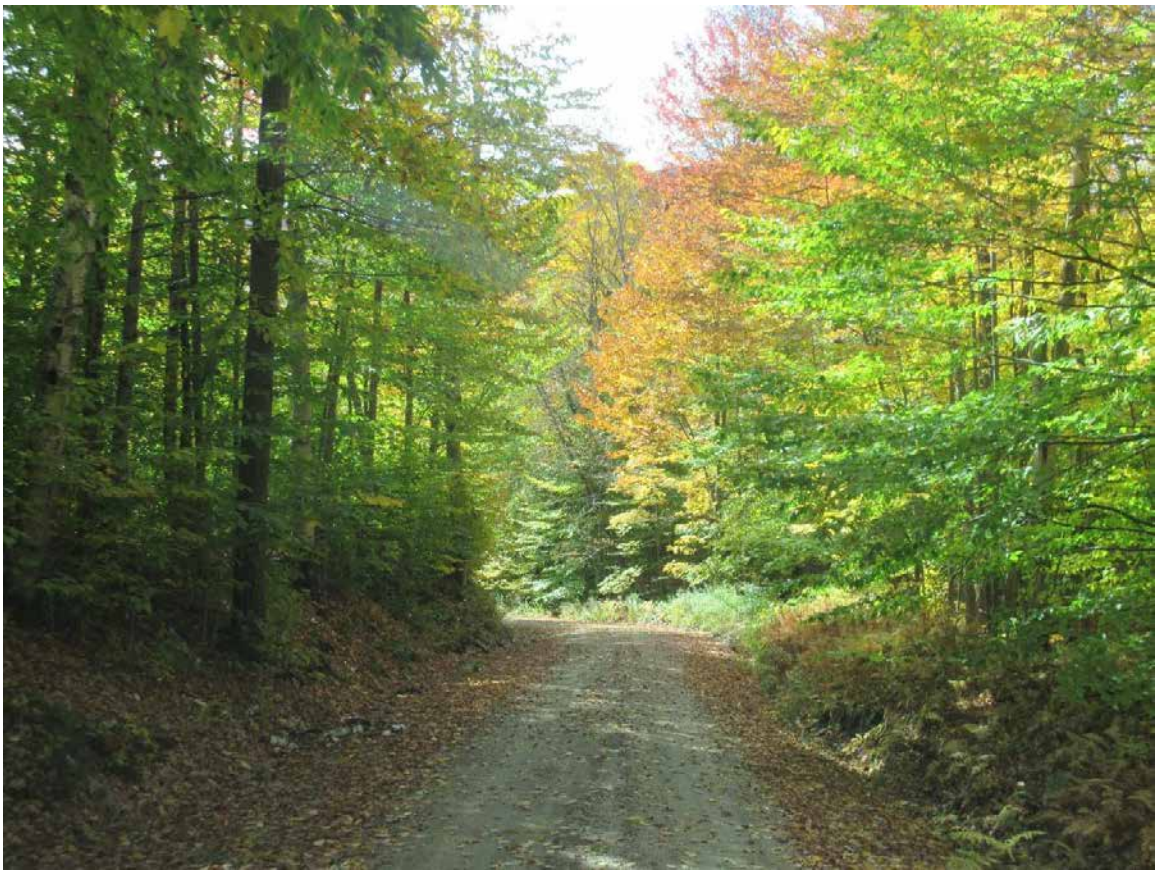
Repair cost estimate
This needs approximately 3 days of work for a 4 man crew. Note: this site is further out of town as well as longer than Site F – hence more time and materials.

Labor	**Rate**	**# Hours**	**Total (Rate x Hours)**
3 days of a 4 man crew	$42.00	96	$4,032.00
		Labor Total	**$4,032.00**
Equipment	**Rate**	**Amount**	**Total (Rate x Hours)**
3 Big Trucks	$60.00	72	$4,320.00
1 Excavator	$18.00	24	$432.00
1 Grader	$60.00	1	$60.00
		Equipment Total	**$4,812.00**
Materials	**Rate**	**Amount**	**Total (Rate x Amount)**
7 inch stone	$11.31	125	$1,413.75

		Materials Total	**$1,413.75**
Miscellaneous	**Rate**	**Mileage**	**Total (Rate x Amount)**
None			$0.00
		Miscellaneous Total	**$0.00**
		Grand Total	**$10,257.75**

Further Engineering needed?		Yes	X	No
VTrans Hydraulics Study needed?		Yes	X	No

Site Photos



Top: Looking down Pleines Road.

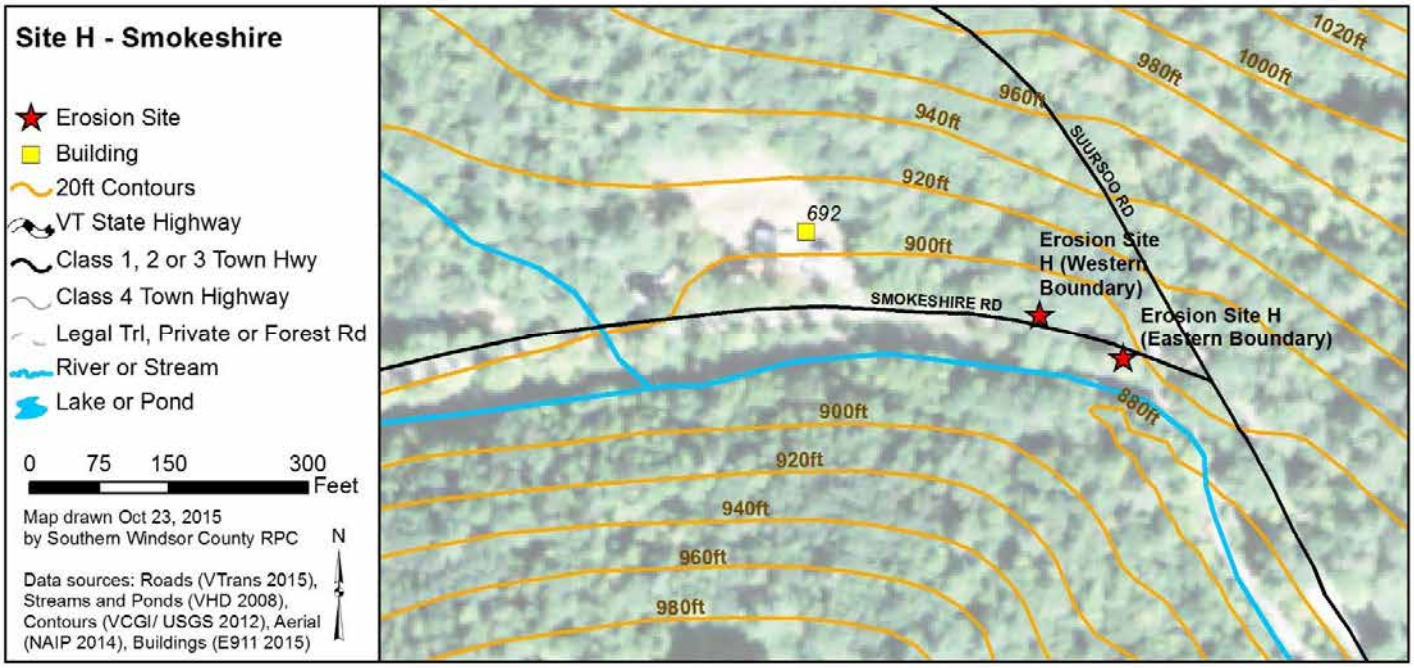
Bottom: Stream just beyond edge of roadway.

SITE H – SMOKESHIRE

Road Name: Smokeshire Road **TH Number:** TH-9 **TH Class:** 3 unpaved
Priority Rank: High (within next few years)

GPS Coordinates:
Western boundary – N 43.34689 W 72.63503
Eastern boundary – N 43.34676 W 72.63469

Site Map



Description of problem

- Road edge starting to collapse and undermine right next to the stream. One very small section currently has issues, but problem will occur along far longer section of roadway before too long – only a few trees left holding the bank together.
- Steep (vertical) slope of approximately 15-20ft between road and river.
- Road cannot move very far away from the river as ledge is very close to the road edge, and there is another steep road paralleling the road just above it (Suursoo Road) which would have to be relocated if Smokeshire Road was relocated.

Water quality problem?	X	Yes		No
Waterbody affected?	X	Yes		No

Proposed solution

Unknown solution. Todd Menees (ANR River Engineer) and Naomi Johnson (engineer) have both done preliminary site visits, but no conclusions for solutions.

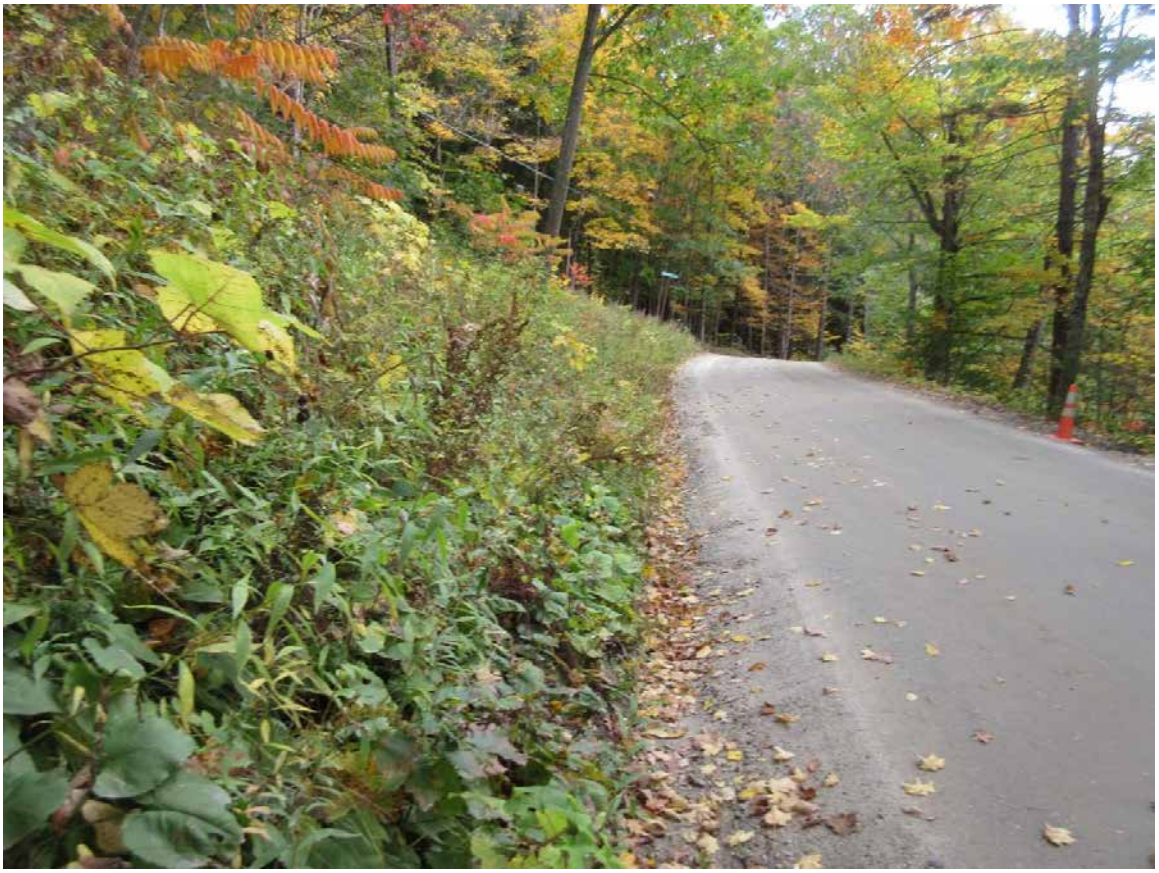
Further Engineering needed?	X	Yes		No
VTrans Hydraulics Study needed?		Yes	X	No

Site Photos

Top: Road edge starting to collapse into river.

Bottom left: Looking downstream (east) from existing collapse site.

Bottom right: Looking upstream (west) from existing collapse site.



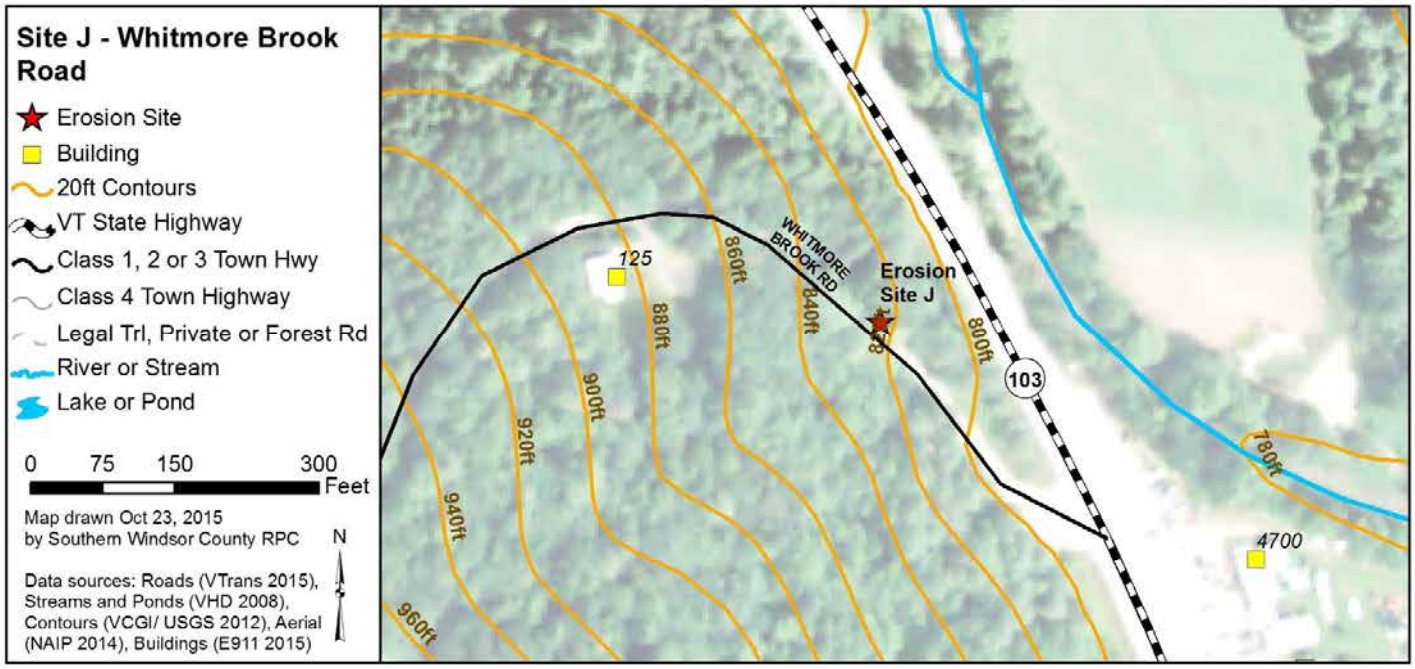
Top: North side of road, looking east towards Suursoo Road intersection (at crest of road)

SITE J – WHITMORE BROOK CULVERTS

Road Name: Whitmore Brook Road **TH Number:** TH-15 **TH Class:** 3 unpaved
Priority Rank: Medium (within next 5 years)

GPS Coordinates:
N 43.34029 W 72.61957

Site Map



Description of problem

- Double culverts (both 24 inch diameter) do not adequately handle water – particularly during icy conditions.
- Complex situation including a steep bank with waterfalls and pools below – which end right next to VT-103.
- Culverts have marble headers – which are not found anywhere else in town – except within VT-103 ROW. Unknown reason

Water quality problem?	[ ]	Yes	[X]	No
Waterbody affected?	[ ]	Yes	[X]	No

Proposed solution

Install a squashed elliptical culvert or a box culvert with a bottom. Hydraulics study needed to determine size. Site may have additional issues that town is unaware of – what was the reason for it being like the VT-103 culverts?

Further Engineering needed?	[X]	Yes	[ ]	No
VTrans Hydraulics Study needed?	[X]	Yes	[ ]	No

Site Photos

Top: Double culvert inlet with marble headers

Bottom: Narrow gully with stream that feeds the double culvert.

Top: Looking at outlet of double culvert from edge of VT-103 Right-Of-Way. Waterfalls and pools below culvert. Base pool directly adjacent to pavement edge.

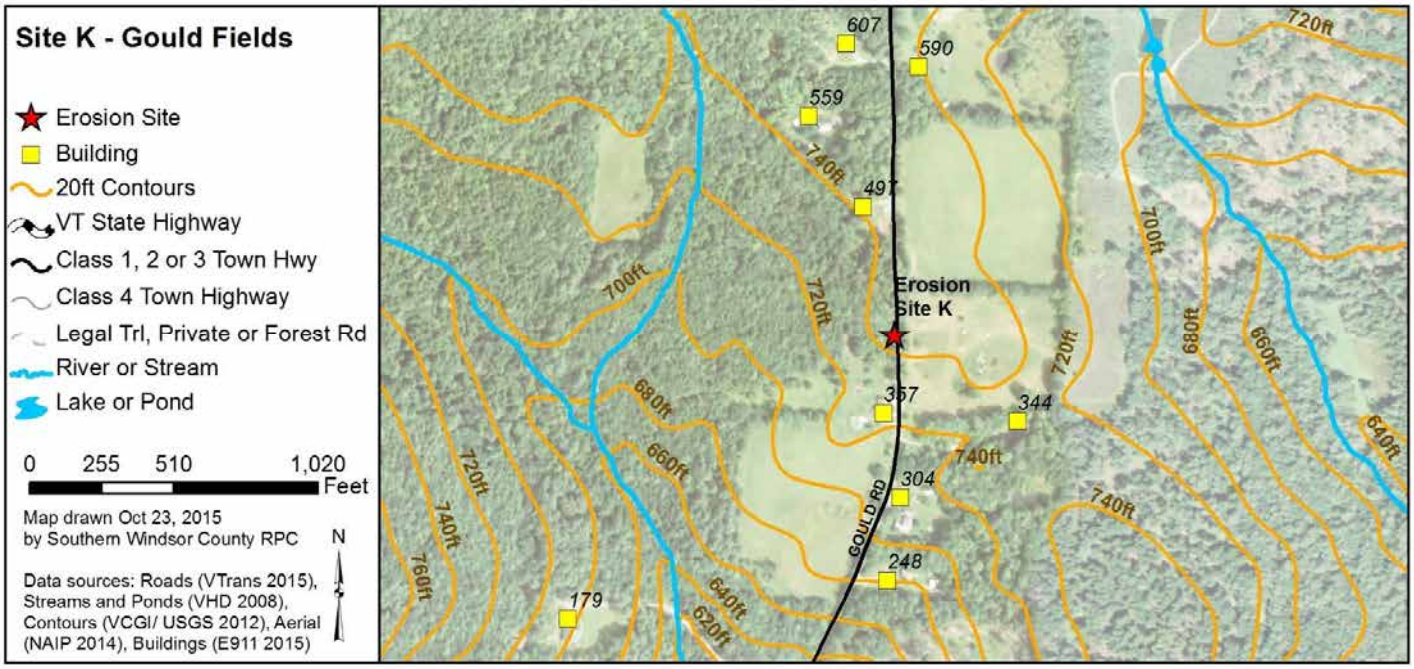
Bottom: Detail of double culvert outlet as viewed from VT-103.

SITE K – GOULD FIELDS

Road Name: Gould Road **TH Number:** TH-27 **TH Class:** 3 unpaved
Priority Rank: Medium (within next 5 years)

GPS Coordinates:
N 43.34076 W 72.55495

Site Map



Description of problem

- Water runs off adjacent fields into the roadway, causing erosion.

Water quality problem?		Yes	X	No
Waterbody affected?		Yes	X	No

Proposed solution

Create ditch on the field side of the road (south). Ledge is close to the surface in this area so probably don't have space for a stone lined ditch which the road grade would require.

Repair cost estimate

This needs approximately 1 day of work for a 3 man crew. Would use grass seed and mulch since don't have space for stone-lined.

Labor	**Rate**	**# Hours**	**Total (Rate x Hours)**
1 day for a 3 man crew	$42.00	24	$1,008.00
		Labor Total	**$1,008.00**
Equipment	**Rate**	**Amount**	**Total (Rate x Hours)**
1 Dump Truck	$60.00	8	$480.00
1 Excavator	$18.00	8	$144.00
1 Grader	$60.00	1	$60.00
		Equipment Total	**$684.00**
Materials	**Rate**	**Amount**	**Total (Rate x Amount)**
Grass seed and mulch			$100.00
		Materials Total	**$100.00**
Miscellaneous	**Rate**	**Mileage**	**Total (Rate x Amount)**

None			$0.00
		Miscellaneous Total	**$0.00**
		Grand Total	**$1,792.00**

Further Engineering needed?		Yes	X	No
VTrans Hydraulics Study needed?		Yes	X	No

Site Photos

Top: Fields above Gould Road that have lots of runoff into the road.

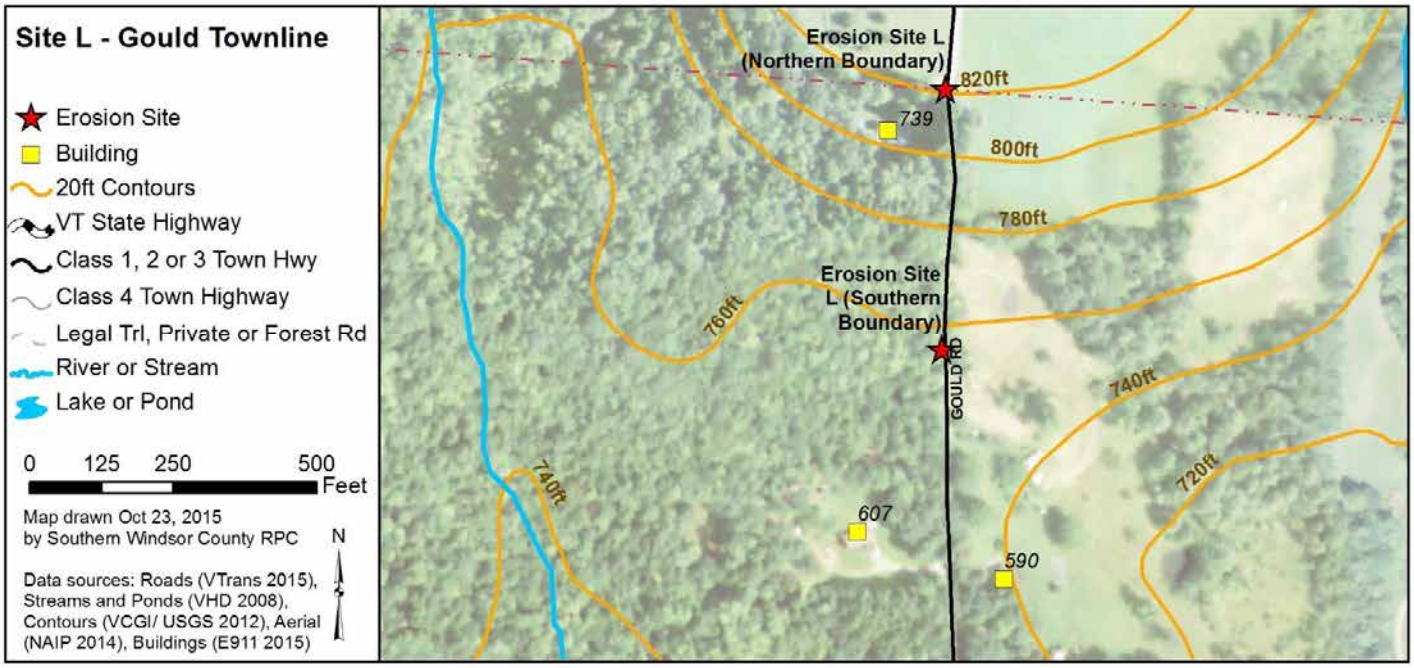
Bottom: Gould Road with fields on the left.

SITE L – GOULD TOWNLINE

Road Name: Gould Road **TH Number:** TH-27 **TH Class:** 3 unpaved
Priority Rank: Low (Five or more years out)

GPS Coordinates:
Northern boundary – N 43.34570 W 72.55501
Southern boundary – N 43.34445 W 72.55504

Site Map



Description of problem

- Very steep road which is very narrow (trees and walls on either side) and has trouble with road erosion.

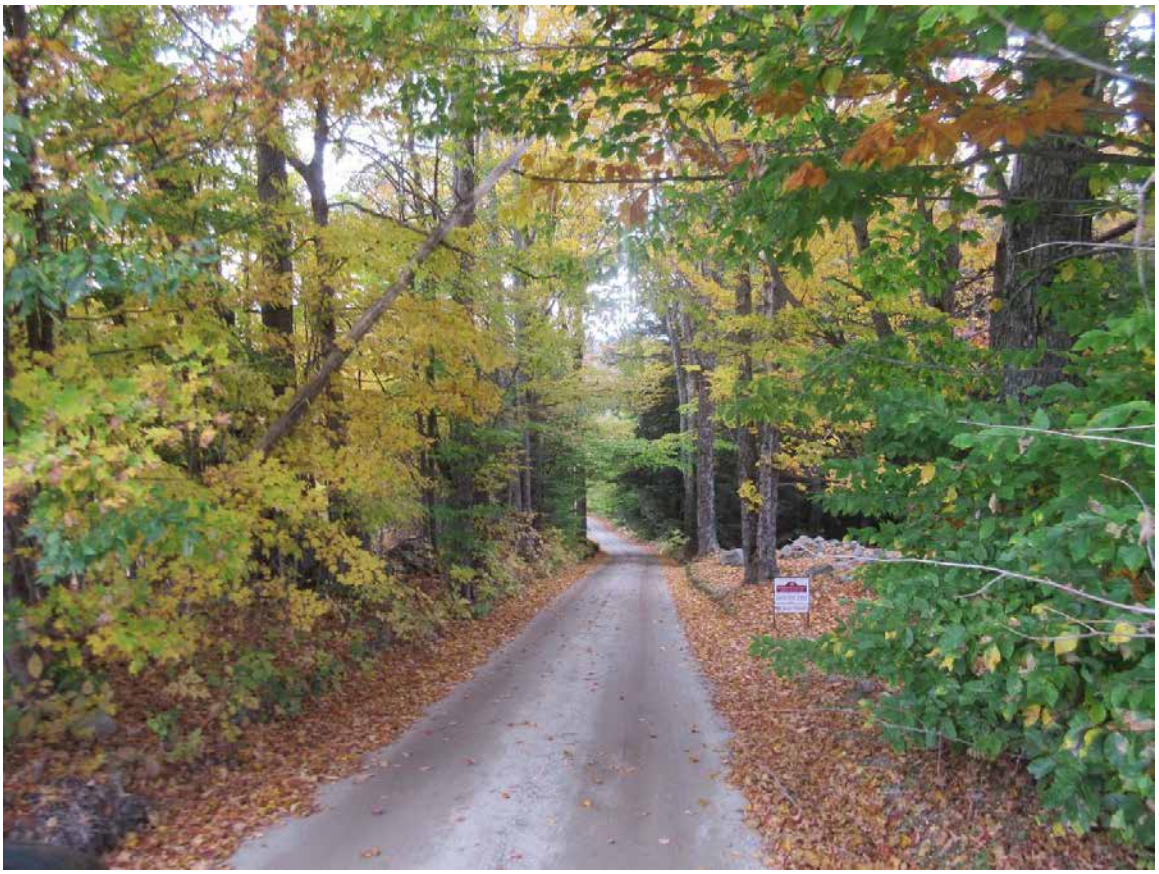
Water quality problem?	☐	Yes	☒	No
Waterbody affected?	☐	Yes	☒	No

Proposed solution

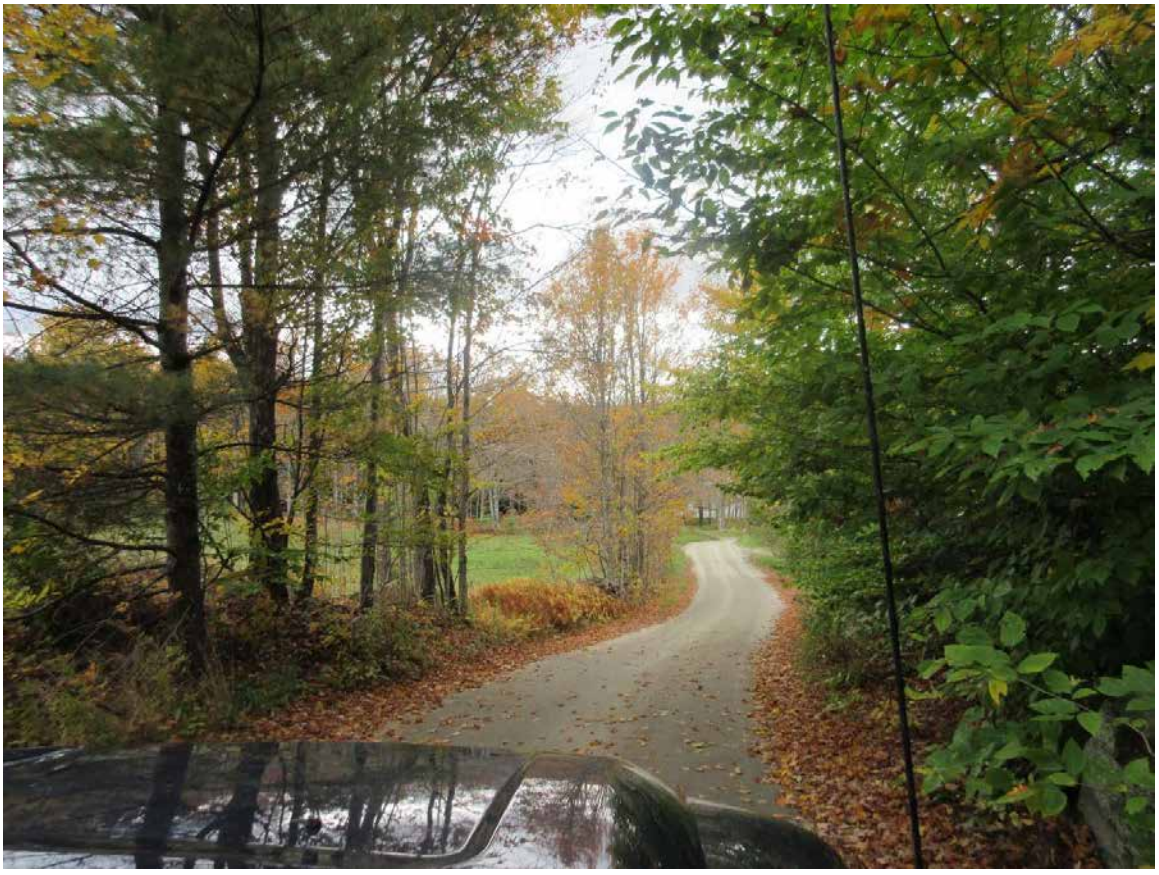
Remove trees and install ditches. Unlikely to happen since all trees on roadside are maple trees and outside the ROW.

Further Engineering needed?	☐	Yes	☒	No
VTrans Hydraulics Study needed?	☐	Yes	☒	No

Site Photos



Top: Looking down Gould Road from near the top of the hill (and the townline with Baltimore). Trees close on both sides. Stone wall on right side.



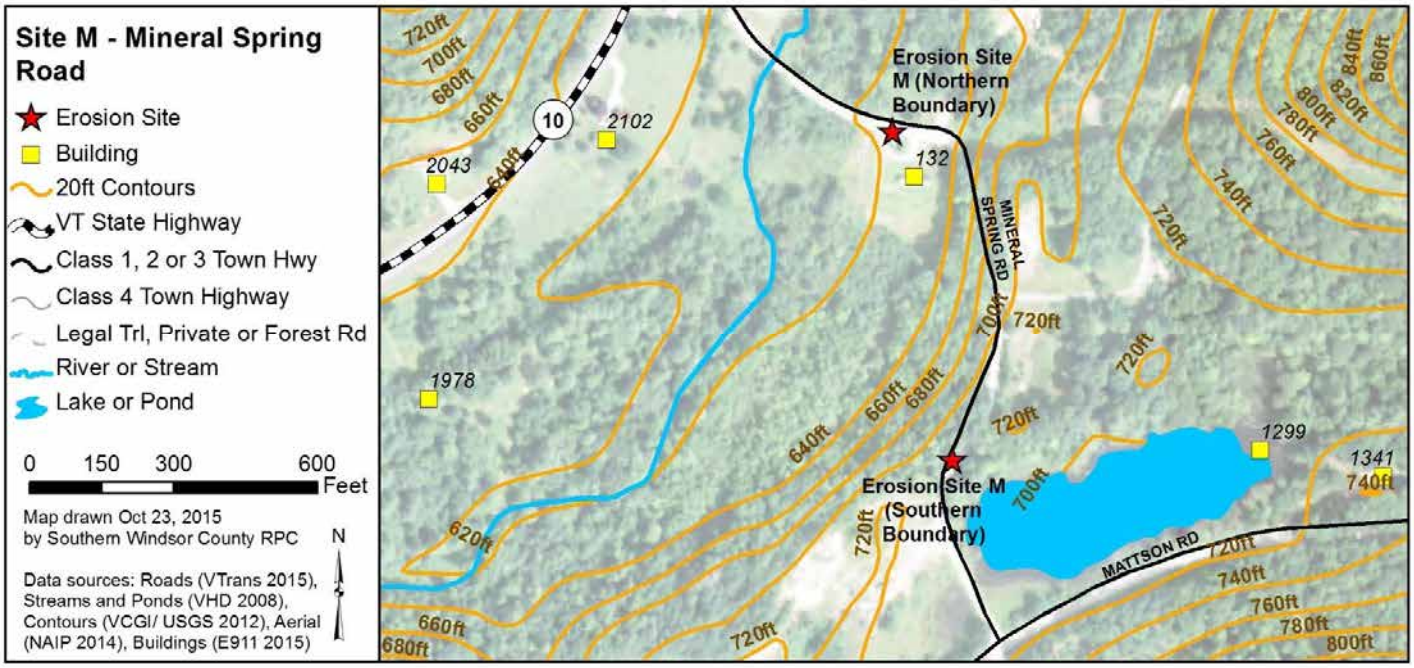
Bottom: Looking down Gould Road from near the top of the hill with drainage issues. Open area next to road in the background are the fields of Site K (Gould Fields).

SITE M – MINERAL SPRINGS ROAD

Road Name: Mineral Springs Road **TH Number:** TH-31 **TH Class:** 3 unpaved
Priority Rank: Medium (within next 5 years)

GPS Coordinates:
Northern boundary – N 43.34445 W 72.56461
Southern boundary – N 43.32465 W 72.56414

Site Map



Description of problem

- Very steep road with drainage issues.
- Road is currently graded with a cross-slope so about 90% of stormwater goes into the ditch on the south side of the roadway.

Water quality problem?	☐	Yes	☒	No
Waterbody affected?	☐	Yes	☒	No

Proposed solution
Stone lined ditches on the south side.

Repair cost estimate
Approximately 1 day of work for a 4 man crew

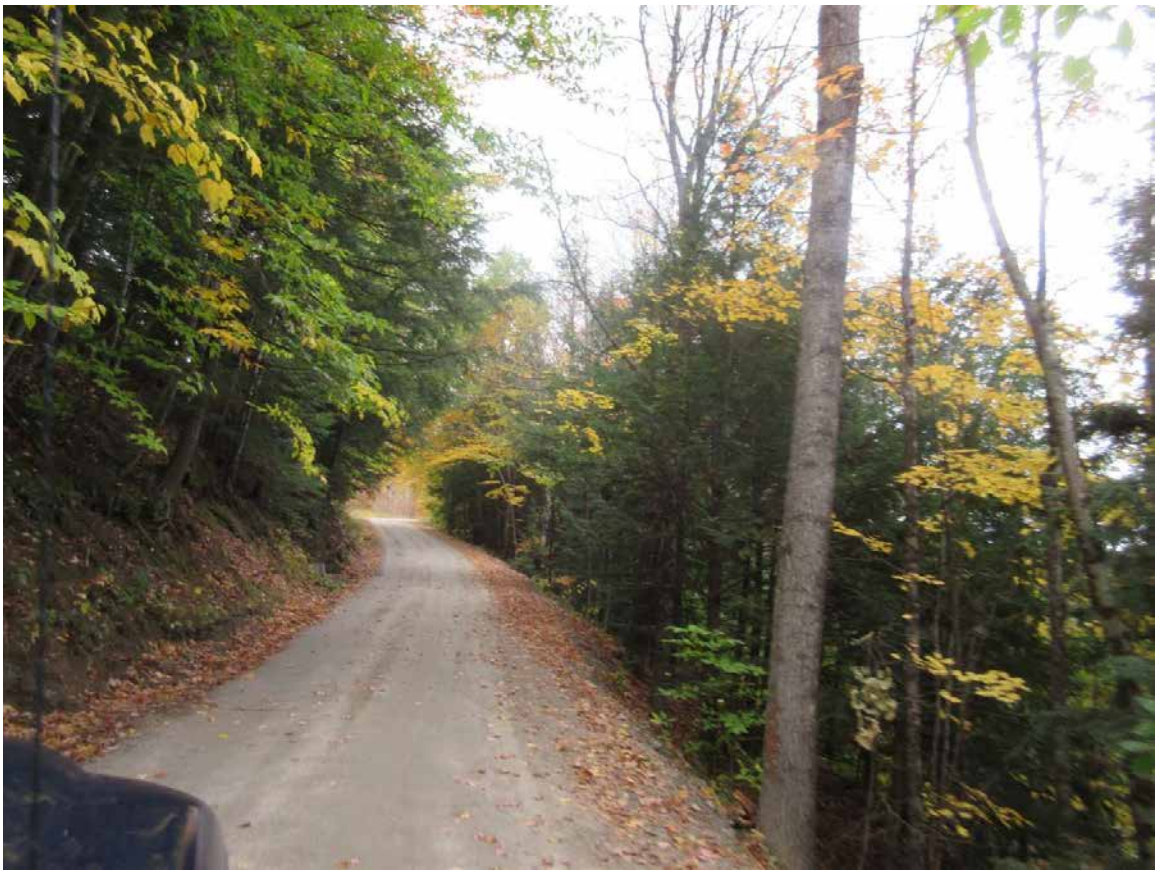
Labor	**Rate**	**# Hours**	**Total (Rate x Hours)**
1 day for a 4 man crew	$42.00	32	$1,344.00
		Labor Total	**$1,344.00**
Equipment	**Rate**	**Amount**	**Total (Rate x Hours)**
2 Big trucks	$60.00	16	$960.00
1 Loader	$40.00	8	$320.00
1 Excavator	$18.00	8	$144.00
1 Grader	$60.00	1	$60.00
		Equipment Total	**$1,484.00**
Materials	**Rate**	**Amount**	**Total (Rate x Amount)**

7 inch stone	$11.31	75	$848.25
		Materials Total	**$848.25**
Miscellaneous	**Rate**	**Mileage**	**Total (Rate x Amount)**
None			$0.00
		Miscellaneous Total	**$0.00**
		Grand Total	**$3,676.25**

Further Engineering needed?		Yes	X	No
VTrans Hydraulics Study needed?		Yes	X	No

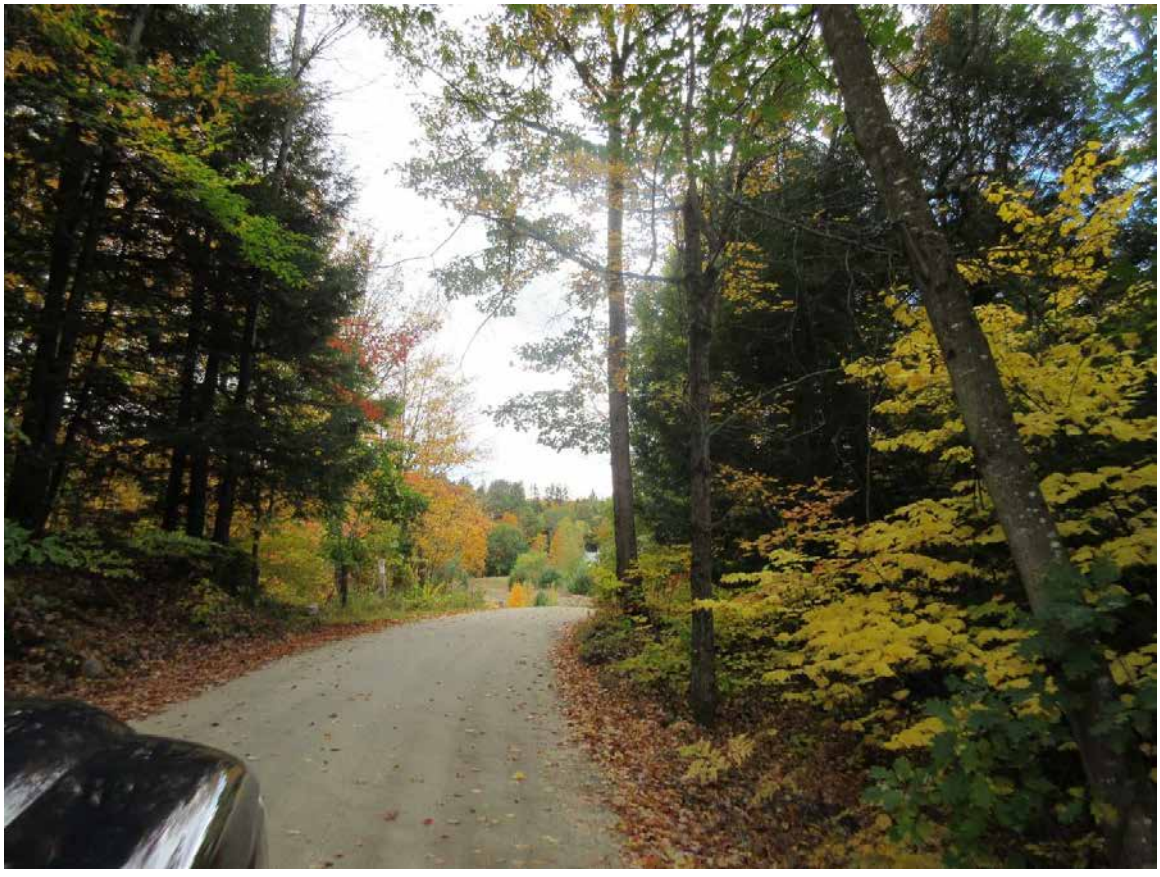
Site Photos

Top: Bottom of big hill on Mineral Springs Road. Hill starts near the corner.



Bottom: Near bottom of big hill on Mineral Springs Road

Top: Halfway up Mineral Springs Road

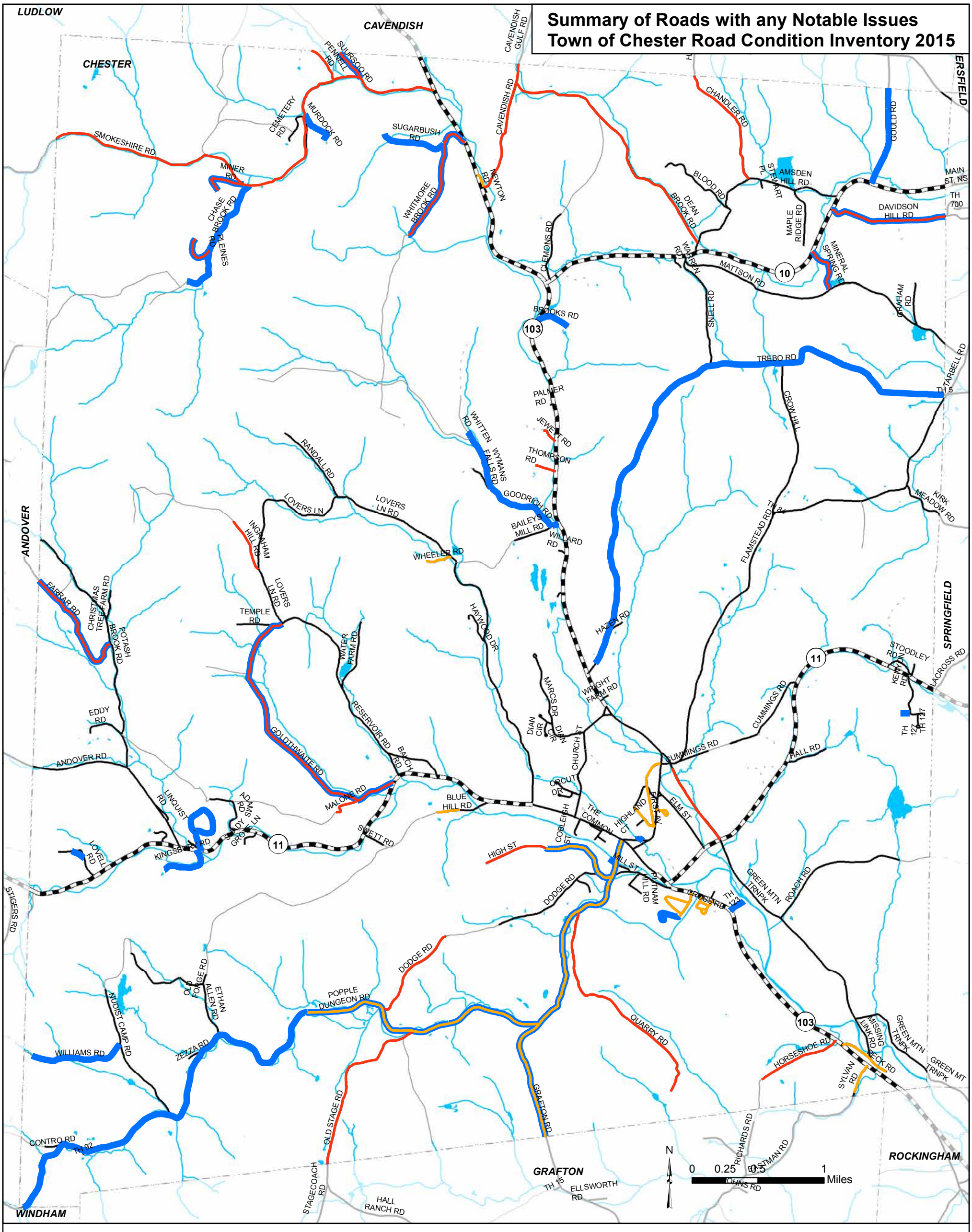


Bottom: Top of Mineral Springs Road

APPENDICES

Appendix A	2015 Chester Road Inventory Map – Summary of roads with any notable issues
Appendix B	2015 Chester Road Inventory Map – Roads with particular issues (clay, ice jams, etc)
Appendix C	2015 Chester Bridge and Culvert Inventory Map
Appendix D	ANR Road Erosion Risk Map for Chester
Appendix E	Funding Sources Matrix
Appendix F	Watershed Sizes as Guidance in Stream Alteration Regulations (from http://www.watershedmanagement.vt.gov/rivers/htm/rv_management.htm)

Summary of Roads with any Notable Issues
Town of Chester Road Condition Inventory 2015



- Paved road with notable issues (see criteria)
- Unpaved road with notable issues (see criteria)
- Road with potential erosion, water quality or ditch issue (see criteria)

Other roads

- VT State Highway
- Class 1, 2 or 3 Town Highway (without notable issue or in another town)
- Class 4 Town Highway
- Legal Trail
- Private Road
- River or Stream
- Lake or Pond
- Town Boundary

"Notable issue" criteria

Unpaved road with one or more notable issue:
- Potholes - low, medium or high
- Rutting/ corrugations - medium or high
- Loose aggregate - medium or high

Paved road with one or more notable issue:
- Allegator cracking - medium or high
- Longitudinal/ transverse cracking - medium or high
- Edge cracking - medium or high
- Patches/ Potholes - medium or high
- Roughness - medium or high
- Rutting - medium or high

Road with potential erosion, water quality or ditch issue:
- Erosion issue - minor, major or severe
- Water quality issue - minor, major or severe
- Ditch - poor condition

VT State Plane, Meters, NAD 83.
For planning purposes only.
Not for regulatory interpretation.

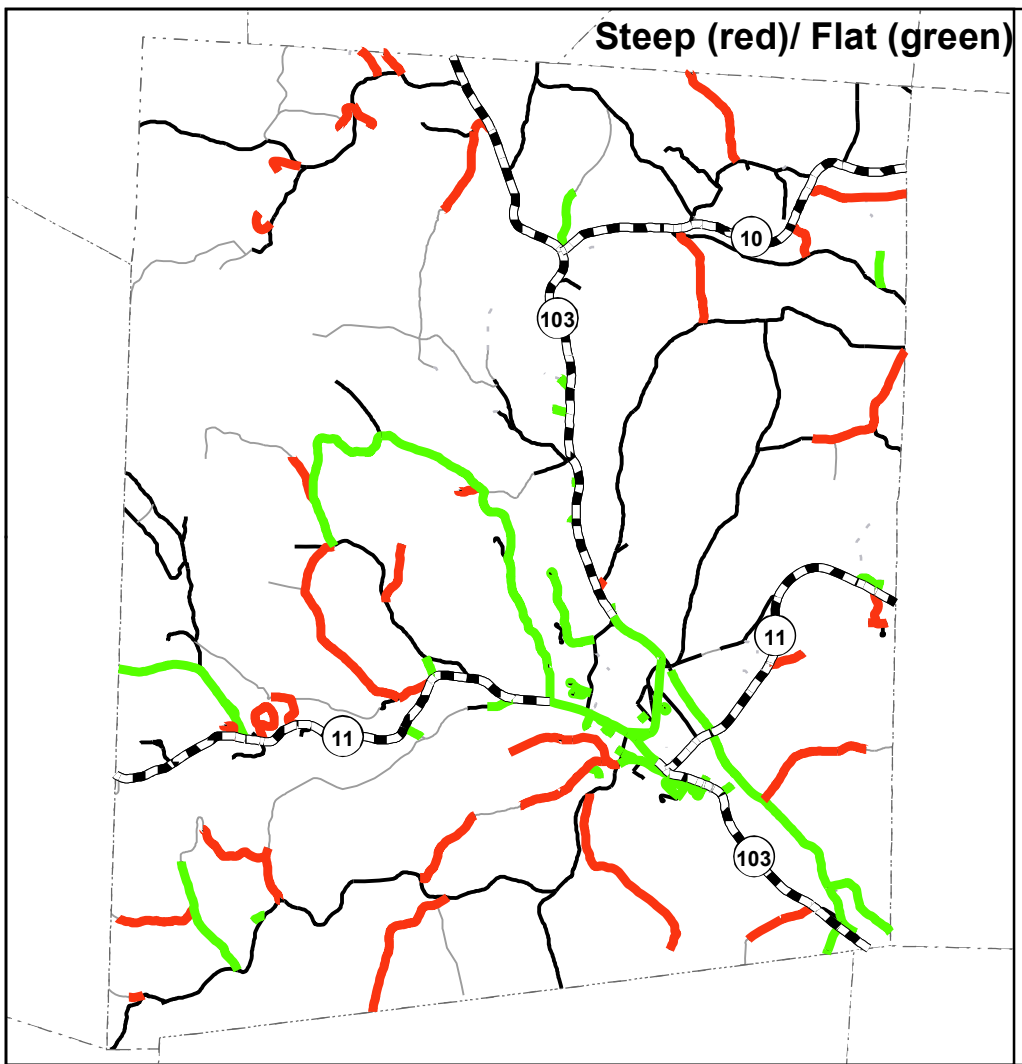
Map drawn: December 10, 2015

Data source: Road locations from VTrans 2015. Road conditions assessed during fieldwork October 2015.

SWCRPC
SOUTHERN WINDSOR COUNTY REGIONAL PLANNING COMMISSION
P.O. Box 320, Ascutney, VT 05030
802-674-9201 www.swcrpc.org

Roads with Particular Issues (Clay, Ice Jams, etc)
Town of Chester Road Condition Inventory 2015

Steep (red)/ Flat (green)



VT State Highway
Class 1, 2 or 3 Town Highway (paved surface or in another town)
Class 4 Town Highway
Legal Trail
Private Road
River or Stream
Lake or Pond
Town Boundary

VT State Plane, Meters, NAD 83.
For planning purposes only.
Not for regulatory interpretation.

Map drawn: December 10, 2015

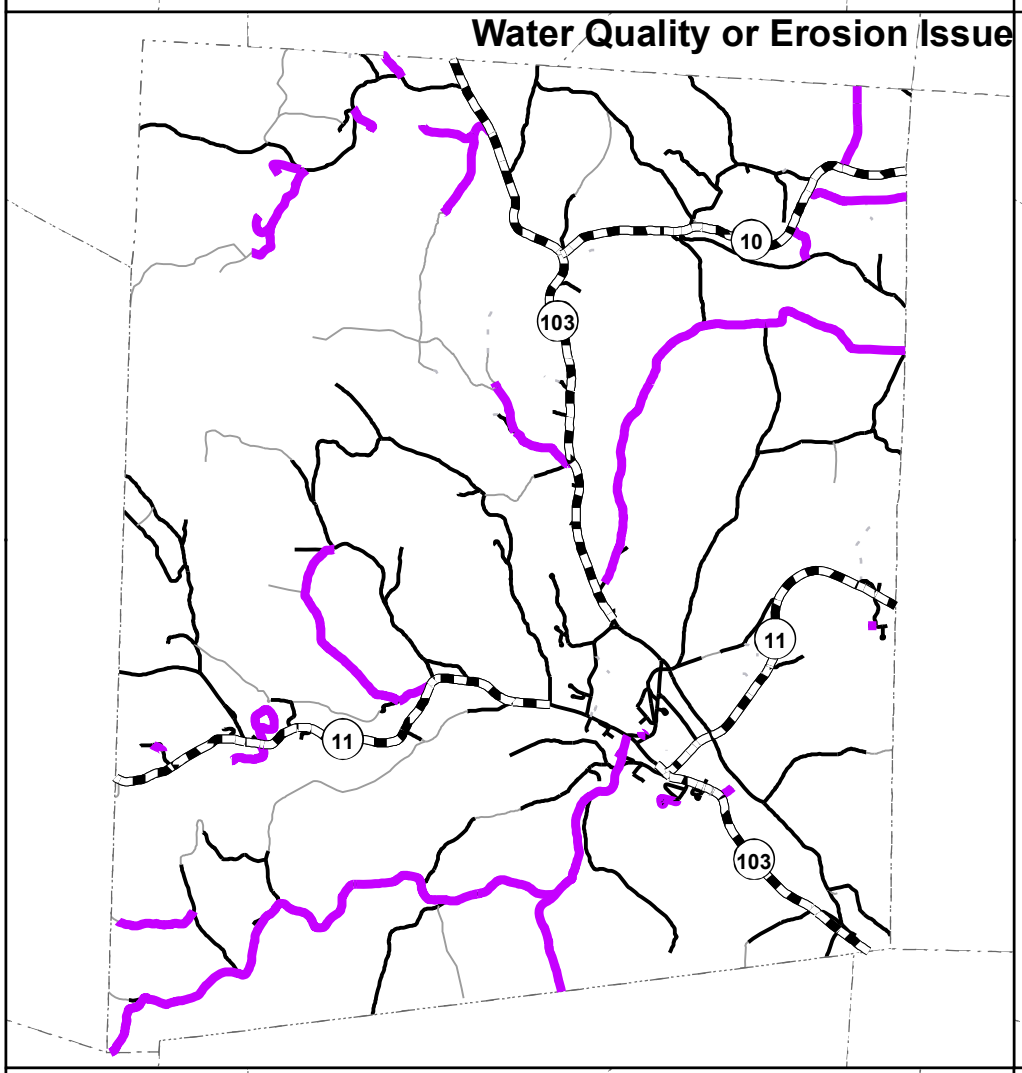
Data source: Road inventory by SWCRPC and Town October 2015.
Road centerline - VTrans 2015

N

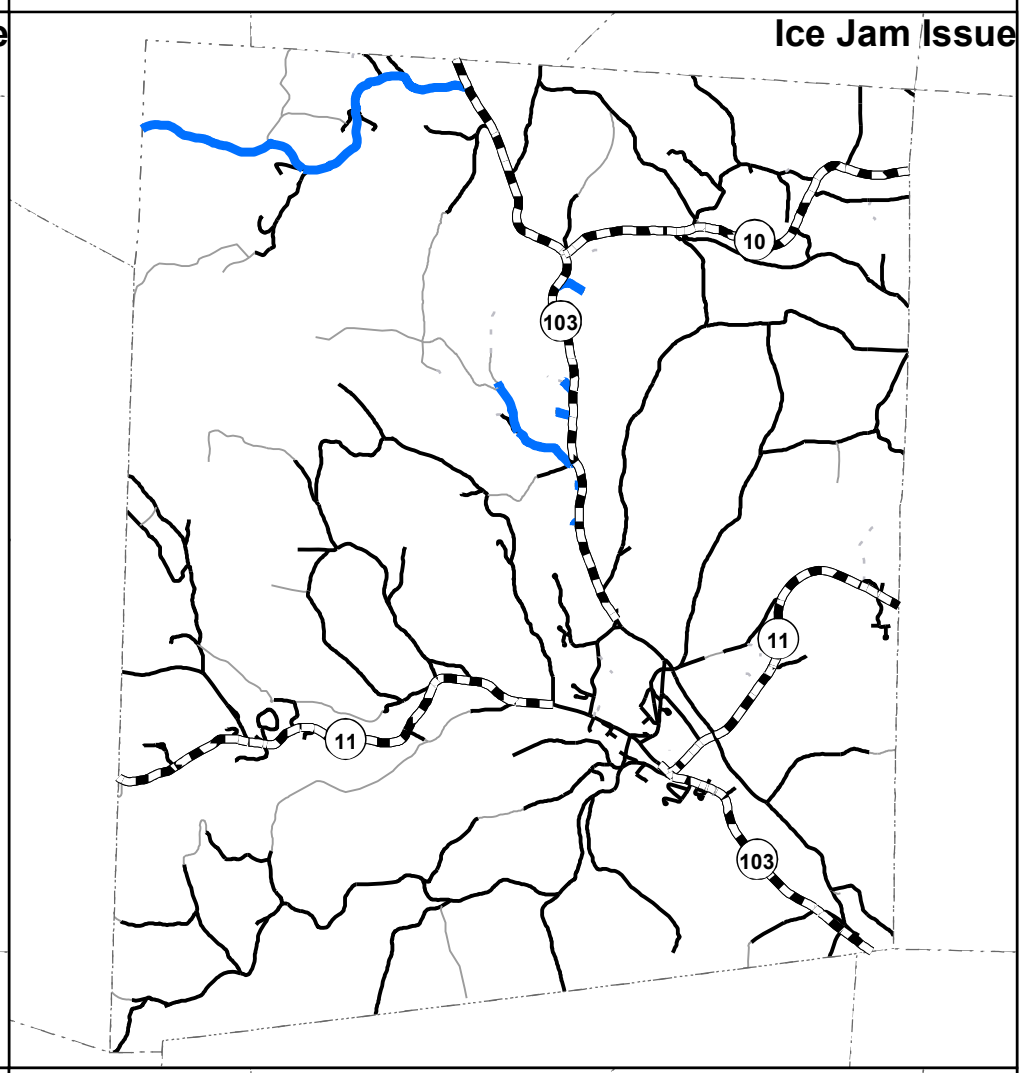
0 0.5 1 2 Miles

SWCRPC
SOUTHERN WINDSOR COUNTY REGIONAL PLANNING COMMISSION
P.O. Box 320, Ascutney, VT 05030
802-674-9201 www.swcrpc.org

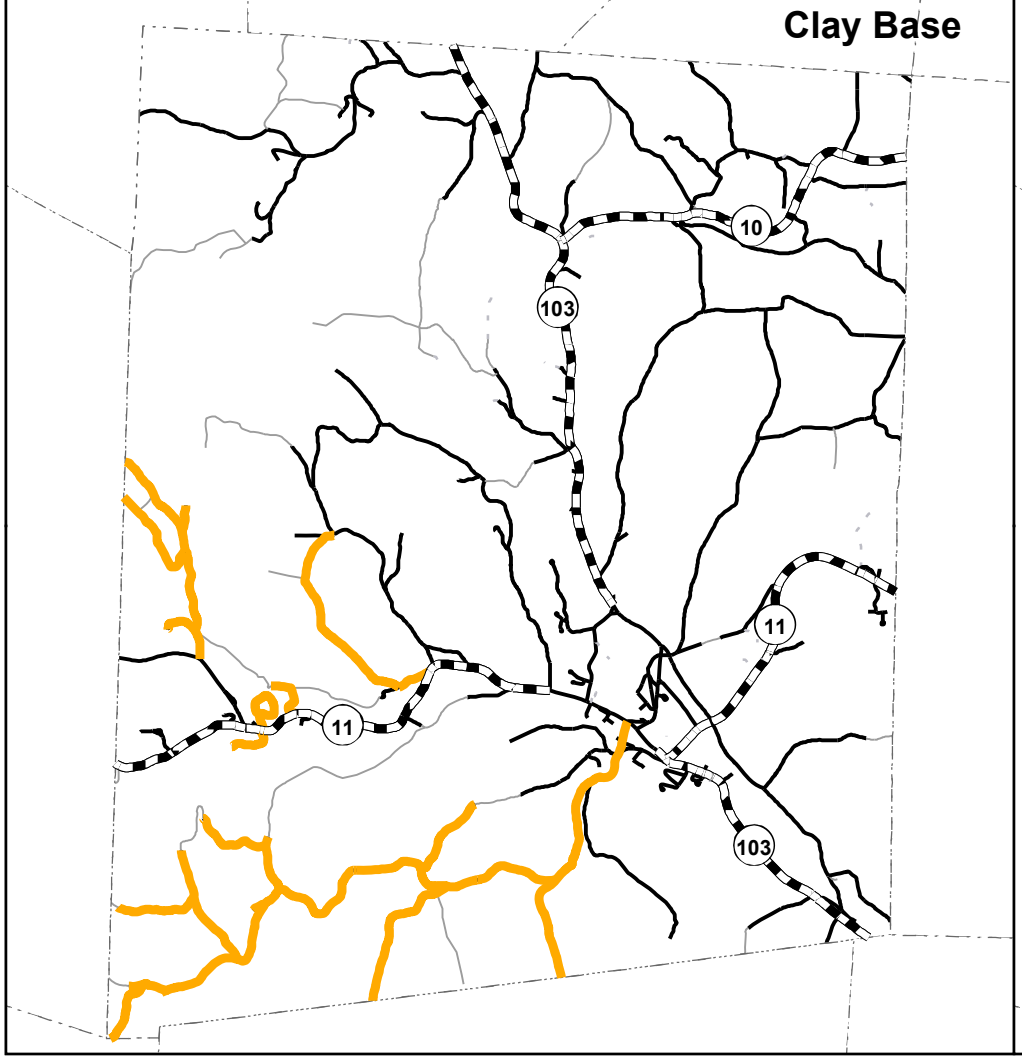
Water Quality or Erosion Issue



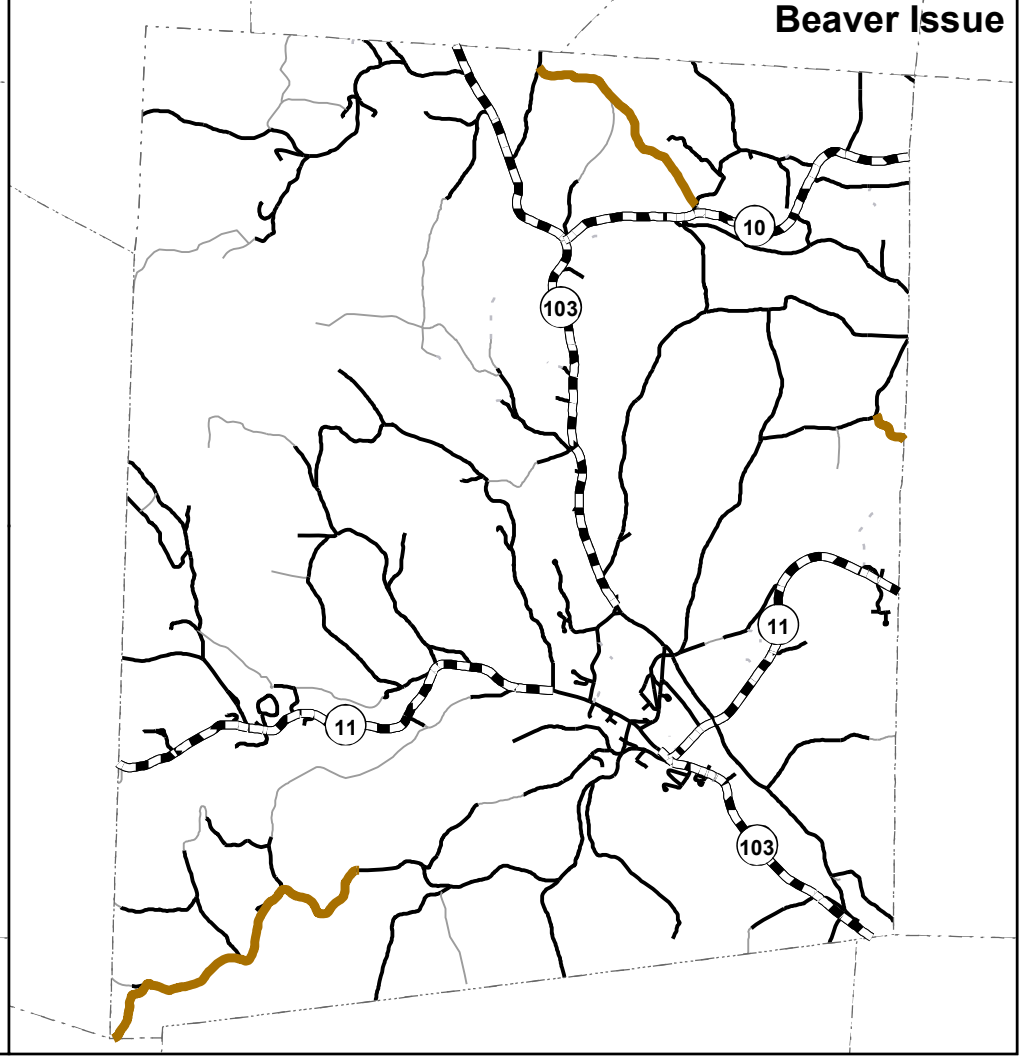
Ice Jam Issue



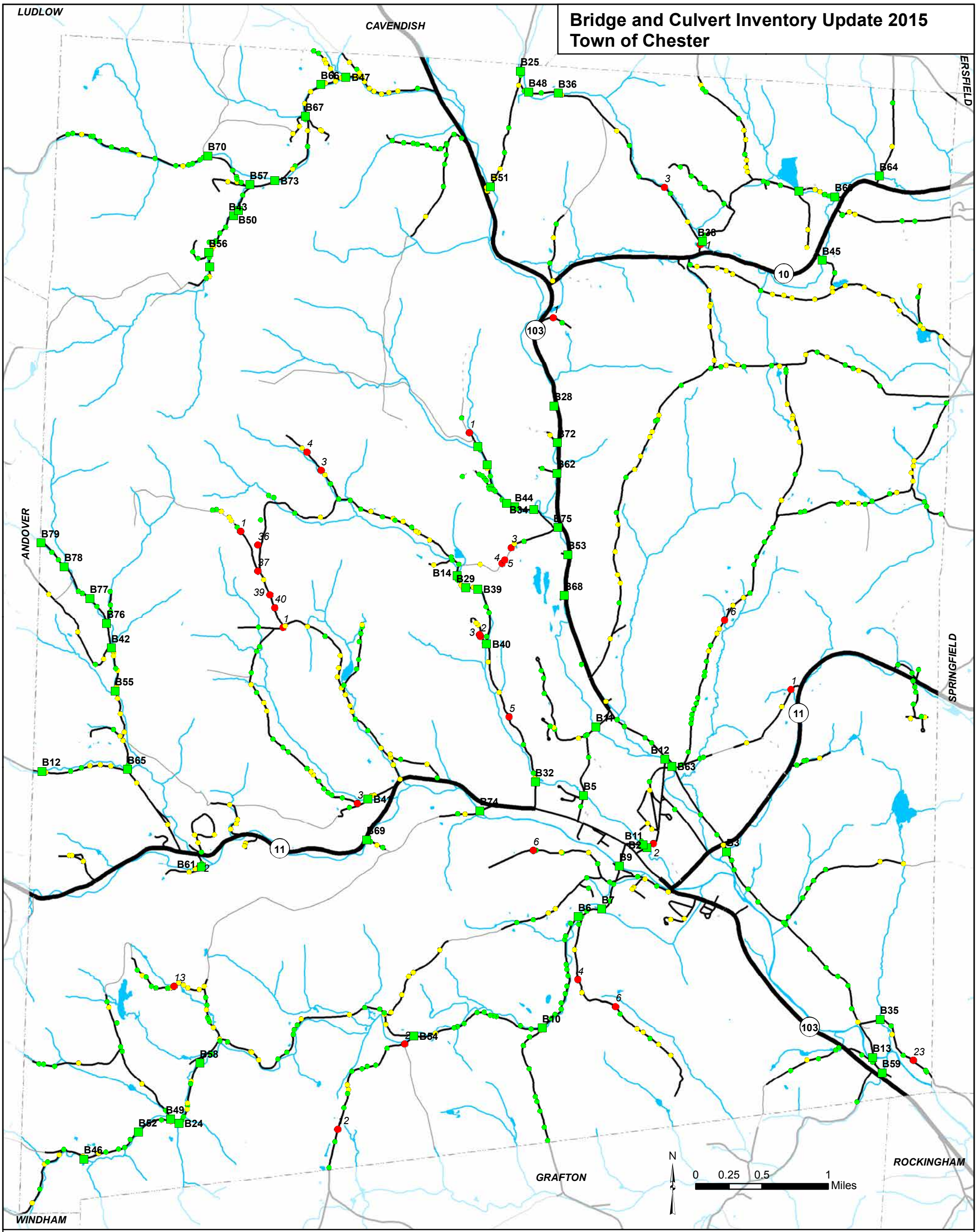
Clay Base



Beaver Issue



Bridge and Culvert Inventory Update 2015
Town of Chester



- Bridge
- Culvert in good or excellent condition
- Culvert in fair condition
- Culvert in critical, poor or unknown condition
- VT State Highway
- Class 1, 2 or 3 Town Highway (without notable issue or in another town)
- Class 4 Town Highway
- Legal Trail
- Private Road
- River or Stream
- Lake or Pond
- Town Boundary

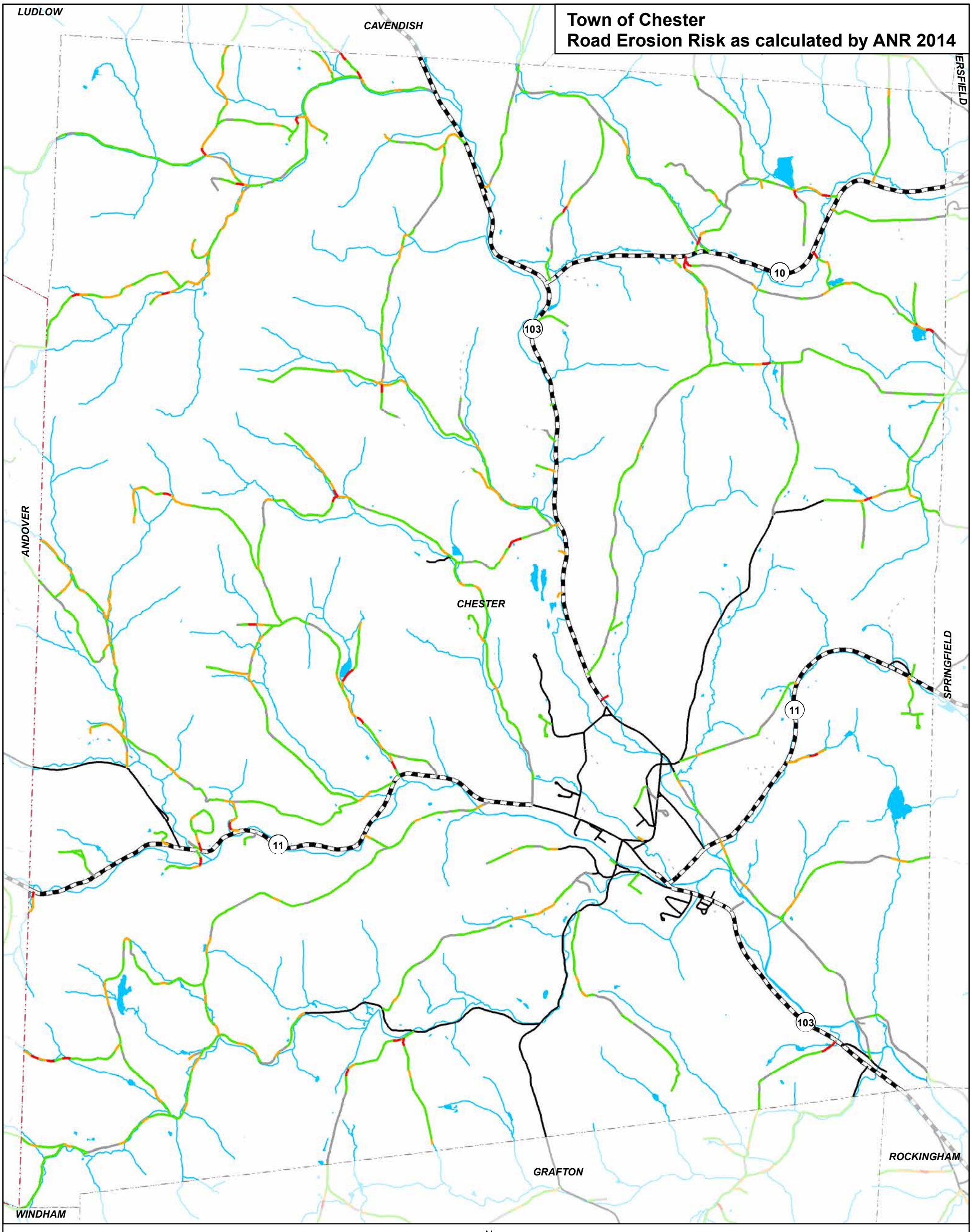
VT State Plane, Meters, NAD 83.
For planning purposes only.
Not for regulatory interpretation.

Map drawn: December 14, 2015

Data source: Road locations from VTrans 2015. Culvert and bridge data updated Fall 2015 and is available from www.vtculverts.org

SWCRPC
SOUTHERN WINDSOR COUNTY REGIONAL PLANNING COMMISSION
P.O. Box 320, Ascutney, VT 05030
802-674-9201 www.swcrpc.org

Town of Chester
Road Erosion Risk as calculated by ANR 2014



Road Erosion Risk (ANR)
(Unpaved roads only)

- High risk
- Moderate risk
- Low risk
- No data or no risk

Other roads

- VT State Highway
- Class 1, 2 or 3 Town Highway (paved surface or in another town)
- Class 4 Town Highway
- Legal Trail
- Private Road

- River or Stream
- Lake or Pond
- Town Boundary

N

0 0.25 0.5 1 Miles

Road erosion risk was calculated for the VT Agency of Natural Resources in 2014. Risk was calculated for unpaved roads and some long driveways. Paved roads are not included in the assessment. Long driveway assessment is not shown on this map.

Locations were identified based on a variety of site factors including but not limited to slope, water features, and soils. Site factors were linked to constraint values and totaled to determine priority ranking from low to high.

For more information about the methodology see http://anrmaps.vermont.gov/websites/vgisdata/layers_anr/metadata/TransRoad_EROSIONRISK.txt

VT State Plane, Meters, NAD 83.
For planning purposes only.
Not for regulatory interpretation.

DRAFT Map drawn: October 21, 2015

Data source: Road locations from VTrans 2014. Road erosion risk calculated by ANR in 2014.

SWCRPC
SOUTHERN WINDSOR COUNTY
REGIONAL PLANNING COMMISSION
P.O. Box 320, Ascutney, VT 05030
802-674-9201 www.swcrpc.org

Quick Guide to Funding Sources for Transportation Projects

Southern Windsor County, Vermont

Last Updated July 2015

SWCRPC
SOUTHERN WINDSOR COUNTY REGIONAL PLANNING COMMISSION

Program	Website/ More info	Agency	Contact	Type	Local Match	Use and Eligibility	Notes
HIGHWAY, BRIDGES OR CULVERTS							
Town Highway Grants	Orange Book	VTrans	DTA	Annual allocation (mileage based)	None	TH & bridge maintenance for Class 1, 2 & 3 TH	
TH Class 2 Roadway Program	Orange Book	VTrans	DTA	Grant from DTA	30% or less	Resurfacing and reconstruction for Class 2 TH	Up to $150k per project
TH Bridge Program	Orange Book	VTrans	Mike Hedges, Katharine Otto	Managed by VTrans	10% or less	Major rehabilitation or reconstruction of any structure over 6ft on Class 1, 2 & 3 TH	Pre-Candidate regional ranking in Jan/Feb each year. Project choice is initiated by VTrans
TH Structures Program	Orange Book	VTrans	DTA	Grant from DTA	20% or less	Bridge maintenace, preservation or repair of any structure over 6ft on Class 1, 2 & 3 TH	Up to $175k per project
Adaptive Use Bridge Program	http://historicbridges.vermont.gov/program-documents	VTrans	Sue Scribner	Unknown	20%	Rehabilitation of historic metal trus bridge for adaptive re-use (Bike-ped)	
Better Backroads Program (Category B)	http://vtransengineering.vermont.gov/bureaus/mab/better-back-roads	VTrans	Alan May	Competitive Grant	20%	Correction of road and culvert related erosion problems	Up to $10k per project. Water quality and erosion focus. Applications due Spring/ early summer
Hazard Mitigation Grant Program (HMGP)	http://vem.vermont.gov/mitigation	FEMA	Ray Doherty	Competitive Grant	25%	Any project that prevents future loss due to natural disaster	Deadlines happen at a variety of times depending on the "round" of funding.
Flood Mitigation Assistance program (FMA)	www.fema.gov/flood-mitigation-assistance-program	FEMA	Ray Doherty	Competitive Grant	Depends	Reduce or eliminate risk of flood damaged to buildings under National Flood Insurance Program (NFIP)	
Pre Disaster Mitigation Program	www.fema.gov/pre-disaster-mitigation-grant-program	FEMA	Ray Doherty	Competitive Grant	Depends	Reduce risk to people and structures	
Emergency Watershed Protection Program	http://www.nrcs.usda.gov/wps/portal/nrcs/main/vt/programs/planning/ewpp/	NRCS	Jennifer Varin	Unknown	25% or more	Undertake emergency measures to safeguard lives and property from flood and erosion after a watershed is suddenly changed by natural disaster	
State Infrastructure Brank	http://www.veda.org/financing-options/other-financing-option/state-infrastructure-bank-program/	VTrans & VEDA	Karen Songhurst	Loan	N/A	Any transpotration project that is eligible for federal funds	Can apply for funds at any time
PARK AND RIDE LOTS							
Muncipal Park and Ride Program	http://vtransengineering.vermont.gov/bureaus/mab/local-projects/parkandride	VTrans	Wayne Davis	Competitive grant	None	Small municipally owned and maintained P&R facilities near state highway	Applications due July/ August

Program	Website/ More info	Agency	Contact	Type	Local Match	Use and Eligibility	Notes
BICYCLE AND PEDESTRIAN FACILITIES							
Transportation Alternatives Grant Program (TAP)	http://vtransengineering.vermont.gov/bureaus/mab/local-projects/transportation-alternatives	VTrans	Scott Robertson	Competitive grant	20% min.	Bicycle and Pedestrian facilites, Safe Routes to School infrastructure, and some other projects. New emphasis in 2015 for stormwater related projects	Formerly "Transportation Enhancements". Up to $300k per project. All projects evaluated against federal criteria. Applications due Sept/ Oct
Vermont Bicycle and Pedestrian Program	http://vtransengineering.vermont.gov/bureaus/mab/local-projects/bike-ped	VTrans	Jon Kaplan	Competitive grant	10%	Bicycle and Pedestrian facilites, scoping, design and construction	Applications due June/ July
Recreation Trails Grant Program	http://fpr.vermont.gov/recreation/grants/rtp	DFPR	Sherry Winnie	Competitive grant	20% min.	Maintenance, restoration and construciton of recreational trails	Applications due Jan/ Feb
VARIETY OF PURPOSES							
Better Backroads Program (Category A)	http://vtransengineering.vermont.gov/bureaus/mab/better-back-roads	VTrans	Alan May	Competitive Grant	20%	Transportation inventories and capital budgets	Up to $4k per project. Water quality and erosion focus. Applications due Spring/ early Summer
Downtown Transportation Fund Grant	http://accd.vermont.gov/strong_communities/opportunities/funding/downtown_transportation_fund	DHCD	Gary Holloway	Competitive Grant	50%	Transportation improvements in Designated Downtown	Up to $100k per town per year. Applications due March
Strong Communities, Better Connections (SCBC) Program	http://vtransplanning.vermont.gov/programs/scbc	VTrans/ DHCD	Jackie Cassino, Rich Amore	Competitive Grant	Unknown	Focus on transportation, land use and Livability	Pilot launched in 2014
Transportation Planning Initiative	http://swcrpc.org/transportation/	SWCRPC	Katharine Otto	Discretionary	Depends	Inventories, capital budgets, counts, any transportation planning project	Depends on needs and available funds/ staff
Vermont Local Roads (VLR) (LTAP)	http://vermontlocalroads.org/	VTrans	Kevin Gadapee	Local Technical Assistance	None	Information, training and technical assistance	
Community Development Block Grant	http://accd.vermont.gov/strong_communities/opportunities/funding/cdbgdr	ACCD	Cindy Blondin				
Ecosystem Restoration Program (formerly "Clean and Clear")	http://www.watershedmanagement.vt.gov/grants.htm	ANR	David Pasco	Competitive Grant	Depends	Includes a project category for "Road-related runoff or erosion mitigation"	2 rounds of applications per year - Spring and Fall. Project needs a connection to River/ Basin Plan.
Municipal Planning Grant (MPG)	http://accd.vermont.gov/strong_communities/opportunities/funding/overview/municipal_planning_grants	ACCD	Annina Seiler	Competitive Grant		Can be used for capital budget planning and downtown master plans - both of which have transportation components	Applications due end of September each year

VTrans Orange Book - A Handbook for Local Of *http://vtransoperations.vermont.gov/sites/aot_operations/files/documents/AOT-OPS_OrangeBook.pdf*

Abbreviations

FEMA	Federal Emergency Management Agency
DEMHS	Dept of Emergency Management and Homeland Security
VEDA	VT Economic Development Authority
DFPR	VT Dept of Forests, Parks and Recreation
DHCD	VT Dept of Housing and Community Development
DTA	VTrans District Transportation Administrator
EPA	Environmental Protection Agency
HMGP	Hazard Mitigation Grant Program
Hwy	Highway
LTAP	Local Technical Assistance Program
MAB	VTrans Municipal Assistance Bureau
NRCS	US Dept of Agriculture Natural Resources Conservation Service
SCBC	Strong Communtiies, Better Connections Program
SWCRPC	Southern Windsor County Regional Planning Commission
TAP	Transportation Alternatives Program
TH	Town Highway
VLR	Vermont Local Roads
VTrans	Vermont Agency of Transportation
ANR	Vermont Agency of Natural Resources

Contact Info

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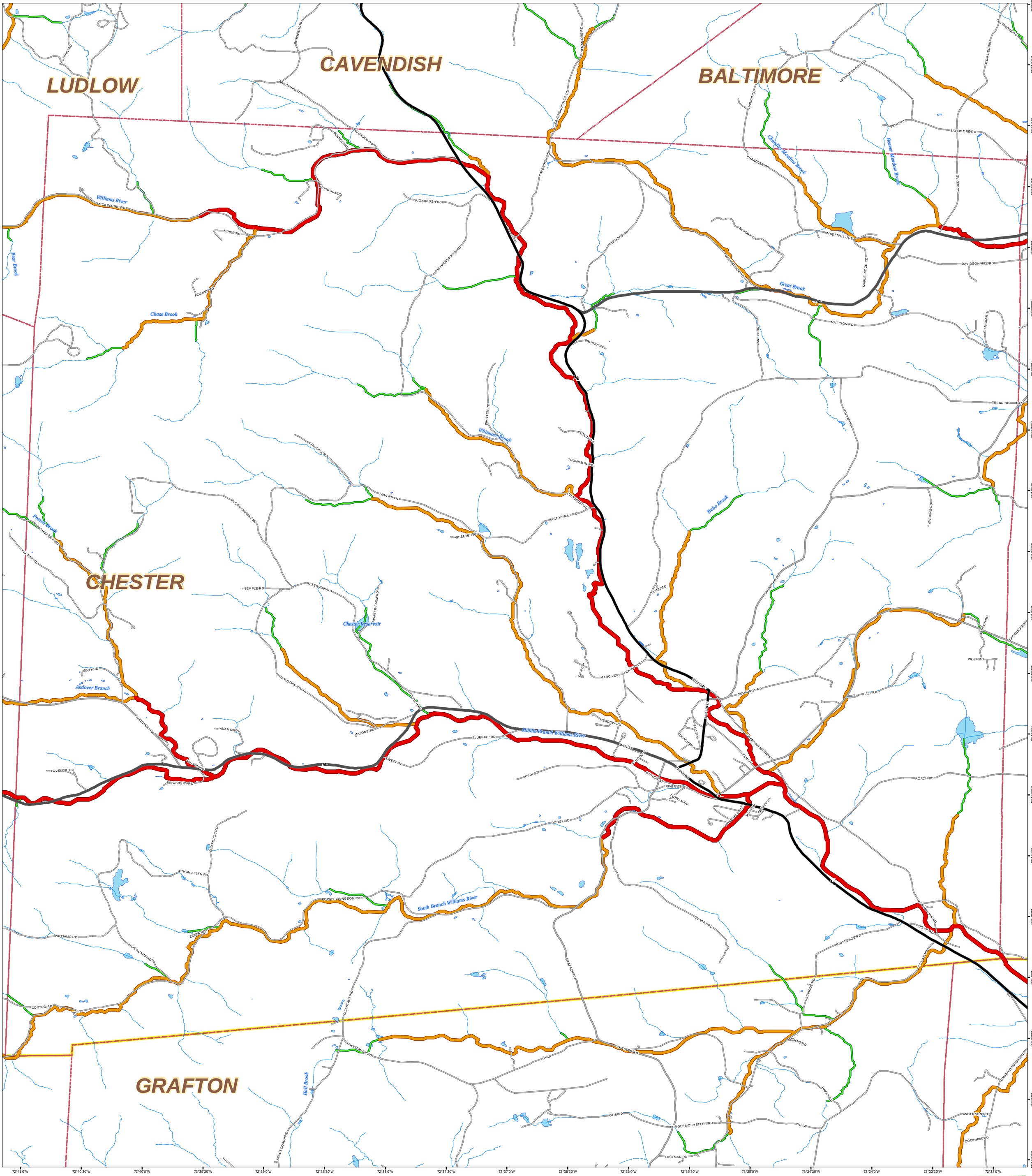
Sue Scribner (VTrans MAB)	sue.scribner@vermont.gov
Katharine Otto (SWCRPC)	kotto@swcrpc.org
Jon Kaplan (VTrans)	jon.kaplan@vermont.gov
Kevin Gadapee (VTrans VLR)	kevin.gadapee@vermont.gov
Sherrie Winnie (DFPR)	sherry.winnie@vermont.gov
Scott Robertson (VTrans MAB)	scott.robertson@vermont.gov
Tammy Ellis (VTrans District 2 & 4)	tammy.ellis@vermont.gov
Robert Faley	robert.faley@vermont.gov
Karen Songhurst	karen.songhurst@vermont.gov
Gary Holloway	gary.holloway@vermont.gov
Jennifer Varin (NRCS Windsor County)	802-775-8969 x 14
David Pasco (ANR)	david.pasco@vermont.gov
Cindy Blondin (ACCD)	cindy.blondin@vermont.gov
Annina Seiler	annina.seiler@vermont.gov

District Transportation Administrator (DTA)

District 2 - Tammy Ellis	Andover, Baltimore, Cavendish, Chester, Springfield, Weathersfield
District 3 - Robert Faley	Ludlow
District 4 - Tammy Ellis	Reading, West Windsor, Windsor

Watershed Sizes Used as Guidance in Stream Alteration Regulations

CHESTER



Map Disclaimer

This map represents guidance on watershed sizes using data and methods that have a certain amount of error associated with them. The accuracy of watershed sizing maps using the Vermont Hydrography Data Set and produced with computer automated methods may be exceeded by other methods using more accurate data. The regulated public may request River Management Program (RMP) approval, or the RMP may decide, to use watershed sizes based on more accurate methods and data.

0 0.2 0.4 0.8 1.2 1.6 Miles

Map Description

This map product indicates the reaches of stream and river in a given town that would be at or below the 0.5, 1.0, and 10.0 square mile watershed thresholds used for jurisdictional determinations under the Vermont ANR Stream Alteration Regulatory Program.

RMP contacts and information about the Stream Alteration GP may be obtained at:
http://www.anr.state.vt.us/dec/waterq/rivers/htm/rv_management.htm

Map Created by, Erik Engstrom. ANR GIS. April 1st, 2011.

LEGEND

Roads
- Principal Arterial
- Minor Arterial
- Urban
- Rural
- Local

Drainage Area
- >10 Square Miles
- 1 - 10 Square Miles
- .5 - 1 Square Mile
- <.5 Square Mile
- Lake/Pond

- VT Town Boundaries
- VT County Boundary

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION