STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

NORTON BF 0321(21)

VT ROUTE 114, BRIDGE 41 OVER NUMBER FIVE BROOK

December 21, 2023

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I. Site Information

Bridge 41 is a State-owned bridge located on VT Route 114 in the Town of Norton approximately 1.8 miles South of the International United States/Canadian border. The existing conditions were gathered from a combination of a Site Visit, the Inspection Report, the Route Log and the existing Survey. See correspondence in the Appendix for more detailed information.

Roadway Classification	Major Collector
Bridge Type	Corrugated Galvanized Multi Plate Pipe (CGMPP)
Culvert Span	10-foot diameter
Culvert Length	80 feet
Average Cover	11 feet
Year Built	1957
Ownership	State of Vermont

Need

Bridge 41 carries VT Route 114 across Number Five Brook. The following is a list of deficiencies of Bridge 41 and VT Route 114 in this location:

1. The culvert is in Poor condition:
    a. There is corrosion along the lower panels causing heavy deformation and squashing towards the northern direction. Voids are present throughout the length of the pipe causing sediment/backfill loss behind various panels.
    b. The CGMPP has a concrete invert treatment that is in poor condition. The concrete invert is missing throughout half of the structure on the downstream end with heavy concrete breakup, and exposed steel reinforcing bars along the upstream end.
    c. Large perforations have formed along lower portions of the southern side of the culvert wall causing the pipe to deform/crush with piping occurring. The piping has caused settlement in the roadway with asphalt patching present over the structure mainly in the southern travel lane.
    d. The channel on the downstream end of the pipe has a large scour pool with some slight erosion along the embankments.
2. The existing culvert does not meet the measured bank full width of Number Five Brook.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2028 and 2048.

TRAFFIC DATA	2028	2048
AADT	508	557
DHV	80	90
%T	11.5	14.2
%D	63	63
ADTT	76	103
Flexible ESALS:	**2027~2047**	**2027~2067**
	709,000	1,501,000

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on an ADT of 557 veh/day, a DHV of 90 veh/hr, and a design speed of 50 mph for a Major Collector.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Roadway Lane and Shoulder Widths	VSS Table 5.3	3'/12'/12'/3' (30') with guardrail	11' lanes /3' shoulders (28') [1]	Exceeds minimum standard
Clear Zone Distance	VSS Table 5.5	Guardrail on both shoulders	12' fill / 8' cut	
Banking	VSS Section 5.13	1.8% to 3.6%	8% (max)	
Speed	VSS Section 5.3	50 mph (Posted)	50 mph (design)	
Horizontal Alignment	AASHTO Green book Table 3-10b	R = 1,153'	R_{min} = 3,090' @ 3.6%	
Vertical Grade	VSS Table 5.6	-2.6%; 3.8%	6% for level terrain, 7% for rolling terrain	Culvert located in a slight sag in roadway
K Values for Vertical Curves	AASHTO Table 3-37	K_{sag} = 47	84 crest / 96 sag	
Vertical Clearance	VSS Section 5.8	No Issues Noted	14'-3" (min)	
Stopping Sight Distance	AASHTO Table 3-37	242' (Headlight Sight Distance)	425'	
Bicycle/Pedestrian Criteria	VSS Table 5.8	3' shoulder (with guardrail)	3' (min) paved shoulders	Meets minimum standard
Hydraulics	VTrans Hydraulics Section	HW/D @ 2% AEP = 1.1 HW/D @ 1% AEP = 1.3 Span: 10 feet	HW/D $\leq$ 1.2 @ 2% AEP HW/D $\leq$ 1.5 @ 1% AEP Minimum Bankfull Width: 22 feet	Substandard BFW
Structural Capacity	SM, Ch. 3.4.1	Structurally Inadequate	Design Live Load: HL-93	Poor rated culvert and asphalt patches over SB lane due to settlement

Inspection Report Summary

Culvert Rating 4 Poor
Channel Rating 6 Satisfactory

10/07/2022 Structure corrosion along the southern wall has progressed enough to allow for pipe deformation / crushing and is now in poor condition with a 12-month inspection cycle. Panels #3 through #6 along the southern side of pipe have large perforations causing the pipe to deform / crush with piping occurring. Large perforations allow sediment / backfill loss causing scattered piping (voids) to be present behind panels #3 through #7. Downstream half of panel #4 has less severe voiding along with small sections of panel #7. Voids start ~26'-0" from the upstream end along the southern side of pipe (Panel #7). Largest / heaviest piping / voids are present between panels #4 halfway up to the end if panel #6. Downstream end has a large scour pool on the downstream side with some slight erosion along the embankments with upper portions being undercut and having scattered boulders and good brush growth. (SMP)

10/31/2018 Barrel has heavy rust scaling with pitting and section loss. Perforations scattered throughout the invert. Invert has pitting with perforations throughout the invert. Laid concrete has

[1] The Vermont State Standards specifies a minimum width of 10'/2' (24') for safety and service. Per HSDEI 11-0004, the minimum paved width shall be 28' for winter maintenance activities.

heavy break up w/ abrasion, exposed rebar, and the lower half section is missing. Piping has occurred. Large scour hole at the outlet end due to damming caused by large boulders and tree debris. Some minor erosion at outlet end. The concrete invert needs replacing; piping is occurring due to perforations throughout. (MAC/SMP)

Hydraulics

The existing structure does meet current standards of the VTrans Hydraulic Manual. However, it does not meet the state stream equilibrium standards for bankfull width (span length). The existing structure constricts the channel width, as it does not meet the 22-foot bankfull width, resulting in an increased potential for debris blockage. This structure results in a headwater depth of 11.1 feet at 2% AEP and 12.5 feet at 1% AEP. VTrans Hydraulics has made recommendations for a replacement structure; these options are outlined in the preliminary hydraulics report in Appendix D.

Utilities

The existing utilities are shown on the Existing Conditions Layout Sheet, and are as follows:

Aerial:

- Vermont Electric Cooperative (3 phase lines)
- Consolidated Communications
- NEK Broadband
- Vermont Telephone Company

The electric and communication aerial utility lines run parallel to VT Route 114 along the west side of the road. There is an aerial communication service line that crosses over VT Route 114 about 55 feet south of Bridge 41.

Underground:

- Consolidated Communications

The underground communications line has an underground drop on a pole located approximately 375 feet north of Bridge 41. The underground utilities appear to run to the north from this pole.

It is anticipated that all aerial and underground utilities will need to be relocated for construction of the preferred alternative.

Right Of Way

The existing Right-of-Way (ROW) is plotted on the Existing Conditions Layout Sheet. Both the structure inlet and outlet are located outside of the existing State-owned ROW. It is anticipated that additional rights will need to be acquired for any construction alternative.

Environmental and Cultural Resources

The environmental resources present at this project are shown on the Existing Conditions Layout Sheet, and are as follows:

Biological:

The VTrans Biologist performed a natural resource evaluation at this site. For additional information on all natural resources, see the Existing Conditions Layout Sheet and the Natural Resources Memo in Appendix G.

Wetlands/Watercourse

There is one known Class II freshwater forested/shrub wetland complex mapped on the VSWI, Advisory Wetland Mapping and USFWS Wetland Mapper databases. A site visit and wetland delineation were completed on 6/20/2023 and determined that the wetland boundaries are closer to the road on the northbound (downstream) side than was previously mapped. Wetlands were also identified on the upstream side of the structure on both the eastern and western banks. This additional area of the wetland was mapped and added to the Existing Conditions Layout Sheet.

The watercourse, Number Five Brook, flowing through Bridge 41 was identified as a perennial stream and a tributary of the Coaticook River.

Rare, Threatened, and Endangered Species

The USFWS IPaC website and the ANR atlas were queried for RTE species. The USFWS IPaC lists the endangered northern long-eared bat (*Myotis septentrionalis*), and the threatened Canada lynx (*Lynx canadensis*). There are no critical habitats within this project area listed under this jurisdiction. The project was run through the FHWA determination key on the IPaC website, and the project will likely have no effect on the northern long-eared bat, but it may affect the Canada lynx.

Wildlife Habitat

The project is just south of a deer wintering area and east of a very large habitat block. Number Five Brook has the capacity for Aquatic Organism Passage (AOP) passage. Moose and racoon tracks were recorded near the project location during a site visit on 6/20/2023, indicating the species are prevalent in the area. The terrestrial passage screening tool indicated that the area ranks high for wildlife connectivity.

Archeological:

The VTrans Senior Archaeologist conducted a field visit to Bridge 41 on June 20, 2023 in order to identify areas of archaeological sensitivity within a broad area adjacent to the existing structure. No areas of archaeological sensitivity were observed during the field visit and no concerns are anticipated associated with project activities.

Historic:

Bridge 41 is not historic, and no other historic properties were identified within a likely project area of potential effect.

Hazardous Materials:

There aren't any Hazardous Wastes Sites identified within the project area.

Stormwater:

It is not expected that an Operational Stormwater permit will be required for this project, unless there is greater than 0.5 acres of impervious area that is redeveloped for this project. There do not appear to be any existing stormwater permits near the project location, nor are there any impaired (303(d) list) or stressed waters.

It is encouraged that drainage work associated with this project, particularly around any ditching and culvert work, be aligned with the VTrans Phosphorus Control Highway Drainage Management Standards, as this may allow future credit toward achieving phosphorus reduction goals required by the Agency's TS4 permit.

Landscape Clearance

The VTrans Landscape Architect conducted a resource identification study in August of 2023. Minimal tree clearing and disturbance to riparian buffer zones were recommended. Trees and gardens at two residences near the project area shall be protected during construction practices. It was also recommended to improve accommodation for bicyclists within the project area per the 2014 Norton Municipal Plan.

II. Safety

There have been 13 crashes along VT Route 114 in Norton in the last five-year period (2017 to 2022). None of those crashes were within approximately 1 mile of the project area. The structure is not located within a designated high crash location section based on the High Crash Location Report 2012-2016 (ranked 515 out of 772).

Legend
✖ = project location
● = recorded crash site

III. Local Concerns

A local concerns questionnaire was sent to the Town of Norton. The Town of Norton sent a reply and didn't have any concerns or issues with the project, but they did provide some comments in the Pedestrians and Bicyclists sections of the questionnaire. There is a copy of the questionnaire in Appendix N.

IV. Operations Concerns

An Operations questionnaire was sent to the VTrans Maintenance District 9. The district sent back the completed questionnaire and didn't have any concerns or issues with the project. They did provide comments on some subsurface work they did in 2022 to fill voids that had developed above the culvert and caused settlement in the road. Additionally, they mentioned a history of slope stabilization issues and road surface work at this location. There is a copy of the questionnaire in Appendix O.

V. Maintenance of Traffic

The Vermont Agency of Transportation has created an Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right of Way, as well as faster construction of projects in the field. One practice that helps in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the

intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects early. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements in new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Construction should provide enhanced safety for the workers and the travelling public while maintaining project quality. The following options have been considered:

Option 1: Off-Site Detour

This option would close the bridge and reroute traffic onto an official, signed State detour. The available State and Local detours are limited due to the extremely rural and isolated location of VT Route 114 in this area. The one potential State-signed detour is as follows:

1. VT Route 114, to VT Route 102, to VT Route 105, back to VT Route 114.
    a. End-to-End Distance = 66.6 miles
    b. Through Distance = 16.2 miles
    c. Detour Distance = 50.4 miles
    d. Added Distance = 34.2 miles

This State detour would be a very long distance to detour traffic during construction and could cause a great deal of difficulty and hardship to travelers and businesses in the area by putting motorists over 50 miles out of their way. There is no available local bypass for this location.

A map of the detour routes can be found in Appendix P.

Advantages: This option would have minimal impacts to natural resources located downstream of the structure. This option reduces the time and cost of the project both at the development stage and construction. This is the safest traffic control option since the traveling public is removed from the construction site.

Disadvantages: Traffic flow would not be maintained through the project corridor during construction. With such a long State detour route, there would be major impacts to motorists and truck traffic traveling across the United States/Canadian international border and along the VT Route 114 corridor, if chosen.

Option 2: Phased Construction

Phased construction is the maintenance of traffic on the existing bridge while building one lane at a time of the proposed structure. This allows keeping the road open during construction, while having minimal impacts to adjacent property owners and environmental resources.

While the time required to develop a phased construction project would remain the same, the time required to complete a phased construction project increases because some of the construction tasks have to be performed multiple times. In addition to the increased design and construction costs mentioned above, the costs also increase for phased construction because of the inconvenience of working around traffic and the effort involved in coordinating the joints between the phases. Another negative aspect of phased construction is the decreased safety of the workers and vehicular traffic, which is caused by increasing the proximity and extending the duration that workers and moving vehicles are operating in the same confined space. Phased construction is usually

considered when the benefits include reduced impacts to resources and decreased costs and development time by not requiring the purchase of additional ROW.

Based on the current AADT and DHV of 557 veh/day and 90 veh/hr respectively, one-way traffic alternating could be maintained throughout construction without considerable delay. One-way traffic could be maintained with phased construction based on roadway widths during construction. Due to the poor condition of the existing culvert, cutting the culvert in sections while it is under live loading presents additional risk to the project.

Advantages: One-way traffic flow would be maintained through the project corridor during construction. Also, this option would have minimal impacts to adjacent properties and natural resources. Less Right-of-Way acquisition would be required for this maintenance of traffic option.

Disadvantages: Phased construction generally involves higher costs and complexity of construction. Costs are usually higher and construction duration is longer since many construction activities must be performed twice. Additionally, since cars are traveling near construction activity, there is decreased safety.

Option 3: Temporary Bridge

From a constructability standpoint, a temporary bridge could be placed either upstream or downstream of the existing structure. A temporary bridge on either the upstream (southeast) or downstream (northwest) side of the road would require major tree clearing efforts, wetland impacts, and relocation of utilities.

Additional costs would be incurred to construct a temporary bridge, including the cost of fill for the approaches and the bridge itself, installation and removal of the temporary bridges and approaches, restoration of the disturbed area, and the time and money associated with the temporary Right-of-Way and wetland permits.

If a temporary bridge is chosen as the preferred method of traffic control, based on the traffic volumes, it should be a signalized one-lane bridge. See the Temporary Bridge Layout Sheets in Appendix Q.

Advantages: Traffic flow can be maintained along the VT Route 114 corridor.

Disadvantages: This option would require multiple utility relocations and would have adverse impacts to wetlands and other natural resources. There would be decreased safety for the workers and to vehicular traffic, because of cars driving near the construction site, and construction vehicles entering and exiting the construction site. This traffic control option would be more costly and time-consuming than an offsite detour. Additional Right-of-Way would need to be acquired for a temporary bridge either up or downstream.

VI. Alternatives Discussion

No Action

This alternative is not recommended. The culvert is in poor condition and will continue to deteriorate if no action is taken. The existing culvert is starting to deform due to continued corrosion

along the lower panels of the plate pipe. The concrete invert is also in poor condition with the concrete missing through half of the structure and large perforations forming along lower portions of the culvert wall causing piping and voids to form. The piping has caused settlement in the roadway with need for an asphalt patch above the culvert in the southern lane. In the interest of safety to the traveling public, the No Action alternative is not recommended. No cost estimate has been provided for this alternative since there are no immediate costs.

Rehabilitation

This alternative involves the rehabilitation of the existing corrugated metal pipe structure.

Rehabilitation options considered:

a. Pipe Liner
b. Spray-On Liners

All rehabilitation options would employ the use of hydroblasting or hydrodemolition to appropriately clean the existing pipe interior prior to rehabilitation. In addition to cleaning, some grouting would be needed to plug holes in the pipe and fill all voids on the outside of the pipe. Curing in dry conditions would be required in most cases, necessitating a re-routing of the stream flow during the work and for a prescribed curing period (usually 24 hours). A headwall with beveled inlets would be recommended for all rehabilitation alternatives.

a. Pipe Liner

A pipe liner involves inserting a culvert liner into the existing culvert and grouting between the two. Slip lining can be done using several different types of pipe material including corrugated steel, aluminum, reinforced concrete, and polyethylene, and can restore the structural integrity of the culvert. The outside diameter of the pipe used for slip lining is generally specified to be at least 4 inches smaller than the inside diameter of the host pipe to allow the grout to be injected into the annular space between the two pipes. A liner option is anticipated to have the longest life expectancy of the rehabilitation alternatives, since the grout provides an increased structural capacity, prevents liner collapse, prevents fatigue failure, stabilizes the pipe, extends the design life from uncertainty to approximately 50 years, and resists temperature changes.

b. Spray-On Liners

Spray-On liners provide a new rigid interior surface for the pipe and use either cementitious materials (polymer-enhanced cement mortar) or polyurea. These liners are spray applied either by hand or machine, although some users have had better quality control with hand-applied methods. Cementitious liners installed by these methods can provide full structural support, depending on thickness applied. Proper curing is essential to using spray-on liners to avoid bond failures. There could be water quality impacts associated with the application of these liners, their degree of impact related to selection of materials, and adherence to curing requirements. If a spray-on liner is selected, the polymer-enhanced cement mortar is recommended for environmental and safety reasons. Temporary Right of Way would need to be acquired to provide a staging area at each end to accomplish this alternative.

Advantages: A repair alternative would address the poor condition, pipe deformation, and continued deterioration of the invert of the existing culvert without affecting traffic flow, and with minimum upfront costs. Additionally, it would have minimal impacts on utilities and natural resources.

Disadvantages: The rehabilitation alternative is only a repair and not a new structure. The life span of the repair work is estimated to be 30 to 50 years. This alternative reduces the hydraulic capacity of the already substandard-spanned existing structure and wouldn't provide AOP or wildlife passage. It is assumed that for any rehabilitation alternative, temporary right-of-way will be necessary for the contractor's access to the ends of the culvert.

Maintenance of Traffic: The rehabilitation alternative has minimal effect on traffic. Traffic will remain open during the duration of the project, with the exception of intermittent lane closures for some construction activities.

Culvert Replacement with a New Buried Structure Using Open Cut

This alternative involves removing the existing corrugated metal pipe and replacing it with either a new 3-sided open bottom concrete rigid frame or a 4-sided box culvert, having a minimum span of 22 feet. There is approximately 11 feet of fill above the existing culvert which could work well with an open cut replacement method and not require significant earthwork. The various considerations under this option include: the roadway width, structure type, culvert length; and skew.

a. Roadway Width

The existing roadway is 30 feet wide which exceeds the minimum standard of 28 feet as set forth in the Vermont State Standards and HSDEI 11-004. Since a new 75+ year structure is being proposed, the new structure length will be designed to match existing roadway widths, meeting minimum roadway width standards.

b. Structure Type

With the minimum span being over 20 feet, either a 3-sided open bottom concrete structure or a 4-sided concrete box culvert are possible options for a buried structure design. A plate arch is not recommended at this site, since it would have a reduced design life compared to a reinforced concrete structure. From the initial geotechnical investigation, there is likely shallow bedrock in this area from the known ledge outcrops downstream. In order to develop a better understanding of the subsurface strata at the project site to choose the best buried structure design, the geotechnical engineer recommended conducting a subsurface investigation to get borings to identify depth of bedrock in the area.

c. Culvert Size, Length and Skew

The existing culvert is a corrugated metal pipe with a diameter of 10 feet, providing a waterway opening of 78 square feet. If a new structure is chosen, the VTrans Hydraulics section recommended a structure with a minimum span of 22 feet. If a new buried structure is chosen, it should have a minimum 22-foot span and 7-foot clear rise, with E-Stone Type III placed within the channel. In order to accommodate a 30-foot-wide roadway, the proposed length will be approximately 90 feet long. The culvert will have a skew of 90 degrees to the roadway to match the existing skew of the channel.

d. Maintenance of Traffic

Either an off-site detour, phased construction, or a temporary bridge would be appropriate measures for traffic control at this site.

Advantages: This alternative would address the structural deficiencies of the existing culvert, with a brand-new culvert with a 75-year design life. This option would meet the minimum roadway width standards. This option would have minimal future maintenance costs.

Disadvantages: This option has the second highest upfront costs. Construction of this structure would impact traffic in the area, especially since there is no local bypass available for local traffic to avoid the project.

Replacement with an At-Grade Bridge

This alternative would replace the existing culvert with a new integral abutment bridge. Due to the existing depth of the stream in relation to VT Route 114, the minimum allowable structure depth would not be a concern.

a. Alignment

The current alignment is well aligned with the waterway so the bridge will be designed to be constructed on alignment.

b. Bridge Width

The current curb to curb width is 30 feet. This meets the minimum standard of 28 feet. Since a new 75-year bridge is being proposed, the bridge geometry should match the existing roadway width typical section, which exceeds the minimum standard.

c. Bridge Length and Skew

The existing structure has a diameter of 10-feet and runs perpendicular to the roadway. This clear span does not meet the minimum bankfull width of 22-feet required for hydraulics. If a new bridge is constructed is recommended that it meets the minimum hydraulic standard. A skew of 0 degrees is recommended to match the existing conditions of the channel. Based on integral abutment layout procedures, a new integral abutment at this location would be approximately 68-feet long.

d. Superstructure Type

The most common superstructure type for this span length is a cast in place composite steel beam bridge, precast NEXT Beams, Precast Bridge Units (PBU's), or precast deck panels on steel beams. Any superstructure type would meet the minimum hydraulic requirements.

e. Substructure Type

Integral abutments could likely be used as sufficient substructures for a new at-grade bridge. Sufficient subsurface information should be obtained in design to verify the in-situ conditions and determine the best foundation type. There is bedrock present at outlet of the existing culvert and was seen further downstream. Shallow bedrock may limit the use of integral abutments.

f. Maintenance of Traffic

Traffic could be maintained on an offsite detour, a temporary bridge, or with phased construction.

Advantages: This alternative would address the immediate concerns of the poor condition of the existing structure with a new bridge with a 75-year design life.

Disadvantages: A bridge replacement option would be expensive with the cost of steel and the construction costs. Overall constructing a new bridge at this site would take longer to complete and would impact traffic greatly.

VII. Alternatives Summary

Based on the existing site conditions, culvert condition, and recommendations from hydraulics and others, the following alternatives are offered:

- Alternative 1a: Culvert Rehabilitation Using a Slip Liner with Traffic Maintained on Existing Culvert
- Alternative 1b: Culvert Rehabilitation Using a Spray-On Liner with Traffic Maintained on Existing Culvert
- Alternative 2a: New Buried Structure (open cut) with Traffic Maintained on Offsite Detour
- Alternative 2b: New Buried Structure (open cut) with Traffic Maintained with Phased Construction
- Alternative 2c: New Buried Structure (open cut) with Traffic Maintained on a Temporary Bridge
- Alternative 3a: New At-Grade Bridge with Traffic Maintained on Offsite Detour
- Alternative 3b: New At-Grade Bridge with Traffic Maintained with Phased Construction
- Alternative 3c: New At-Grade Bridge with Traffic Maintained on a Temporary Bridge

A cost evaluation for each of the alternatives is shown below.

VIII. Cost Matrix[2]

Norton BF 0321(21)		Do Nothing	Alternative 1		Alternative 2			Alternative 3		
			Culvert Rehabilitation		Culvert Replacement with Buried Structure			Culvert Replacement with New At-Grade Bridge		
			On-Alignment		On-Alignment			On-Alignment		
			a. Slip Liner	b. Spray-On Liner	a. Off-site Detour	b. Phased Construction	c. Temporary Bridge	a. Off-site Detour	b. Phased Construction	c. Temporary Bridge
COST	Structure Cost	$0	$136,491	$136,160	$1,198,620	$1,378,413	$1,198,620	$1,642,900	$1,016,900	$884,200
	Removal of Structure	$0	$80,000	$88,000	$80,000	$92,000	$80,000	$80,000	$92,000	$80,000
	Roadway	$0	$113,246	$113,114	$246,898	$354,916	$246,898	$287,000	$391,000	$272,000
	Maintenance of Traffic	$0	$44,040	$44,040	$120,800	$146,600	$256,540	$121,300	$146,600	$256,540
	Construction Costs	$0	$373,778	$381,314	$1,646,318	$1,971,929	$1,782,058	$2,131,200	$1,646,500	$1,492,740
	Construction Engineering & Contingencies	$0	$130,822	$133,460	$411,580	$492,982	$445,515	$490,176	$493,950	$373,185
	Accelerated Premium	$0	$0	$0	$65,853	$0	$0	$149,184	$0	$0
	Total Construction Costs w CEC	$0	$504,600	$514,774	$2,123,750	$2,464,911	$2,227,573	$2,770,560	$2,140,450	$1,865,925
	Preliminary Engineering	$0	$112,133	$114,394	$246,948	$295,789	$267,309	$319,680	$329,300	$298,548
	Right of Way	$0	$10,000	$60,000	$10,000	$10,000	$60,000	$10,000	$10,000	$60,000
	Total Project Costs	$0	$626,733	$689,168	$2,380,698	$2,770,701	$2,554,881	$3,100,240	$2,479,750	$2,224,473
	Annualized Costs	$0	$12,600	$23,000	$31,800	$37,000	$34,100	$41,400	$33,100	$29,700
TOWN SHARE	No Local Share									
TOWN %										
SCHEDULEING	Project Development Duration	N/A	2 years	2 years	2 years	2 years	2 years	2 years	2 years	2 years
	Construction Duration	N/A	4 months	4 months	8 months	18 months	18 months	8 months	18 months	18 months
	Closure Duration (If Applicable)	N/A	NA	NA	30 days	NA	NA	30 days	NA	NA
ENGINEERING	Typical Section - Roadway (feet)	30	30	30	30	30	30	30	30	30
	Geometric Design Criteria	Exceeds Minimum Standard	Exceeds Minimum Standard		Exceeds Minimum Standard			Exceeds Minimum Standard		
	Traffic Safety	No Change	No Change	No Change	Improved	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Bicycle Access	No Change	Meets Minimum Standard		Meets Minimum Standard			Meets Minimum Standard		
	Pedestrian Access	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Hydraulics	Substandard BFW	Doesn't Meet Minimum BFW and VTrans Hydraulic Standards		Meets Minimum BFW and VTrans Hydraulic Standards			Meets Minimum BFW and VTrans Hydraulic Standards		
	Utilities	No Change	May require underground stabilization		May require underground relocation			May require underground relocation		
OTHER	ROW Acquisition	No Change	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Road Closure	No Change	No	No	Yes	No	No	Yes	No	No
	Design Life (years)	No Change	50	30	75	75	75	75	75	75

[2] Costs are estimates only, used for comparison purposes.

IX. Conclusion

Alternative 2b or c is recommended; to replace the existing culvert with a new buried structure while traffic is maintained either by phased construction or a temporary bridge.

Structure:
The existing culvert is over 60 years old and is nearing the end of its anticipated design life. Additionally, the current culvert does not meet the minimum hydraulic standard for bank full width, and would become even more substandard if rehabilitated, further warranting a full replacement. Aquatic organism passage (AOP) and flood resiliency is important for this culvert which can be better accommodated with a full structure replacement.

Due to the structural condition of the existing culvert along with the required bank full width of a new structure, a new buried structure is more cost effective than a rehabilitation effort. A bridge replacement option was considered but would be a longer construction duration and more long term maintenance than a buried structure.

The new structure will be a minimum 22-foot span, precast buried structure with either three or four sides, to be determined in the design phase. If the structure chosen is a 3-sided concrete rigid frame, the open bottom of the frame should have E-Stone Type III placed throughout the channel, accommodating aquatic organism passage, as per the VTrans Hydraulic Section's recommendation. If the structure chosen is a 4-sided concrete box culvert, the invert of the box should be embedded and filled with E-Stone Type III, accommodating aquatic organism passage. Either buried structure designed shall have no roadway overtopping below the Q_{100} storm event.

The existing roadway through the project area has a 30-foot width which exceeds the minimum Vermont State Standards of 28-feet. The new structure and reconstructed roadway will be designed to meet the existing roadway width.

Traffic Control:
Either phased construction or a temporary bridge is recommended for maintaining traffic along the VT Route 114 corridor. If phased construction is chosen it will be a two-phase construction operation which will likely lengthen the construction duration of the project. If a temporary bridge is constructed, it is recommended that it is placed on the upstream side due to the layout of Number Five Brook. The temporary bridge option would require significant tree removal to construct. The temporary bridge will have impacts on natural resources, utilities, and will require additional temporary Right-of-Way acquisition.

X. Appendices

- Appendix A: Site Pictures
- Appendix B: Town Map
- Appendix C: Bridge Inspection Report
- Appendix D: Hydraulics Memo
- Appendix E: Preliminary Geotechnical Information
- Appendix F: Resource Identification Completion Memo
- Appendix G: Natural Resources Memo
- Appendix H: Archeology Memo
- Appendix I: Historic Memo
- Appendix J: Environmental Specialist resource ID
- Appendix K: Hazardous Sites Map
- Appendix L: Stormwater Resource ID
- Appendix M: Landscape Clearance Resource ID
- Appendix N: Local Input
- Appendix O: Operations Input
- Appendix P: Detour Map
- Appendix Q: Plans

Appendix A: Site Pictures

Southern approach (Inspection photo 2020)

Northern approach (Inspection photo 2020)

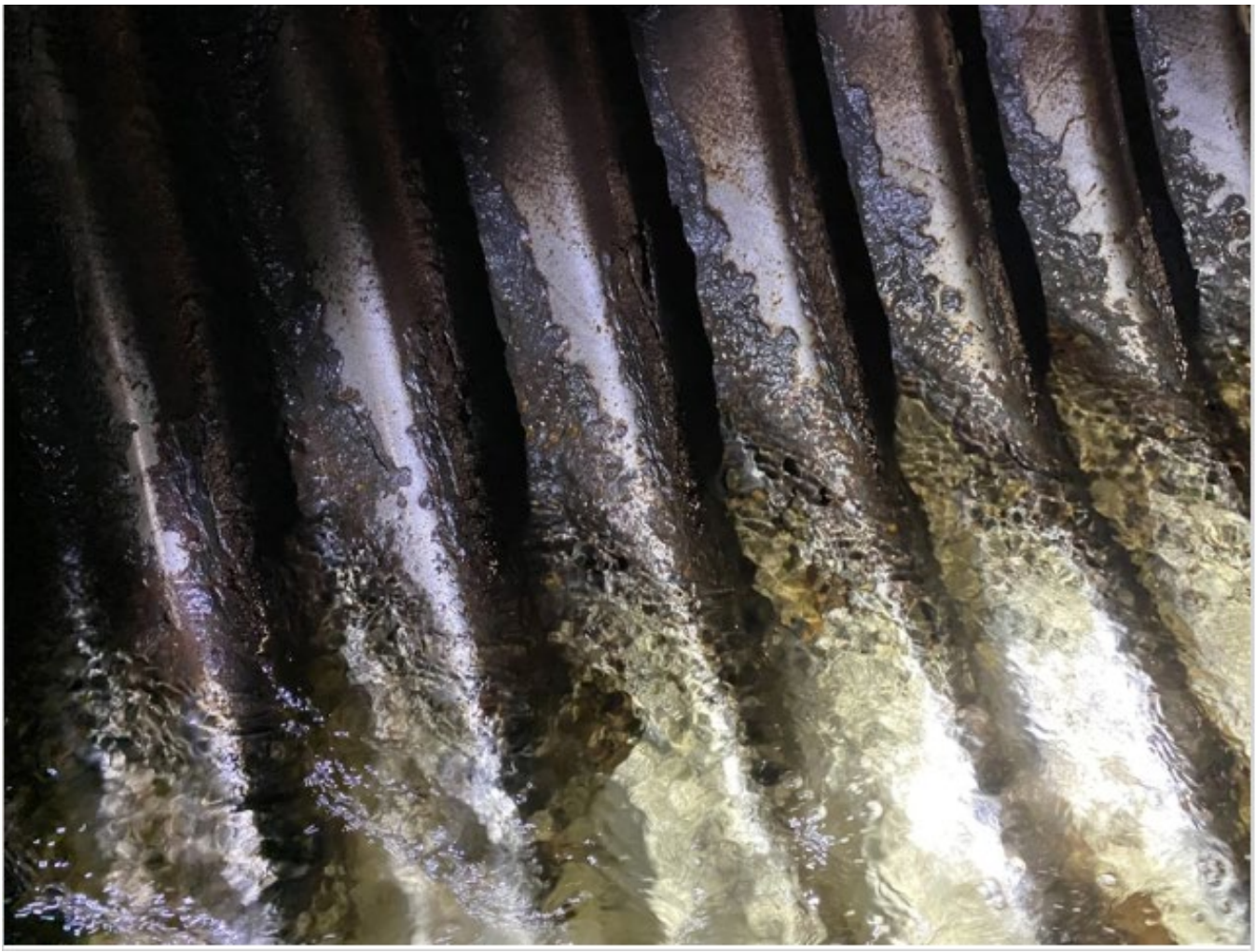
Looking upstream from VT114 (Inspection photo 2020)

Inlet (Inspection photo 2020)

View of inlet from upstream (Inspection photo 2020)

Upstream from inlet (Inspection photo 2020)

Barrel from upstream (Inspection photo 2022)



Inspection Finding Photo (2022)

Inspection finding photo (2022)

View of outlet and downstream from VT114 (Inspection photo 2020)

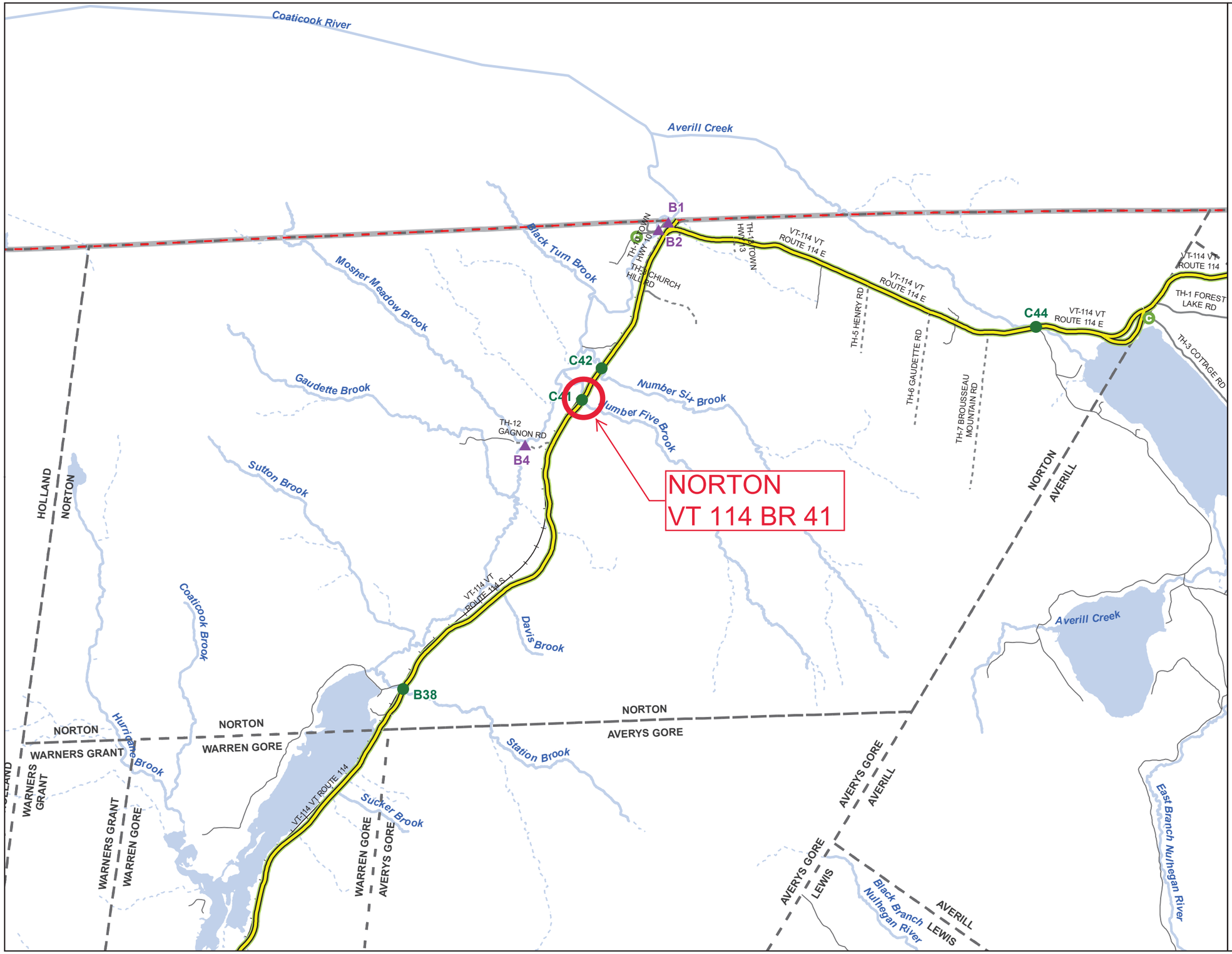
Outlet and scour pool (Inspection photo 2020)

Scour hole “sill” is visible ledge at outlet (Inspection photo 2020)

View of downstream below outlet scour hole (Inspection photo 2020)

Further downstream (Inspection photo 2020)

Appendix B: Town Map



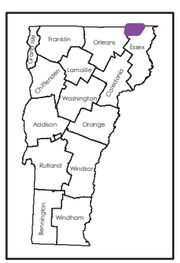
Scale: 1:52,900

N

- INTERSTATE
- STATE LONG
- STATE SHORT
- TOWN LONG
- FEDERAL AID
- BIKE PATH
- INTERSTATE
- STATE HIGHWAY
- CLASS 1
- CLASS 2
- CLASS 3
- CLASS 4
- LEGAL TRAIL
- PRIVATE
- DISCONTINUED
- FEDERAL AID HIGHWAY
- MAINTENANCE DISTRICT
- POLITICAL BOUNDARY
- VTRANS REGION BOUNDARY
- NAMED RIVER-STREAM
- UNNAMED RIVER-STREAM
- Point from Local Bridge Data *
- Point from Local Culvert Data *

* Points are from local town bridge and culvert inventories. Some points may overlap where VTrans has also conducted an inventory on the Town highway.
Data source: VOBCIT aka VTCulverts

Produced by:
Mapping Section
Division of Policy, Planning and Intermodal Development
Vermont Agency of Transportation
April 2022



NORTON

COUNTY-TOWN CODE: **0516-0**
ESSEX COUNTY
DISTRICT #9
District Long Name: Derby District
VTrans Four Region: Northeast

This map was funded in part through grants from the Federal Highway Administration, U.S. Department of Transportation. The representation of the authors expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

Appendix C: Bridge Inspection Report

VERMONT
AGENCY OF TRANSPORTATION

Route VT114 /
Structure #0041 / (Routine)
VT114 over NUMBER 5 BROOK
Team Lead: Stephen Piro, **Inspection Date:** 10/07/2022

Town: 157 - NORTON

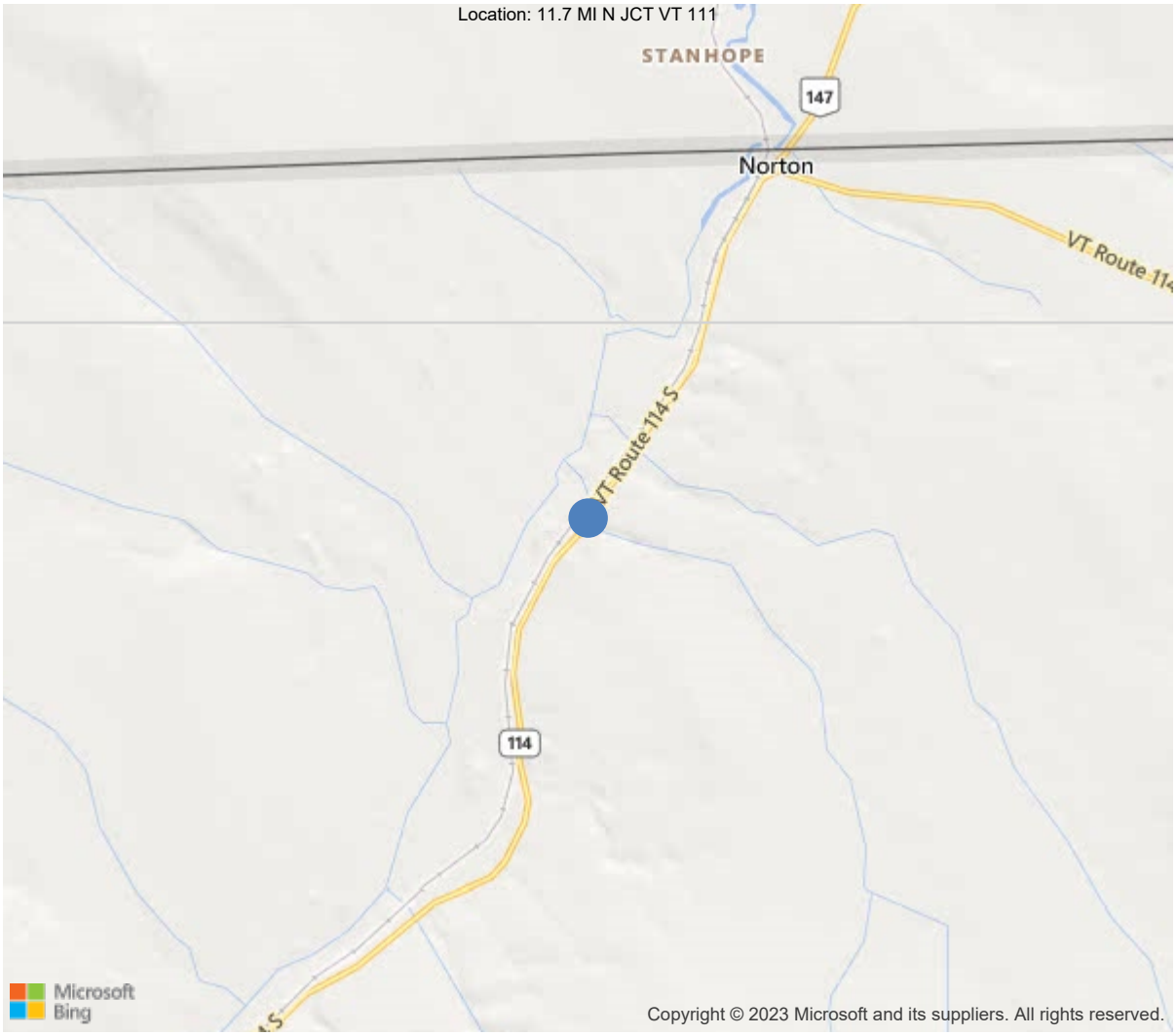
District 9, 9 - ESSEX County

Owner:

Maintenance Responsibility: 1 - State Highway Agency

VERMONT
AGENCY OF TRANSPORTATION

Route VT114 /
Structure #0041 / (Routine)
VT114 over NUMBER 5 BROOK
Team Lead: Stephen Piro, **Inspection Date:** 10/07/2022



44.98783, -71.81086

VERMONT
AGENCY OF TRANSPORTATION

Route VT114 /
Structure #0041 / (Routine)
VT114 over NUMBER 5 BROOK
Team Lead: Stephen Piro, **Inspection Date:** 10/07/2022

IDENTIFICATION	
(1) State Names	50 - Vermont
(8) Structure Number	300321004105161
(5) Inventory Route	
(2) Highway Agency District	9 - District 9
(3) County Code	9 - ESSEX
(4) Place Code	52750
(6) Features Intersected	NUMBER 5 BROOK
(7) Facility Carried	VT114
(9) Location	11.7 MI N JCT VT 111
(11) Mile Point	mi
(12) Base Highway Network	No
(13) LRS Inventory Rte & Subrte	
(16) Latitude	44.987825
(17) Longitude	-71.8108611111111
(98) Border Bridge State Code	
(99) Border Bridge Structure No.	
STRUCTURE TYPE AND MATERIAL	
(43) Main Structure Type	319
Material	3 - Steel
Type	19 - Culvert
(44) Approach Structure Type	
Material	
Type	
(45) No. of Spans in Main Unit	1
(46) No. of Approach Spans	
(107) Deck Structure Type	N - Not applicable
(108) Wearing Surface/Protective System	
Type of Wearing Surface	N - Not applicable (applies only to stru
Type of Membrane	N - Not applicable (applies only to stru
Type of Deck Protection	N - Not applicable (applies only to stru
AGE AND SERVICE	
(27) Year Built	1957
(106) Year Reconstructed	
(42) Type of Service	15
On	1 - Highway
Under	5 - Waterway
(28) Lane	
On	2
Under	0
(29) Average Daily Traffic	600
(30) Year of ADT	1996
(109) Truck ADT	%
(19) Bypass, Detour Length	40 mi
GEOMETRIC DATA	
(48) Length of Maximum Span	10 ft
(49) Structure Length	10 ft
(50) Curb or Sidewalk Width	
Left	0 ft
Right	0 ft
(51) Bridge Roadway Width Curb to Curb	0 ft
(52) Deck Width Out to Out	0 ft
(32) Approach Roadway Width (W/Shoulders)	28 ft
(33) Bridge Median	0 - No median
(34) Skew	10 Deg
(35) Structure Flared	
(10) Inventory Route Min Vert Clear	ft
(47) Inventory Route Total Horiz Clear	30 ft
(53) Min Vert Clear Over Bridge Rdwy	ft
(54) Min Vert Underclear	9.25 ft
Ref:	
(55) Min Lat Underclear RT	ft
Ref:	
(56) Min Lat Underclear LT	ft
NAVIGATION DATA	
(38) Navigation Control	
(111) Pier Protection	
(39) Navigation Vertical Clearance	ft
(116) Vert-Lift Bridge Nav Min Vert Clear	ft
(40) Navigation Horizontal Clearance	ft

CLASSIFICATION	
(112) NBIS Bridge Length	
(104) Highway System	
(26) Functional Class	7 - Rural Major Collector
(100) Defense Highway	
(101) Parallel Structure	
(102) Direction of Traffic	
(103) Temporary Structure	
(105) Federal Lands Highways	
(110) Designated National Network	
(20) Toll	
(21) Maintain	1 - State Highway Agency
(22) Owner	
(37) Historical Significance	
CONDITION	
(58) Deck	N
(59) Superstructure	N
(60) Substructure	N
(61) Channel & Channel Protection	6
(62) Culverts	4
LOAD RATING AND POSTING	
(31) Design Load	
(63) Operating Rating Method	
(64) Operating Rating	
Type	
Rating	
(65) Inventory Rating Method	
(66) Inventory Rating	
Type	
Rating	
(70) Bridge Posting	
(41) Structure Open/Posted/Closed	
APPRAISAL	
(67) Structural Evaluation	
(68) Deck Geometry	
(69) Clearances, Vertical/Horizontal	
(71) Waterway Adequacy	
(72) Approach Roadway Alignment	8
(36A) Bridge Railings	
(36B) Transitions	
(36C) Approach Guardrail	
(36D) Approach Guardrail Ends	
(113) Scour Critical Bridges	
PROPOSED IMPROVEMENTS	
(75) Type of Work	
(76) Length of Structure Improvement	ft
(94) Bridge Improvement Cost	$
(95) Roadway Improvement Cost	$
(96) Total Project Cost	$
(97) Year of Improvement Cost Estimate	
(114) Future ADT	
(115) Year of Future ADT	

INSPECTIONS *			
(90) Inspection Date			10/07/2022
(91) Frequency			12
(92) Critical Feature Inspection	Done	Freq. (Mon)	Date
A: Fracture Critical Detail	No		
B: Underwater Inspection	No		
C: Other Special Inspection			

* The inspection date and frequency information in this box contains the current NBI date and frequency information. Please refer to the report header for the date this inspection was conducted.

VERMONT
AGENCY OF TRANSPORTATION

Route VT114 /
Structure #0041 / (Routine)
VT114 over NUMBER 5 BROOK
Team Lead: Stephen Piro, **Inspection Date:** 10/07/2022

Culvert

ELEMENTS	DESCRIPTION	UNITS	TOTAL	CS1	CS2	CS3	CS4
240	Steel Culvert	LF	80	0	38	10	32
1000	Corrosion	LF	80	0	38	10	32

APPROACH / DECK

72 - Approach Roadway Alignment (8 - Equal to present desirable criteria)
Roadway alignment is fairly straight and flat.

A13 - Approach Rail Condition (2 - Good)
Galvanized steel beam rail is in fairly good condition having a few small dents and scrapes scattered throughout.

A16 - Approach Post Condition (2 - Good)
Galvanized steel posts with composite offsets are in fairly good condition.

A18 - Approach Erosion/Settlement
Small to medium size riprap is present along the upstream southern corner of structure with no grubbing material.

58 - Deck (N - NOT APPLICABLE)

CULVERT

62 - Culverts (4 - Large spalls, heavy scaling, wide cracks, considerable efflorescence or opened construction joint permitting loss of backfill. Considerable settlement or misalignment. Considerable scouring or erosion at curtain walls, wingwalls or pipes. Metal culverts have significant distortion and deflection throughout, extensive corrosion or deep pitting.)
Corrugated galvanized multi plate pipe with concrete invert is in poor condition. Southern side of structure is starting to deform / crush due to continued corrosion along the lower panels with heaviest deformations between panels #3 through #6. Inlet and outlet have deformation with rotation / squashing towards northern direction. Voids start ~26'-0" from the upstream end of structure at panel #7 from the downstream end and varies throughout to panel #3 from the downstream end. Small section (~4'-0" in length) has less voiding behind panel #4 from the downstream end near center of panel.

A99 - Culvert Invert Condition (5 - Poor)
Corrugated steel panels have heavy pitting and rust scaling along the lower portions throughout with concrete invert missing throughout half of the structure on the downstream end with heavy concrete breakup, exposed random steel reinforcing bars along the upstream end. Panels #3 through #6 along the southern side of pipe have large perforations along lower portions of culvert wall causing the pipe to deform / crush with piping occurring. Piping has caused settlement in roadway with asphalt patching present over structure mainly in the southern travel lane. Severe perforations allow sediment / backfill loss causing scattered piping (voids) to be present behind panels #3 through #7. Last ~6'-0" of pipe has undermining present with backfill material missing below invert.

A108 - Culvert Retaining/Wing Wall Condition (Poor)
Upstream southern corner has concrete wing / block present that is retaining embankment material. Upstream northern corner of structure has stacked up boulder / riprap for wingwall with no mortar or chinking. Downstream end has no wingwalls with boulders and grubbing material present surrounding structure.

SUBSTRUCTURE

60 - Substructure (N - NOT APPLICABLE)

CHANNEL

61 - Channel/Channel Protection (6 - Bank is beginning to slump. River control devices and embankment protection have widespread minor damage. There is minor stream bed movement evident. Debris is restricting the channel slightly.)
Number 5 Brook funs fairly straight through structure flowing over small stones and gravel mix. Channel Banks on the upstream end have good brush growth, stones and boulders. Downstream end has a large scour pool on the downstream side with some slight erosion along the embankments with upper portions being undercut and having scattered boulders and good brush growth.

GENERAL OBSERVATION

Structure corrosion along the southern wall has progressed enough to allow for pipe deformation / crushing and is now in poor condition with a 12 month inspection cycle. Panels #3 through #6 along the southern side of pipe have large perforations causing the pipe to deform / crush with piping occurring. Large perforations allow sediment / backfill loss causing scattered piping (voids) to be present behind panels #3 through #7. Downstream half of panel #4 has less severe voiding along with small sections of panel #7. Voids start ~26'-0" from the upstream end along the southern side of pipe (Panel #7). Largest / heaviest piping / voids are present between panels #4 halfway up to the end if panel #6.

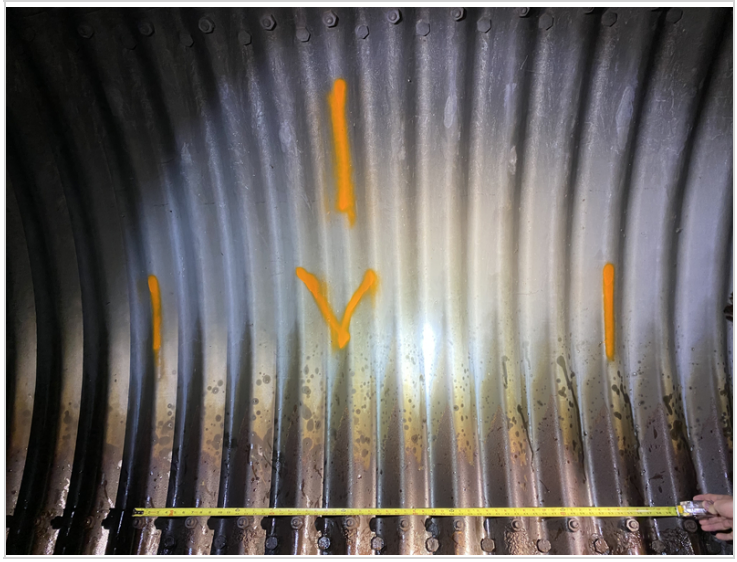
VERMONT
AGENCY OF TRANSPORTATION

Asset **#300321004105161**(Routine)
District: 9, **County:** 9
Team Lead: Stephen Piro, **Inspection Date:** 10/07/2022

ELEMENTS	DESCRIPTION	UNITS	TOTAL	CS1	CS2	CS3	CS4
240	Steel Culvert	LF	80	0	38	10	32
1000	Corrosion	LF	80	0	38	10	32

Asphalt Patch over Downstream End of Structure

Asphalt Patch Over Downstream End



~5’-0” Voided Area ~26’-0” from the Upstream End on Southern Wall with Perforations along Invert Haunch

Downstream Outlet

Upstream Inlet

Barrel from Upstream End with Southern Wall Deformation

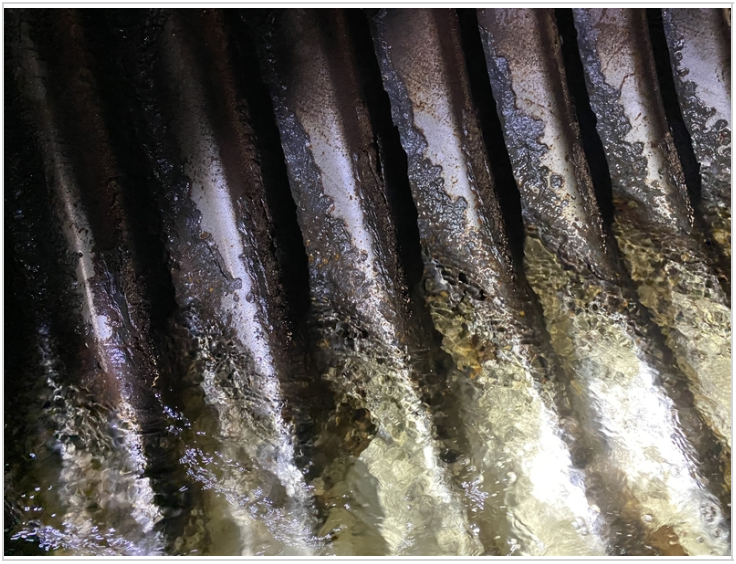
Barrel from Upstream End with Southern Wall Deformation

Barrel from Downstream End with Southern Wall Deformation

VERMONT
AGENCY OF TRANSPORTATION

Route VT114 /
Structure #0041 / (Routine)
VT114 over NUMBER 5 BROOK
Team Lead: Stephen Piro, **Inspection Date:** 10/07/2022

No Voids Present in Downstream Section of Panel #4 from Downstream End



Panel #7 from Downstream

Culvert Invert from Upstream End

Southern Wall Perforations along Invert

VERMONT
AGENCY OF TRANSPORTATION

Route VT114 /
Structure #0041 / (Routine)
VT114 over NUMBER 5 BROOK
Team Lead: Stephen Piro, **Inspection Date:** 10/07/2022

Southern Wall Perforations at Panel #7 from Downstream End

Perforations ion Panel #5 from Downstream End on Southern End

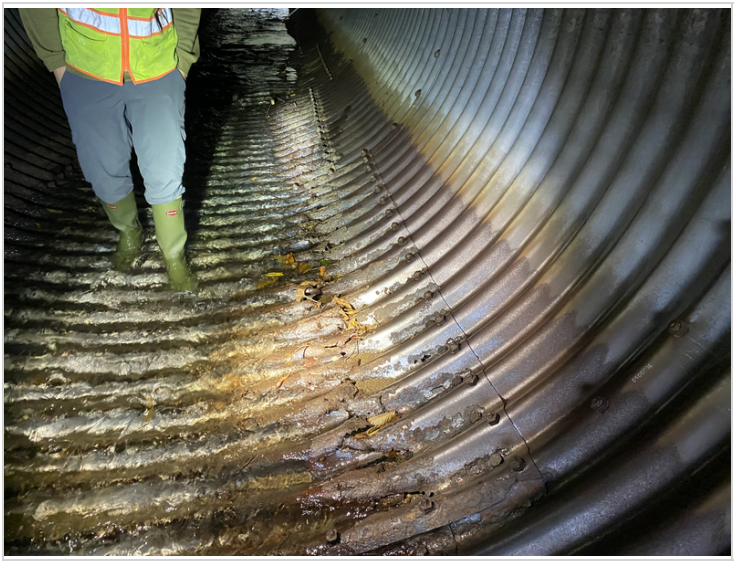
Perforations / Crushing / Deformation on Southern Side of Panel #5 from Downstream End

Perforations / Crushing / Deformation on Southern Side of Panel #5 from Downstream End

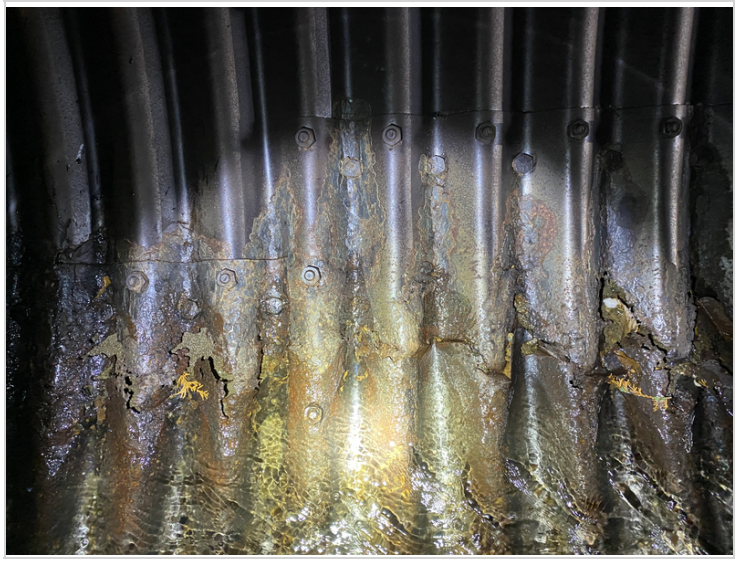
VERMONT
AGENCY OF TRANSPORTATION

Route VT114 /
Structure #0041 / (Routine)
VT114 over NUMBER 5 BROOK
Team Lead: Stephen Piro, **Inspection Date:** 10/07/2022

Panel #3 on Southern Side from the Downstream End



Panel #3 on Southern Side from the Downstream End looking Upstream



Perforations / Crushing on Southern Side of Panel #4 from the Downstream End

Panel #4 from Downstream End

Panel #4 from Downstream End with Significant Bending on Downstream Portion and Large Perforations

Panel #6 from Downstream End

Panel #5 from Downstream End

Southern Approach

VERMONT
AGENCY OF TRANSPORTATION

Route VT114 /
Structure #0041 / (Routine)
VT114 over NUMBER 5 BROOK
Team Lead: Stephen Piro, **Inspection Date:** 10/07/2022

Downstream End of Culvert

Upstream Southern Corner Riprap

Upstream Southern Embankment

Upstream Channel Elevation

Upstream Channel

Appendix D: Hydraulics Memo

VERMONT

State of Vermont
Structures and Hydraulics Section
One National Life Drive
Montpelier, Vermont 05633-5001
vtrans.vermont.gov

Agency of Transportation

[phone] 802-371-7326
[fax] 802-828-3566
[ttd] 800-253-0191

TO: Jason Sevigny, District 9 Technician

CC: Patrick Ross, ANR River Management Engineer

FROM: Keith Friedland, Hydraulics Technician

DATE: June 25, 2020

SUBJECT: Norton, VT-114, Br41 over Number 5 Brook tributary to Coaticook River
Site location: Mile Marker 3.69
Coordinates: 44.987777, -71.810916

We have completed our hydraulic study for the above referenced site, and offer the following for your use. **The drainage area and structure size recommended are both large enough that when a survey of the site becomes available, a more detailed model should be developed for this structure.**

Hydrology

The following physical characteristics are descriptive of this drainage basin:

Drainage Area	3.98 square miles
Land Cover	Forest
Avg. Drainage Basin Slope	6.7%
Water Bodies and Wetlands (NLCD 2006)	0.5 %

Using the USGS hydrologic method, the following design flow rates were selected:

Annual Exceedance Probability (AEP)	Flow Rate in Cubic Feet per Second (cfs)	
43 %	230	
10 %	420	
4 %	570	
2 %	690	Design Flow – Major Collector
1 %	830	Check Flow

Channel Morphology

The channel for this perennial stream is straight to sinuous with an estimated local channel slope of 3%. Field measurements of bankfull width varied from 20 to 25 feet at a bankfull depth of 2 to 3 feet upstream and downstream of the structure. There is exposed ledge in the downstream channel.

Existing Conditions

The existing structure is a corrugated metal plate pipe arch with a diameter of 10 feet, providing a waterway opening of 79 square feet. The culvert invert is perched 3 feet at the outlet. There is a deep and wide scour pool

at the outlet with exposed ledge serving as the pool 'sill'. At some point the invert was paved but that repair appears to be failing with holes through the invert. The pavement above the structure is cracking and repaired suggesting loss of fill material around the culvert. Our calculations, field observations and measurements indicate the existing structure does meet current standards of the VTrans Hydraulic Manual. However, it does not meet the state stream equilibrium standards for bankfull width (span length). The existing structure constricts the channel width, resulting in an increased potential for debris blockage. This complication is known to cause ponding at the inlet, increase stream velocity and scour at the outlet, and may also lead to erosion and failure of channel banks. This structure results in a headwater depth of approximately 11.1 feet at 2% AEP and 12.5 feet at 1% AEP. These headwater depths are close to the allowable limit.

Replacement Recommendations

In sizing a new structure, we attempt to select structures that meet both the current VTrans hydraulic standards, state environmental standards with regard to span length and opening height, and allow for roadway grade and other site constraints.

Below is a preliminary recommendation based on the above considerations and the information available:

- A bridge with a minimum hydraulic clear span of 22 feet between abutments, measured perpendicular to flow, and a minimum clear height of 7 feet, providing 154 square feet of waterway area. If stone fill is placed in front of the abutments and the waterway area is reduced, the structure will need to be larger. Based on a simplified hydraulic model, this structure results in a headwater depth of 5.4 feet at the 2% AEP and 6.2 feet at the 1% AEP, providing 1.6 feet of freeboard at the 2% AEP design flow.

Note: *Any similar structure that fits the site conditions could be considered.*

To approximately match the local stream slope, the structures recommended above have been modeled with a culvert slope of 3%. Stone Fill, Type III should be used to protect any disturbed channel banks or roadway slopes at the structure's inlet and outlet, up to a height of at least one-foot above the top of the opening. The stone fill should not constrict the channel or structure opening.

Prior to any action toward the implementation of any recommendations received from VTrans, stream type and structure size must be confirmed, and may be modified, by the VT ANR River Management Engineer to ensure compliance with state environmental standards for stream crossing structures Regulatory authorities including the US Army Corps of Engineers may have additional concerns or requirements regarding this structure.

General Comments

It is always desirable for a new structure to have flared wingwalls, matched into the channel banks at the inlet and outlet, to smoothly transition flow and protect the structure and roadway approaches from erosion. It is also recommended that full height concrete headwalls be constructed at the inlet and outlet. If a new bridge is installed, the bottom of abutment footings should be at least 6 feet below the channel bottom, or to ledge, to prevent undermining. Abutments on piles should be designed to be free standing for a scour depth at least 6 feet below channel bottom. Any new structure should be properly aligned with the channel, span the natural channel width, and be constructed on a grade that matches the channel.

The structures recommended above have been sized with respect to hydraulic and environmental standards and do not consider debris blockage complications. To minimize maintenance and ensure constructability, it is recommended that the structure height be adequate for the passage of debris.

Please note that while a site visit was made, these recommendations were made without the benefit of a survey and are based on limited information. The drainage area is large enough that if a survey of the site does

become available, a more detailed model should be developed for this structure. The final decision regarding replacement of this structure must comply with state regulatory standards, and should take into consideration matching natural channel conditions, roadway grade, environmental concerns, safety, and other requirements.

Please contact us if you have any questions or if we may be of further assistance.

From: Friedland, Keith
To: Glow, Madeline
Subject: RE: NORTON BF 0321(21) Stone Fill
Date: Friday, December 15, 2023 11:01:44 AM
Attachments: image001.png
image002.png

Hey Maddie –

Sounds good.

Thanks!

Keith Friedland | Hydraulics Technician
Project Delivery Bureau | Hydraulics Unit
Highways Division
Vermont Agency of Transportation
219 North Main Street | Barre, VT 05641
(802) 371-7326
vtrans.vermont.gov

From: Glow, Madeline <Madeline.Glow@vermont.gov>
Sent: Friday, December 15, 2023 10:38 AM
To: Friedland, Keith <Keith.Friedland@vermont.gov>
Subject: NORTON BF 0321(21) Stone Fill

Hey Keith,

I wanted to confirm the updated E-stone and Stone fill sizing recommendations for Bridge 41 in Norton. As discussed, the updated recommendation is for **E-Stone Type III** to be placed within the channel and open-bottom structure (if needed) and **Stone Fill Type IV** to be placed along the channel banks and side slopes.

Thanks,
Maddie

Madeline Glow | Hydraulics/Scoping Engineer
Project Delivery Bureau | Structures Section | Project Initiation and Innovation
Highway Division
Vermont Agency of Transportation
Barre City Place | 219 North Main Street | Barre, VT 05641
802-595-6003 phone | madeline.glow@vermont.gov

http://vtrans.vermont.gov/highway/structures-hydraulics/project-initiation-and-innovation

Appendix E: Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Laura Stone, P.E., Scoping Engineer

From: August Arles, Geotechnical Engineer

Date: June 26th, 2023

Subject: Norton BF 0321(21) Preliminary Geotechnical Information

1.0 INTRODUCTION

As requested, we have completed our preliminary geotechnical investigation of Bridge 41 on VT Route 114 over the Number Five Stream in the Town of Norton, VT. Bridge 41 is located approximately 11.7 miles north of the intersection of VT Route 114 and VT Route 111. This review included the examination of as-built record plans, water well logs and hazardous site information on file at the Vermont Agency of Natural Resources (ANR), as well as published surficial and bedrock geologic maps, and information we gained from in-house bridge inspection reports and photos. This project is currently in the scoping phase.

2.0 SUBSURFACE INFORMATION

2.1 Published Geologic Data

Mapping conducted in 1970 for the Surficial Geologic Map of Vermont, conducted in 1970, shows that the project site consists of glaciofluvial deposits consisting primarily of kame moraine (Doll, 1970).

According to the 2011 Bedrock Map of Vermont, published by the State of Vermont and USGS, the site is underlain with Granite and Pegmatite of the Averill Pluton Formation (Ratliffe, et. al, 2011).

2.2 Water Well Logs

The Vermont (ANR) documents and publishes a database of all public and private wells that have been drilled in the state. Published online, these logs may provide general characteristics of the soil strata and depth to bedrock in the area. The three closest wells with soil information are WRN 16, TAG 4-672, and TAG 7-646, located approximately 660 ft, 1,020 and 1,070 ft from the project site, respectively. Wells WRN 16 and TAG 7-646 reported encountering bedrock at a depth of 36 ft, and 30ft, respectively, while TAG 4-672, did not report encountering bedrock to a depth of 30 ft.

2.3 Hazardous Materials and Underground Storage Tanks

The ANR Atlas also maintains a database of all known hazardous waste sites and underground storage tanks. According to their published data there are no sites or tanks within a 0.5-mile radius and the project itself does not lie on a hazardous site.

2.4 Record Plans

A review of historic records plans was included in this investigation; however, no record plans were available for this project.

3.0 FIELD OBSERVATIONS

A site investigation was not conducted by Geotechnical Section staff however photos from bridge inspection reports and satellite imagery were reviewed to evaluate the feasibility of boring operations and assess general site conditions as they relate to the proposed project. Overhead utilities were visible along southbound lane of VT Route 114, and can be seen in Figure 3.1. The utilities are likely to not interfere with boring operations. If additional subsurface information is needed in the areas of the overhead utilities, geophysical techniques can be utilized. From the inspection photos there is a possibility of bedrock outcroppings in the streambed in the upstream location of the culvert. In addition to the possibility of bedrock outcroppings, cobbles and boulders were noticed downstream of the culvert, this can be seen in Figure 3.2.

Figure 3.1: *Facing North on VT Route 114; overhead utilities parallel route on outlet side of culvert.[Inspection photo dated 2018]*

Figure 3.2: *Facing upstream; note boulders and cobbles in riverbed, and the possibility of bedrock outcroppings. [Inspection photo dated 2018]*

4.0 RECOMMENDATIONS

Based on this information, possible foundation options for bridge replacement at a similar elevation as the existing structure include the following:

- Reinforced concrete box with new wingwalls and headwalls with spread footings founded on soil or bedrock
- Concrete rigid frame supported on H-piles, micropiles, or spread footings
- Precast or steel arch bridge with spread footings founded on soil or bedrock

In order to develop a better understanding of the subsurface strata at the project site, we recommend conducting an investigation consisting of at least two borings, one at alternating corners of the structure. Typically for a large culvert or small bridge replacement, these borings would extend at least twice the anticipated depth to the bottom of footings, but most likely to bedrock. Additional borings may be advanced if shallow bedrock is encountered to get a better understanding for the bedrock profile along each abutment.

5.0 CLOSING

If a culvert replacement is selected as the preferred alternative, the Geotechnical Engineering Section can assist in designing a subsurface investigation that efficiently gathers adequate information for the alternative chosen.

If you have any questions or would like to discuss this report, please contact the Geotechnical Section by email.

6.0 REFERENCES

Doll, C. G., 1970, Surficial Geologic Map of Vermont, Vermont Geological Survey, Montpelier, VT.

Ratcliffe, N. M., Stanley, R. S., Gale, M. H., Thompson, P. J., Walsh, G. J., 2011, Bedrock Geologic Map of Vermont, Vermont Geological Survey, Montpelier, VT.

Vermont Agency of Natural Resources Department of Environmental Conservation, Natural Resources Atlas, www.anr.vermont.gov/maps/nr-atlas%20, accessed 6/13/2023.

Review by: Eric Denardo, P.E., Geotechnical Engineer

cc: Electronic Read File/MG
Project File/CEE
AJA

Z:\Highways\CMB\GeotechEngineering\Projects\Norton BF 0321(21)\REPORTS\Norton BF 0321(21) Preliminary Geotechnical Report.docx

Appendix F: Resource ID Completion Memo

OFFICE MEMORANDUM

AOT - PDB - ENVIRONMENTAL SECTION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Laura Stone, Project Manager
FROM: Lee Goldstein, Environmental Specialist
DATE: September 11, 2023
Project: **Norton BF 0321(21) 22B360**

ENVIRONMENTAL RESOURCES:

Archaeological Resources:	___	Yes	X	No See Archaeological Resource ID Memo
Historic Resources:	___	Yes	X	No See Historic Resource ID Memo
Wetlands:	X	Yes	___	No See Natural Resource ID Memo
Aquatic Organism Passage:	X	Yes	___	No See Natural Resource ID Memo
Agricultural Soils:	X	Yes	___	No See Natural Resource ID Memo
Wildlife Habitat:	X	Yes	___	No See Natural Resource ID Memo
Endangered Species:	X	Yes	___	No See Natural Resource ID Memo
Stormwater Considerations:	X	Yes	___	No See Stormwater Resource ID Memo
Landscape Considerations:	X	Yes	___	No See Landscape Resource ID Memo
6(f) Properties:	___	Yes	X	No See Environmental Specialist Resource ID Memo
Hazardous Waste:	___	Yes	X	No See Environmental Specialist Resource ID Memo
Contaminated Soils:	___	Yes	X	No See Environmental Specialist Resource ID Memo
Wild Scenic Rivers:	___	Yes	X	No See Environmental Specialist Resource ID Memo
Act 250 Permits:	___	Yes	X	No See Environmental Specialist Resource ID Memo
FEMA Floodplains:	___	Yes	X	No See Environmental Specialist Resource ID Memo
Flood Hazard Area:	___	Yes	X	No See Environmental Specialist Resource ID Memo
River Corridor:	X	Yes	___	No See Environmental Specialist Resource ID Memo
Protected Lands:	X	Yes	___	No See Environmental Specialist Resource ID Memo
US Coast Guard:	___	Yes	X	No See Environmental Specialist Resource ID Memo
Lakes and Ponds:	___	Yes	X	No See Environmental Specialist Resource ID Memo
Scenic Highway/ Byway:	___	Yes	X	No See Environmental Specialist Resource ID Memo
Environmental Justice:	___	Yes	X	No See Environmental Specialist Resource ID Memo
Other:	___	Yes	X	No See Environmental Specialist Resource ID Memo

cc: Project File

Appendix G: Natural Resources Memo

Jessie Johnson
VTrans Biologist
State of Vermont
Environmental Section
Barre City Place
219 Main St.
Barre City, VT 05641
https://vtrans.vermont.gov/

Agency of Transportation

To: File
From: Jessie Johnson, VTrans Biologist
Date: Monday, July 24, 2023
Subject: Norton BF 0321(21) 22B360– Natural Resource ID

I have completed natural resource identification for the below referenced project (figure 1). This project is a culvert improvement project that is located along VT114 in Norton, Vermont. My evaluation has included wetlands, wildlife habitat, rare, threatened, and endangered species, and agricultural soils.

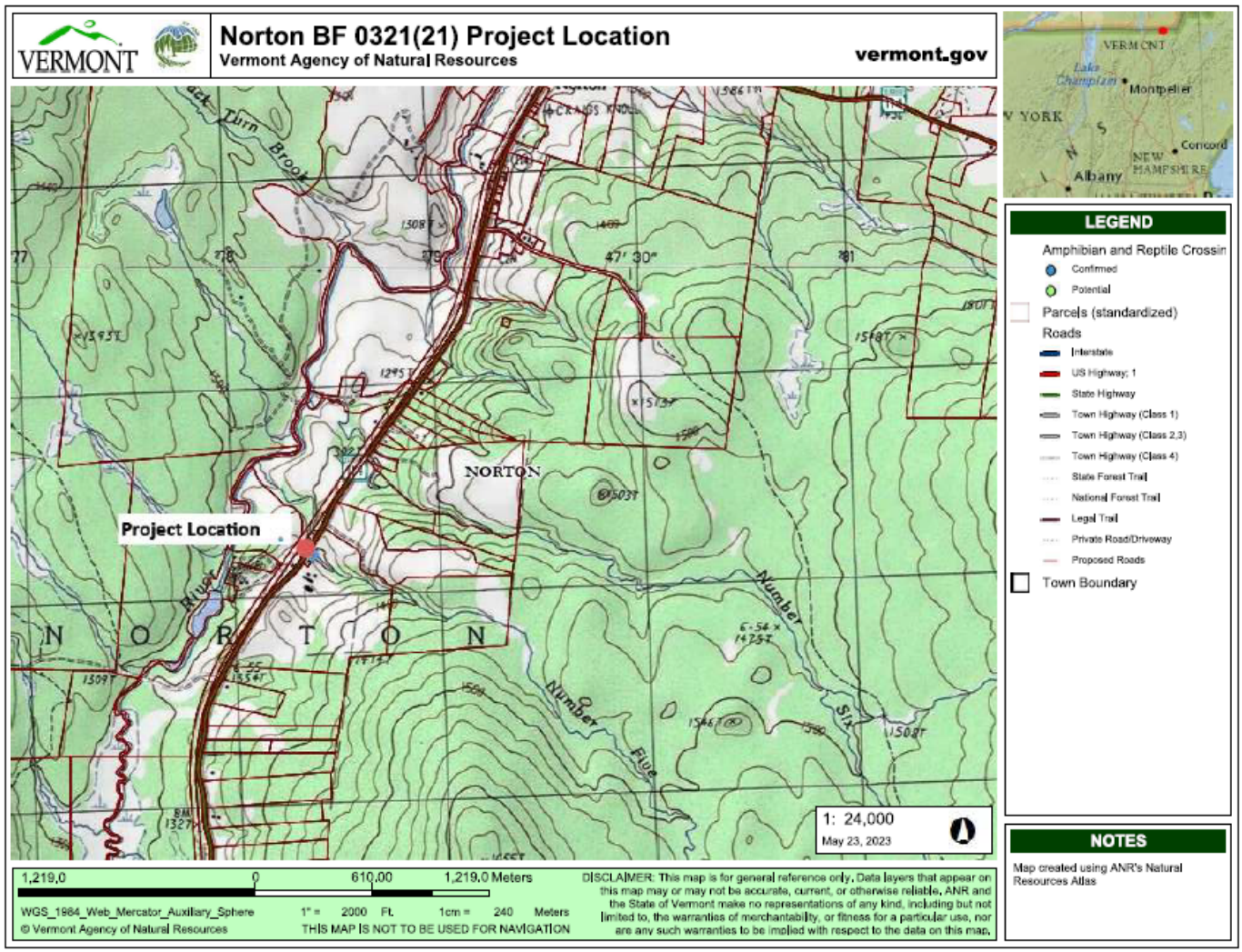


Figure 1: A map of the project location in Norton, VT along VT route 114 over Brook Number Five.

Wetlands/Watercourses

I reviewed existing VSWI, Advisory Wetland Mapping and USFWS Wetland Mapper prior to field work. One wetland is mapped in the vicinity of the project. This wetland is a Class II PFO1E freshwater forested/shrub wetland and is determined to be 19.70 acres in size. A site visit was completed on 6/20/2023 and determined that the wetland barriers are closer to the road than was previously mapped. A wetland delineation was completed on 6/20/2023, which indicated that wetlands are present closer to the road than depicted on the map below. The area where wetlands were found is indicated in yellow. The project runs over Brook number 5, which is a tributary of the Coaticook River.

Figure 3: A map of the wetlands and watercourses in and around the project location.

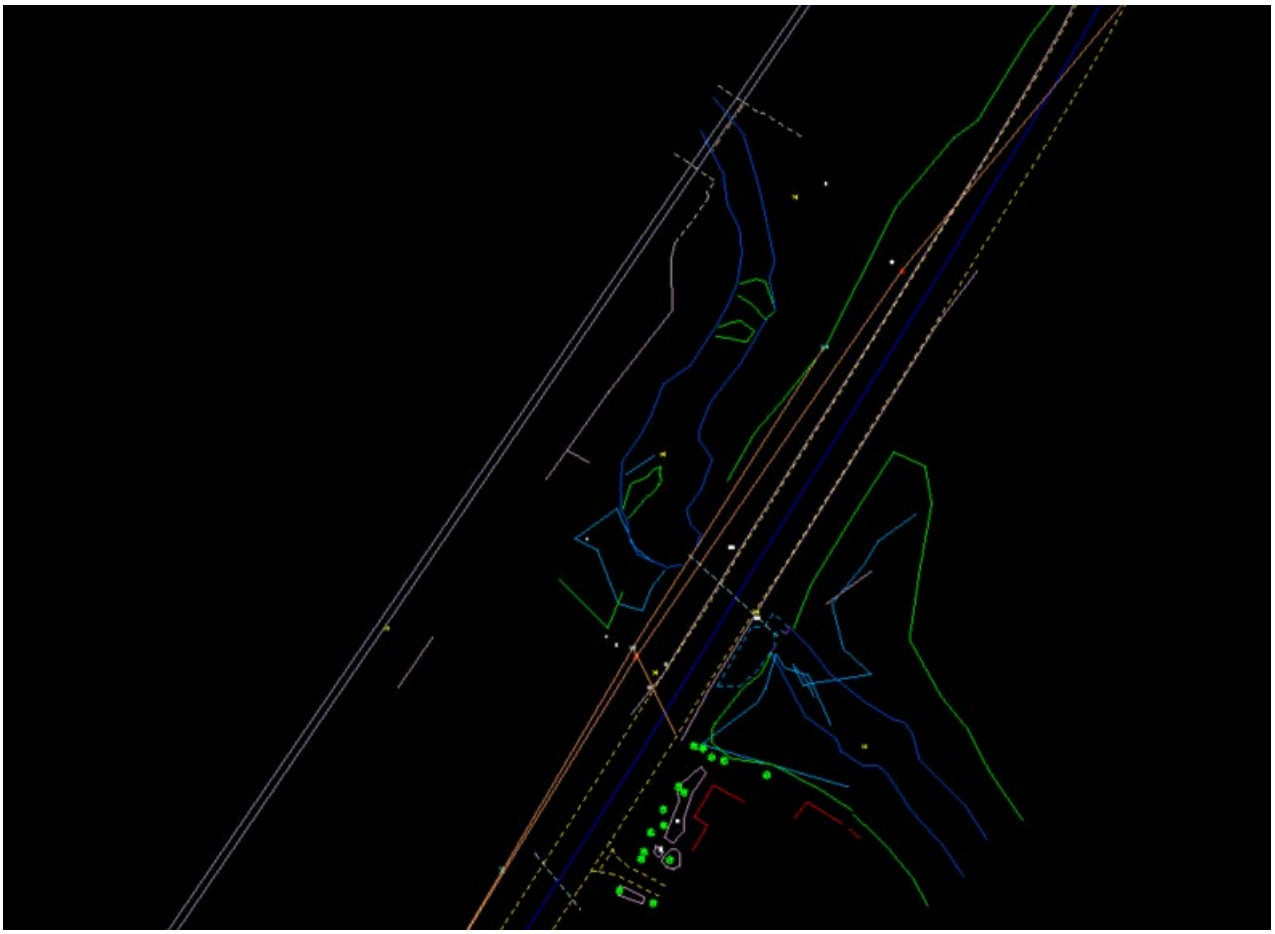


Figure 2: The wetlands mapped while in the field using a GPS.

Wildlife Habitat

The project is just south of a deer wintering area and east of a very large habitat block. Number 5 brook, which the project overlies, has the capacity for AOP passage. The project is slightly southeast of the Black Turn Brook State Forest, which is listed as a significant natural community on the ANR atlas. Moose and racoon tracks were recorded near the project location during a site visit on 6/20/2023, indicating the species are prevalent in the area. The terrestrial passage screening tool indicated that the area ranks high for wildlife connectivity.

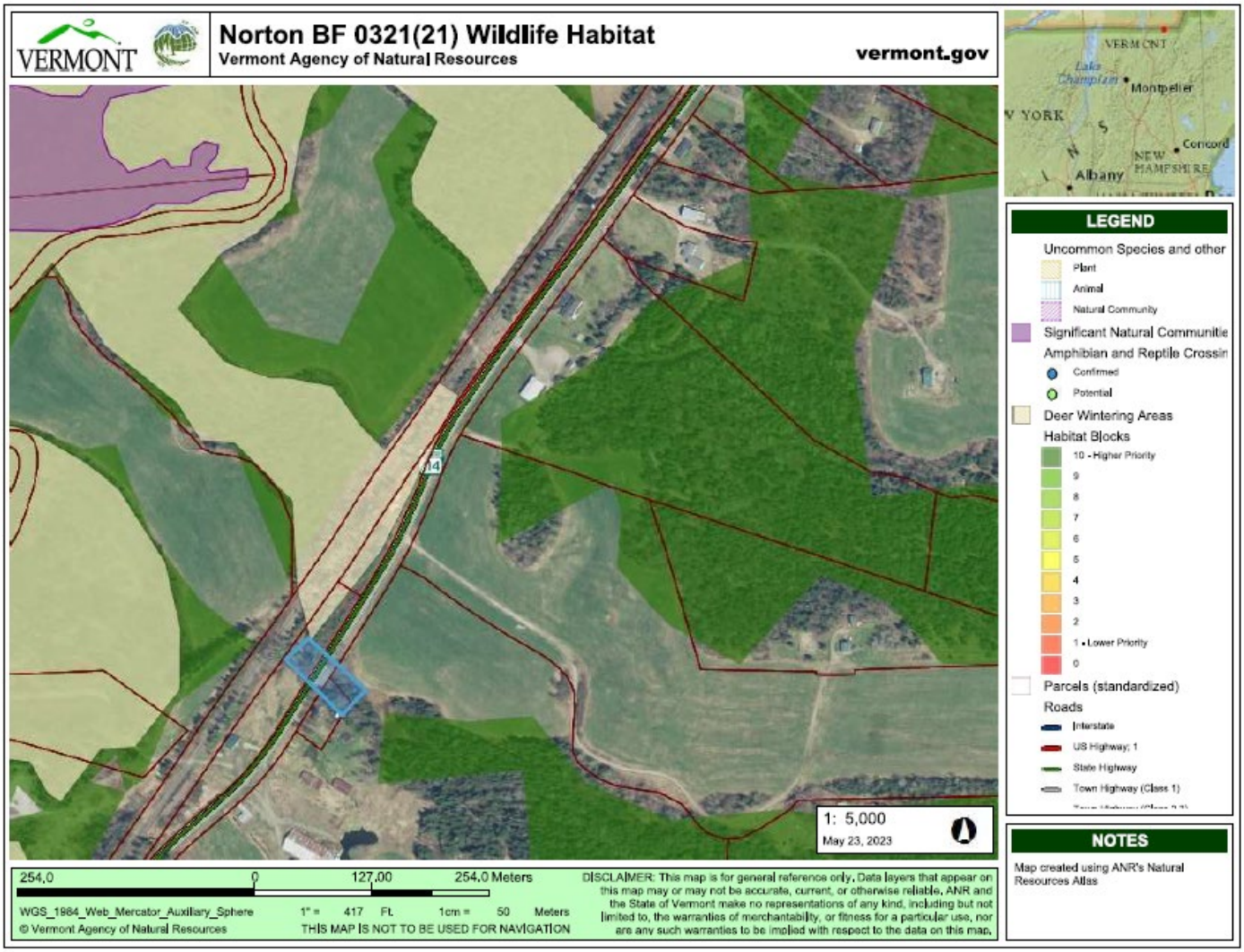


Figure 4: A map of the habitat block, deer wintering areas, and significant natural communities near the project location.

Rare, Threatened, and Endangered Species

I have queried the USFWS IPaC website and the ANR atlas for RTE species. The Vermont ANR atlas did not identify any RTE species near the project location. The USFWS IPac lists the endangered northern long-eared bat *(Myotis septentrionalis)*, and the threatened Canada lynx *(Lynx canadensis).* There are no critical habitats within this project area listed under this jurisdiction. I ran the project through the FHWA determination key on the IPaC website and the project will likely have no effect on the endangered northern long-eared Bat *(Myotis septentrionalis).* I also ran the project through the Northeast Endangered Species Determination Key, which indicated that the project may effect the Canada lynx *(Lynx canadensis).*

Agricultural Soils

The project borders Colton-Duxbury Complex, 3 to 8 percent slopes, Kinsman sand, 0 to 3 percent slopes, and Cabot-Colonel complex, 8 to 15 percent slopes, all of which are classified as agricultural.

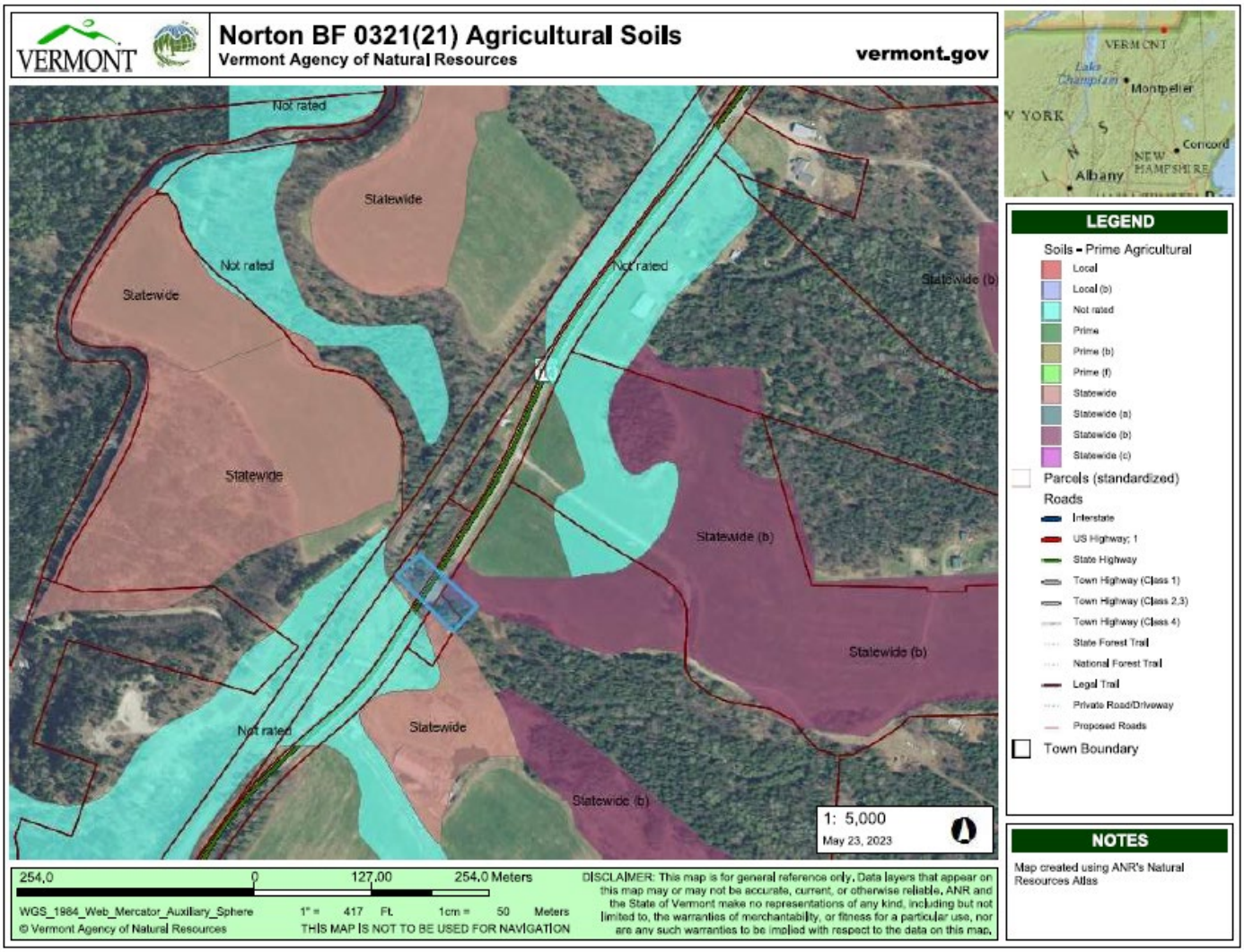


Figure 5: A map of the agricultural soils near the project location.

Appendix H: Archeology Memo

VERMONT

Jeannine Russell
VTrans Archaeology Officer
State of Vermont
Environmental Section
Barre City Place
219 Main St.
Barre City, VT 05641
802-477-3460 phone
Jeannine.russell@vermont.gov

Agency of Transportation

To: Lee Goldstein, Environmental Specialist

From: Jeannine Russell, VTrans Archaeology Officer

Date: September 8, 2023

Subject: Norton BF 0321(21) – Archaeological Resource ID

This project is located along VT 114 approximately 1.7 miles south of the intersection with VT 147 in Norton, VT. The project area sits within the Green Mountain Range on a high terrace with areas of cleared fields. Beyond the cleared fields, the area consists of densely wooded forests. A rail line sits just west of the project. Number 5 Brook passes through a large culvert that crosses beneath VT 114 and the immediate area consists of very steep slopes down to the brook. The brook eventually empties into the Coatlcook River approximately .2 miles to the west.

There are no recorded archaeological sites anywhere near the project and the only environmental factor contributing to sensitivity is the stream itself. The northeast quadrant drops steeply to the brook. The northwest quadrant also slopes steeply and sits at the base of a sloping hill. The southwest quadrant sits between VT 114 and the RR. The VTrans Archaeology Officer conducted a field visit on June 20, 2023 and observed some areas of disturbance perhaps related to access to the RR. The southeast quadrant contains a residence.

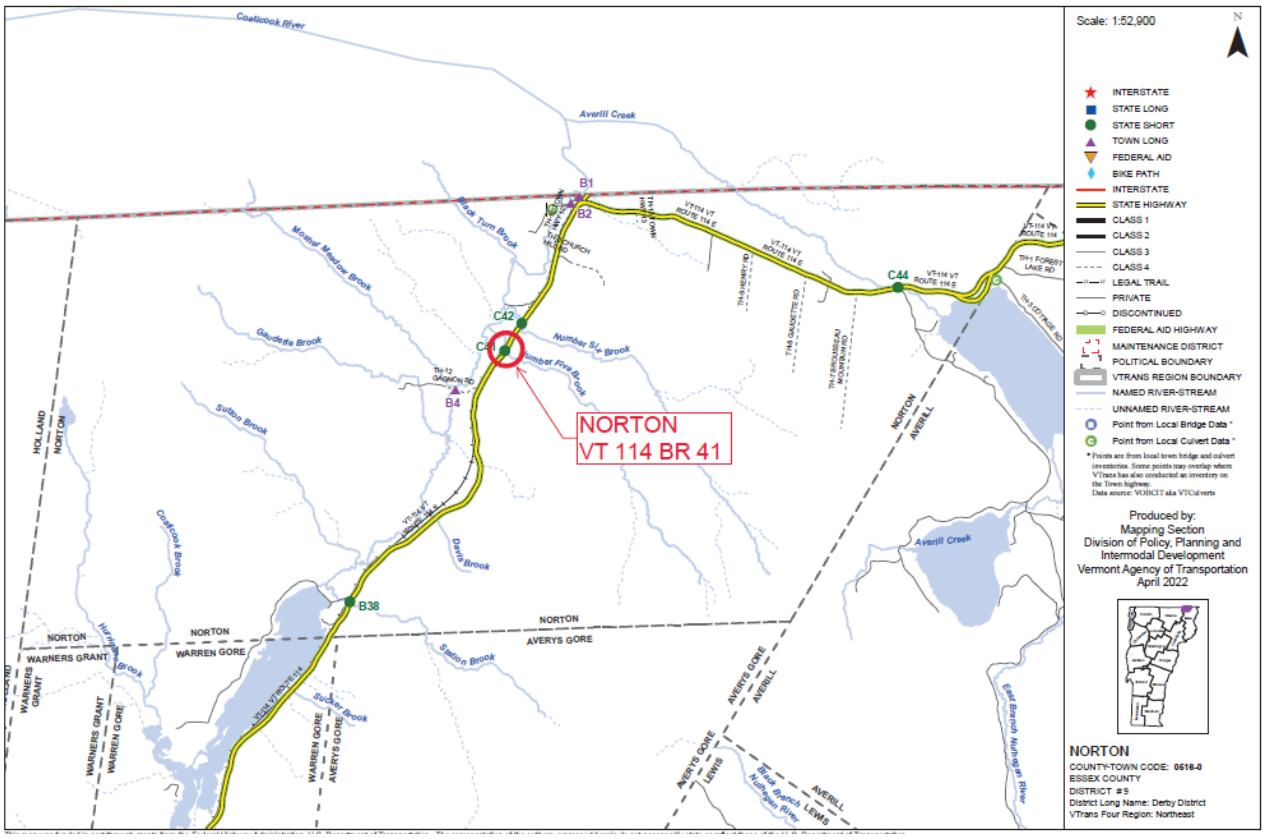
In short, no areas of archaeological sensitivity were observed during the field visit and no concerns are anticipated associated with project activities.

Please let me know if you have any questions.

Jeannine Russell

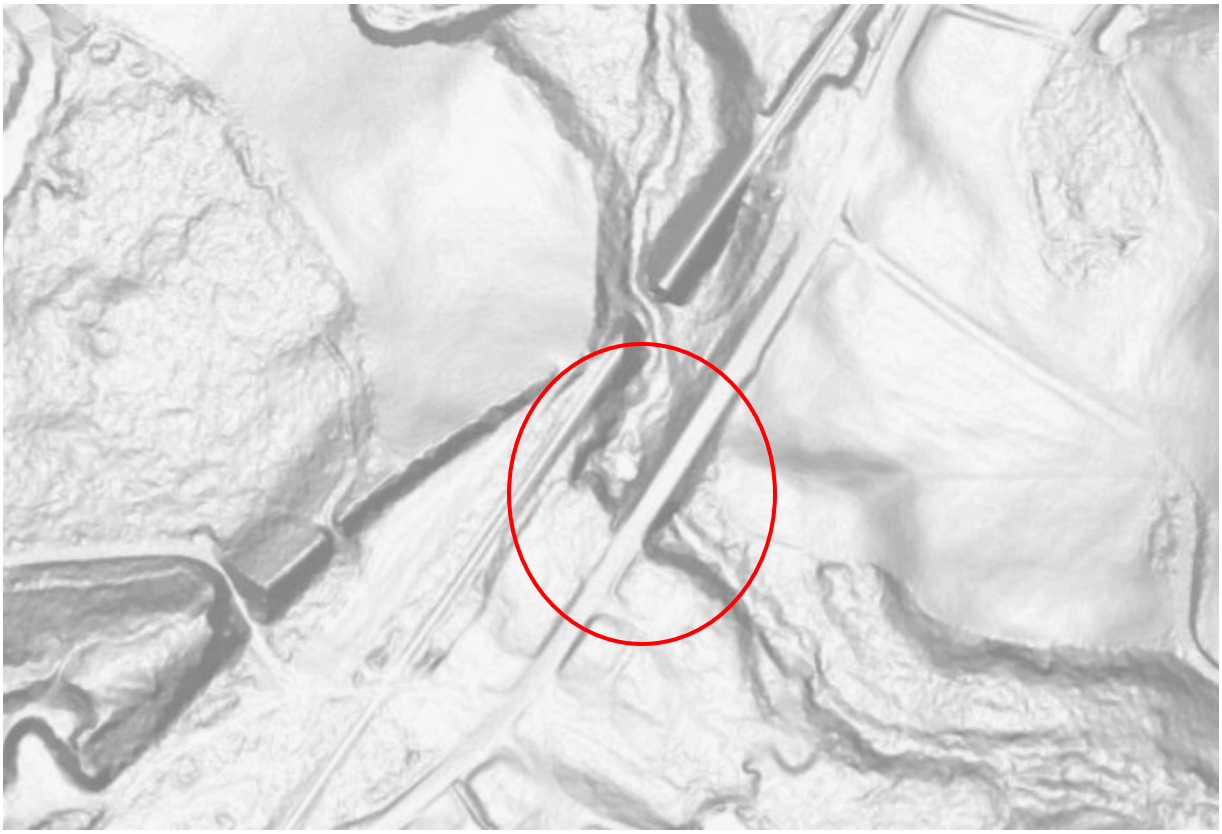
Thank you,
Jen Russell
VTrans Archaeology Officer

VTrans Working to Get You There
Vermont Agency of Transportation



Project location shown on town map

Google aerial image showing closer view of project



ORC LiDAR image of project area

Project locaton facing north on VT 114

Project location facing south on VT 114

Appendix I: Historic Memo

VERMONT

Vermont Agency of Transportation
Project Delivery Bureau - Environmental Section
Barre City Place
Tel: 802.595-3744

To: Lee Goldstein

From: Judith Williams Ehrlich, VTrans Historic Preservation Officer

Date: August 24, 2023

Subject: Historic Resource Identification for Norton BF 0321(21) 22B360

I have completed a resource identification (ID) for Norton BF 0321(21) 22B360. At this time, the project is anticipated to include replacement of the existing culvert. The culvert is Bridge 41 located at MM 3.69 on VT Route 114.

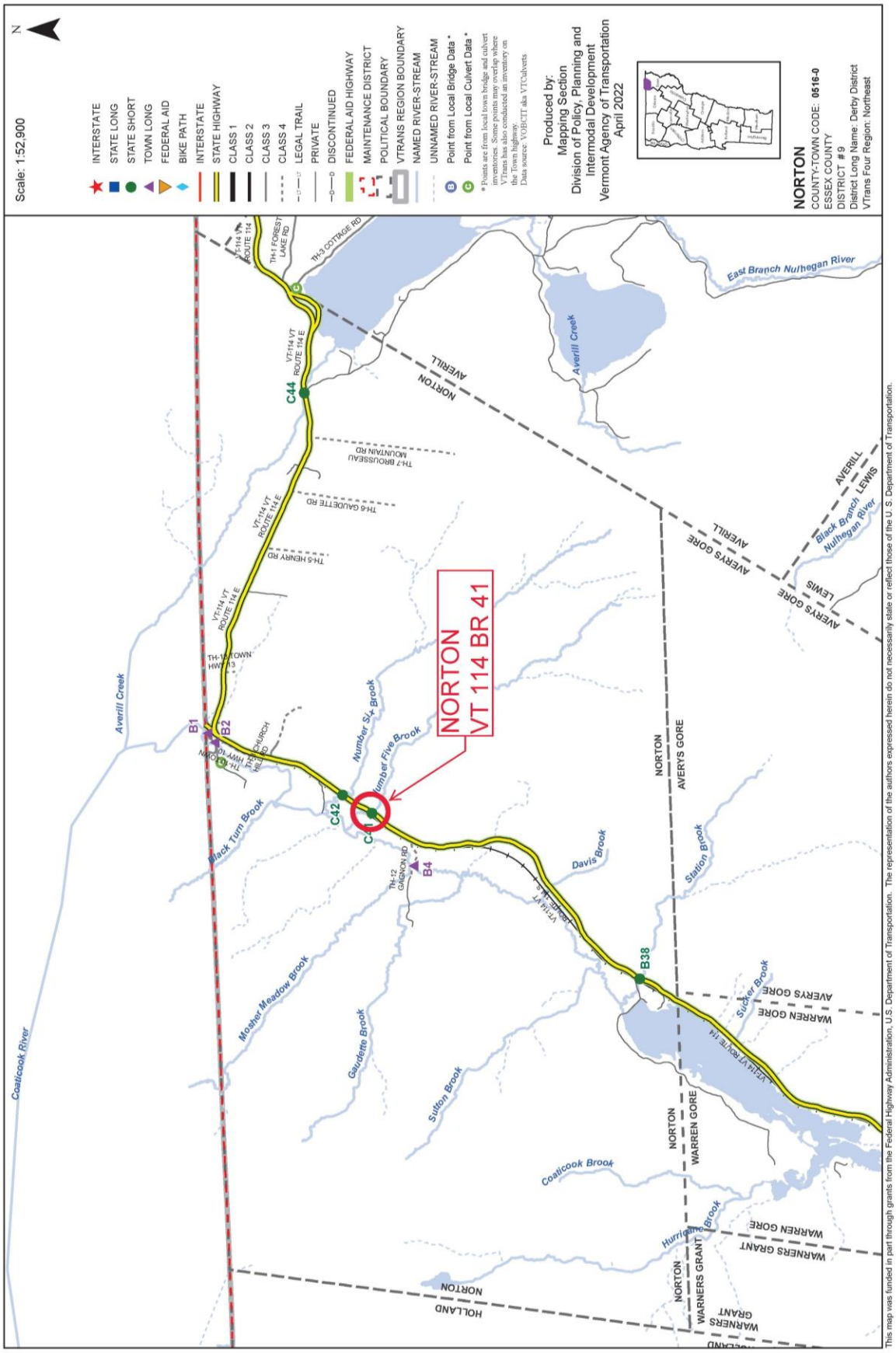
This Resource Identification effort is being undertaken to provide information to the VTrans designers working on a proposed improvement project. Toward that end, VTrans Cultural Resources staff have identified potential resources within a broad preliminary Area of Potential Effect to ensure the designers are aware of all cultural resources that could possibly be affected by a project. Once the project is defined at the Conceptual Design phase, Cultural Resources staff will be able to determine a formal Area of Potential Effect for purposes of Section 106 and 22 VSA § 14.

The existing culvert is a 10-foot diameter corrugated metal pipe. The culvert is not considered historic and is not a 4(f) resource.

There are no historic or 4(f) properties in the project area.

Please do not hesitate to contact me should you require additional information.

Attachments
1. Culvert location map
2. Photos



This map was funded in part through grants from the Federal Highway Administration, U.S. Department of Transportation. The representation of the authors expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

Culvert location map

Looking south on VT-114

Looking north on VT-114

Inlet

Inlet

Looking downstream from VT-114

Outlet

Appendix J: Environmental Specialist Resource ID

VERMONT

State of Vermont
Highways-PDB-Environmental
219 N. Main Street
www.aot.state.vt.us

Agency of Transportation

Date: September 7, 2023
Project: **Norton BF 0321(21) 22B360**

6(f) Properties:
There aren't any 6(f) Properties within the project area.

Hazardous Waste:
There aren't any Hazardous Wastes Sites identified within the project area.

Contaminated Soils:
There aren't any Contaminated Soils within the project area.

Wild Scenic Rivers:
There aren't any designated Wild Scenic Rivers within the project area.

Act 250 Permits:
There aren't any Act 250 Permits within the project area.

FEMA Floodplains:
There aren't any FEMA Floodplains mapped within the project area.

River Corridor:
There is a River Corridor mapped within the project area and a Flood Hazard Area/ River Corridor Permit may be required if there are impacts. Consultation with a ANR river management engineer is likely to be required.

Protected Lands:
There are Protected Lands mapped within the project area. These lands are listed as a Vermont land trust easement (conservation easement). The PM should design to avoid impacting these parcels due to requiring additional NEPA and permitting requirements.

US Coast Guard:
There aren't any US Coast Guard navigable waterways within the project area.

Lakes and Ponds:
There aren't any lakes or ponds within the project area.

Scenic Highway/ Byway:
There aren't any Scenic Highway/ Byways within the project area.

Environmental Justice:
There aren't any EJ populations present within the study area, therefore there isn't any potential to have a disproportionately high and adverse effect.

Other:
There aren't any other resources within the project area.

Appendix K: Hazardous Sites Map

Hazardous Waste Urban Soils Map

Vermont Agency of Natural Resources

vermont.gov

LEGEND

- Landfills
  - OPERATING
  - CLOSED
- Land Use Restrictions
  - Class IV GW Reclass
  - Class VI GW Reclass
  - Deed Restriction
  - Easement
  - Land Record Notice
  - Other
- Hazardous Site
- Hazardous Waste Generators
- Brownfields
- Salvage Yard
- Aboveground Storage Tank
- Underground Storage Tank (w
- Dry Cleaner
- Urban Soil Background Areas
- Parcels (standardized)
- Stream
  - Stream
  - Intermittent Stream
- Roads
  - Interstate
  - US Highway; 1
  - State Highway
  - Town Highway (Class 1)

NOTES

Map created using ANR's Natural Resources Atlas

130.0 0 65.00 130.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 213 Ft. 1cm = 26 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Appendix L: Stormwater Resource ID

State of Vermont
Environmental Section
219 North Main Street
Barre, Vermont 05641
Vtrans.vermont.gov

Agency of Transportation

[phone] 802-498-5787

To: Lee Goldstein, VTrans Environmental Specialist
From: Heather Voisin, VTrans Green Infrastructure Engineer
Date: September 7, 2023
Subject: Norton BF 0321(21) - Stormwater Resource ID Review

Project Description: I have reviewed the project area for Norton BF 0321(21) for stormwater related regulatory and water quality concerns. The project will involve improvements to Bridge 41, which conveys Number Five Brook under VT Route 114 in Norton, VT. My evaluation has included the review of existing imagery and mapping (ANR Natural Resource Atlas, VTrans Operational Stormwater Permits) to capture existing stormwater features and existing drainage.

Regulatory Considerations
It is not expected that an Operational Stormwater permit will be required for this project, unless there is greater than 0.5 acres of impervious area that is redeveloped for this project. If that is the case, the project would qualify for using Chapter 6 of the 2017 Vermont Stormwater Management Manual as a Public Linear Transportation Project. There do not appear to be any existing stormwater permits near the project location, nor are there any impaired (303(d) list) or stressed waters.

Existing Drainage
Based on a review of Google Street view, it appears that the roadway within the proposed limits is not curbed, with runoff flowing from the roadway overland onto adjacent properties in a distributed manner.

Design Considerations
It is encouraged that drainage work associated with this project, particularly around any ditching and bridge or culvert work, be aligned with the VTrans Phosphorus Control Highway Drainage Management Standards, as this may allow future credit toward achieving phosphorus reduction goals required by the Agency's TS4 permit.

Appendix M: Landscape Clearance Resource ID

VERMONT
AGENCY OF TRANSPORTATION

State of Vermont | Agency of Transportation
Environmental Section
219 North Main
Barre, VT 05641
Vtrans.vermont.gov

To: Project File
From: Bonnie Kirn Donahue, *VTrans Landscape Architect*
Date: August 17, 2023
Project: **Norton BF 0321(21) 22B360**
Subject: Landscape (LA) Clearance for Resource ID

I have reviewed the proposed area for **Norton BF 0321(21) 22B360,** and found the following:

SITE DESCRIPTION
The existing culvert is located in a rural area on state route VT-114. The surrounding area consists of open and wooded areas, with residential and agricultural land uses.

EXISTING CONDITIONS
The following items/conditions were found on site that could influence design decisions:

1. Riparian buffer:
    a. This project includes work within a riparian area and may benefit from a planting plan.

2. Trees to protect:
    a. This project includes trees that should be protected, including:
        i. Trees and gardens at the residence on 1703 VT-114.
        ii. Trees at the residence 1552 VT-114

3. Special site features:
    a. This project includes special site features that should be protected, including:
        i. Hayfields to the northeast of the culvert.

4. Plants observed during desktop review: (this is not a complete list of species on site)
    a. Apple
    b. Poplar
    c. Red maple
    d. Spruce
    e. Sugar maple
    f. Specked alder

5. Invasive species observed during desktop review: (this is not a complete list of species on site)
    a. No invasive species were identified in the project area (see natural resources clearance)

6. Accessibility & Active Transportation:
    a. This project would benefit from the addition or improvement of bicycle facilities.

7. Other:
    a. Per the VTrans Bicycle Corridor Priority map, this route is rated Low Use / Priority, however the municipal plan indicates bicyclists utilize the VT-114 corridor.

COMMUNITY RESOURCES

Per the 2014 Municipal Plan, the following sections apply to this project:

1. "Future development in town should be placed so as to utilize existing road and utility infrastructure, and to make pedestrian and bicycle use a viable transportation option." (p.36)
2. "The Northeast Kingdom Travel and Tourism Association (NEKTTA) maintains a website for the Northeast Kingdom Byway at www.travelthekingdom.com. Although Route 114 is not officially part of the byway, it is included as one of the sidetrips on the website's interactive map. The site identifies Route 114 in Norton as a bike route, and provides information on the Gore Mountain and Brousseau Mountain Trails." (p.14)
3. "Bicycle riders make seasonal use of State Route 114. There are also bike paths identified in the Sladyk Wildlife Management Area, located in the western part of Norton." (p.18)

RECOMMENDATIONS

1. Minimize tree clearing in this area.
2. Minimize disturbance in the riparian buffer.
3. Develop a riparian planting plan for any disturbed riparian areas on this project.
4. Tree protection shall be used for any trees with canopies within the area of construction, including:
    a. Trees and gardens at the residence on 1703 VT-114.
    b. Trees at the residence 1552 VT-114
5. Per the 2014 Norton Municipal Plan, improve accommodations for bicyclists within the project area (Example: widen shoulders).

NOTES

1. I am available to assist with landscape architectural design, including planting plans, plant lists, hardscape/pedestrian access plans, etc. (bonnie.donahue@vermont.gov).

ATTACHMENTS

Please see photos below.

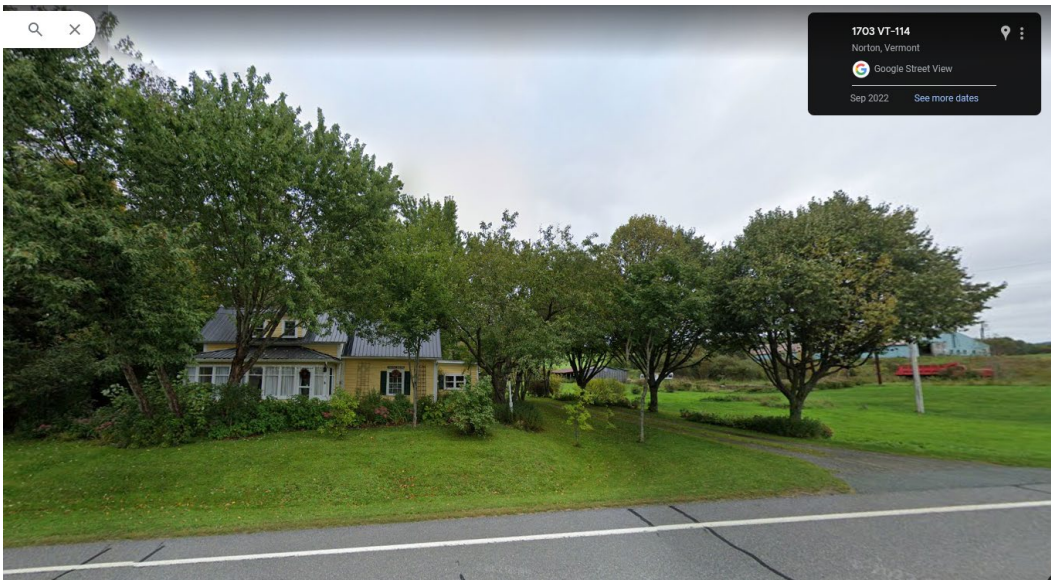


Figure 1: Protect trees and gardens at residence.

Figure 2: Protect trees at residence

Appendix N: Local Input Questionnaire

Local & Regional Input Questionnaire

Project Summary

This project, BF 0321(21), focuses on a culvert on VT Route 114 in Norton, Vermont. The culvert is deteriorating and needs either a major maintenance action or replacement. Potential options being considered for this project include a new liner applied to the interior of the existing culvert, removal of the existing culvert and replacement with a new culvert placed in the same location. It is possible that VTrans will recommend a road closure and detour traffic away from the project site for the duration of the work. Efforts will be made to limit the detour to State roads.

Community Considerations

1. Are there regularly scheduled public events in the community that will generate increased traffic (e.g. vehicular, bicycles and/or pedestrians), or may be difficult to stage if the bridge is closed during construction? Examples include annual bike races, festivals, parades, cultural events, weekly farmers market, concerts, etc. that could be impacted? If yes, please provide approximate date, location and event organizers' contact info.

   No

2. Is there a "slow season" or period of time from May through October where traffic is less or no events are scheduled?

   No

3. Please describe the location of the Town garage, emergency responders (fire, police, ambulance) and emergency response routes that might be affected by the closure of the bridge, one-way traffic, or lane closures and provide contact information (names, address, email addresses, and phone numbers.

   Emergency Responders: Beecher Falls Fire Department Attn: Steve Young
   PO Box 326
   1252 Route 253
   Beecher Falls, VT 05902
   802-266-822

   Vermont Sheriff's Department Attn: Trever Colby
   91 Courthouse Drive
   Guildhall, VT 05905
   802-676-3500

   45th Parallel/EMS Attn: Nate Borland
   46 Ramsey Road
   Colebrook, NH 03576
   603-237-5593

4. Are there businesses (including agricultural operations and industrial parks) or delivery services (fuel or goods) that would be adversely impacted either by a detour or due to work zone proximity?

   Yes-major truck route

5. Are there important public buildings (town hall, community center, senior center, library) or community facilities (recreational fields, town green, etc.) close to the project?

   yes-within 3 miles

6. What other municipal operations could be adversely affected by a road/bridge closure or detour?

   None

7. Are there any town highways that might be adversely impacted by traffic bypassing the construction on other local roads? Please indicate which roads may be affected and their condition (paved/unpaved, narrow, weight-limited bridges, etc), including those that may be or go into other towns.

   No-no alternate route available

8. Is there a local business association, chamber of commerce, regional development corporation, or another downtown group that we should be working with? If known, please provide name, organization, email, and phone number.

   No

9. Are there any public transit services or stops that use the bridge or transit routes in the vicinity that may be affected if they become the detour route?

   School bus route

Schools

1. Where are the schools in your community and what are their yearly schedules (example: first week in September to third week in June)?

   Daily to Canaan Memorial Schools- 2 stops past this culvert; School starts August 29 and goes to June 13 for this year.

2. Is this project on specific routes that school buses or students use to walk to and from school?

   Yes

3. Are there recreational facilities associated with the schools nearby (other than at the school)?

   No

Pedestrians and Bicyclists

1. What is the current level of bicycle and pedestrian use on this section of VT Route 114?

   Some depending on the time of year.

2. Are the current lane and shoulder widths adequate for pedestrian and bicycle use?

   No

3. Does the community feel there is a need for a sidewalk or bike lane on this section of VT Route 114?

   Maybe, contact Kingdom Trails.

4. Is pedestrian and bicycle traffic heavy enough that it should be accommodated during construction?

   Yes

5. Does the Town have plans to construct either pedestrian or bicycle facilities along this section of VT Route 114? Please provide any planning documents demonstrating this (scoping study, master plan, corridor study, town or regional plan).

   No

6.

7. In the vicinity of the culvert, is there a land use pattern, existing generators of pedestrian and/or bicycle traffic, or zoning that will support development that is likely to lead to significant levels of walking and bicycling?

   No

Design Considerations

1. Are there any concerns with the alignment of this section of VT Route 114? For example, if the bridge is located on a curve, has this created any problems that we should be aware of?

   No

2. Are there any concerns with the width of this section of VT Route 114?

   NO

3. Are there any special aesthetic considerations we should be aware of?

   US Customs, Border Patrol and Homeland Security.

4. Does the location have a history of flooding? If yes, please explain.

   It washed out during Irene in 2011.

5. Are there any known Hazardous Material Sites near the project site?

   No

6. Are there any known historic, archeological and/or other environmental resource issues near the project site?

   Houses-yes
   Resources-No

7. Are there any utilities (water, sewer, communications, power) along this section of VT Route 114? Please provide any available documentation.

   Yes

8. Are there any existing, pending, or planned municipal utility projects (communications, lighting, drainage, water, wastewater, etc.) near the project that should be considered?

   No

9. Are there any other issues that are important for us to understand and consider?

   People need to access this area, a lot of people commute through the area for their jobs, to get groceries, etc.

Land Use & Zoning

1. Please provide a copy of your existing and future land use map or zoning map, if applicable.

   I will attach the Zoning Map.

2. Are there any existing, pending or planned development proposal that would impact future transportation patterns near the bridge? If so, please explain.

   No

3. Is there any planned expansion of public transit or intercity transit service in the project area? Please provide the name and contact information for the relevant public transit provider.

   No

Communications

1. Please identify any local communication outlets that are available for us to use in communicating with the local population. Include weekly or daily newspapers, blogs, radio, public access TV, Facebook, Front Page Forum, etc. Also include any unconventional means such as local low-power FM.

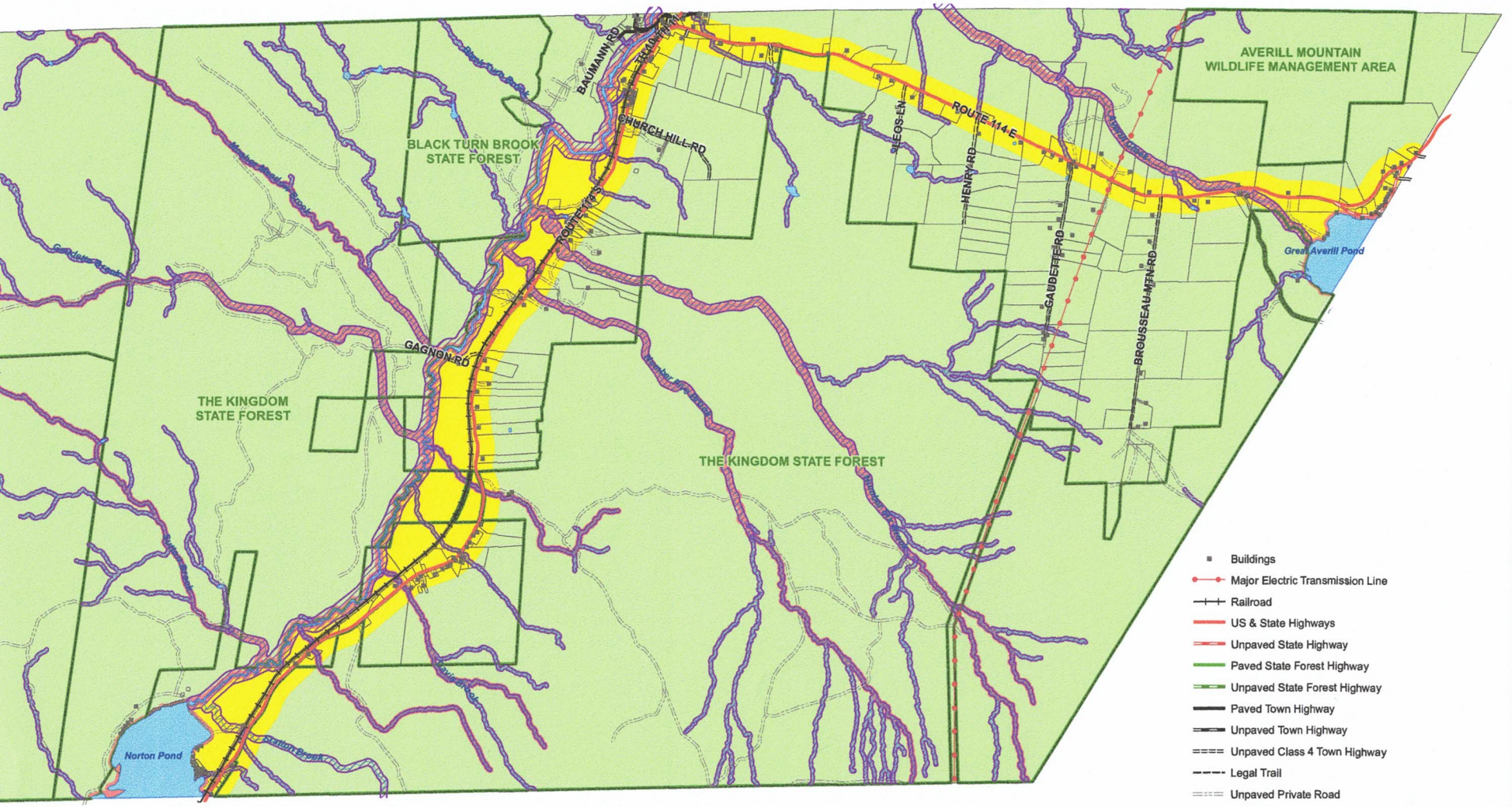
   Newspapers: The News and Sentinel 603-237-5501
   The Colebrook Chronicle 603-246-8998
   The Newport Daily Express 802-334-6568
   The Barton Chronicle 802-525-3531
   The Caledonian Record 802-748-8121
   The Town also has a Facebook Page that I can post information on.

2. Other than people/organizations already referenced in this questionnaire, are there any others who should be kept in the loop as the project moves forward?

   Not that I can think of.

Town of Norton Zoning District Map #6

07/02/2014



- Buildings
- Major Electric Transmission Line
- Railroad
- US & State Highways
- Unpaved State Highway
- Paved State Forest Highway
- Unpaved State Forest Highway
- Paved Town Highway
- Unpaved Town Highway
- Unpaved Class 4 Town Highway
- Legal Trail
- Unpaved Private Road
- Streams
- Lakes, Ponds & Rivers
- Public Lands
- Parcel Boundaries - 2003

Zoning Districts

- Agricultural/Forest
- Lake Shore & Streambank
- Rural Residential
- Flood Hazard Overlay - River Corridors

***The FEMA Special Flood Hazard Areas are shown separately on the Flood Insurance Rate Map (FIRM) and are regulated as part of the FHOD."**

Warning- This Data is for planning purposes only and does not replace a survey and/or engineering study. Because this map is developed from various scale sources, there may be some discrepancies between data layers.

0 1 2 Miles

Appendix O: Operations Input Questionnaire (blank)

Bridge Scoping Project BF 0321(21)
Operations Input Questionnaire

The Structures Section has begun the scoping process for BF 0321(21), VT Route 114, Culvert 41, carrying the Number 5 Stream, in Norton, Vermont. This is a Corrugated Galvanized Metal Plate Pipe. constructed in 1957. The Structure Inspection, Inventory, and Appraisal Sheet (attached) rates the culvert as a 4(poor). We are interested in hearing your thoughts regarding the items listed below. Leave it blank if you don't wish to comment on a particular item.

1. What are your thoughts on the general condition of this culvert and the general maintenance effort required to keep it in service?

   We concur with the Inspection Report. We have performed slope stabilization, filled subsurface voids and road surface work.

2. What are your comments on the current geometry and alignment of the roadway (curve, sag, banking, sight distance) at this location?

   No issues.

3. Do you feel that the posted speed limit is appropriate?

   Yes.

4. Is the current roadway width adequate for winter maintenance including snow plowing?

   Yes.

5. Are the railings constantly in need of repair or replacement? What type of railing works best for your district?

   No rail maintenance issues. W beam.

6. Are you aware of any unpermitted driveways within close proximity to the culvert? We frequently encounter driveways that prevent us from meeting railing and safety standards.

   No.

7. Are you aware of abutting property owners that are likely to need special attention during the planning and construction phases? These could be people with disabilities, elderly, or simply folks who feel they have been unfairly treated in the past.

   No knowledge of any such issues.

8. Do you find that extra effort is required to keep the slopes and riverbanks around the culvert in a stable condition? Is there frequent flood damage that requires repair?

   We have performed slope stabilization.

9. Does this culvert seem to catch an unusual amount of debris from the waterway?

   Nothing unusual.

10. Are you familiar with traffic volumes in the area of this project?

    Relatively light, but significant truck traffic.

11. Do you think a closure with off-site detour and accelerated construction would be appropriate? Do you have any opinion about a possible detour route, assuming that we use State route for State projects and any route for Town projects? Are there locations on a potential detour that are already congested that we should consider avoiding?

    We don't believe there is a viable detour for this site.

12. Please describe any larger projects that you have completed that may not be reflected on the attached Appraisal sheet, such as deck patches, paving patches, railing replacement with new type, steel coating, etc.

    In 2022, we drilled some holes into the subsurface to pour flocon to fill some voids that had developed above the culvert.

13. If there is a sidewalk at this location, how effective are the Town's efforts to keep it free of snow and ice?

    N/A.

14. Are there any drainage issues that we should address with this project?

    No.

15. Are you aware of any complaints that the public has about issues that we can address on this project?

    No.

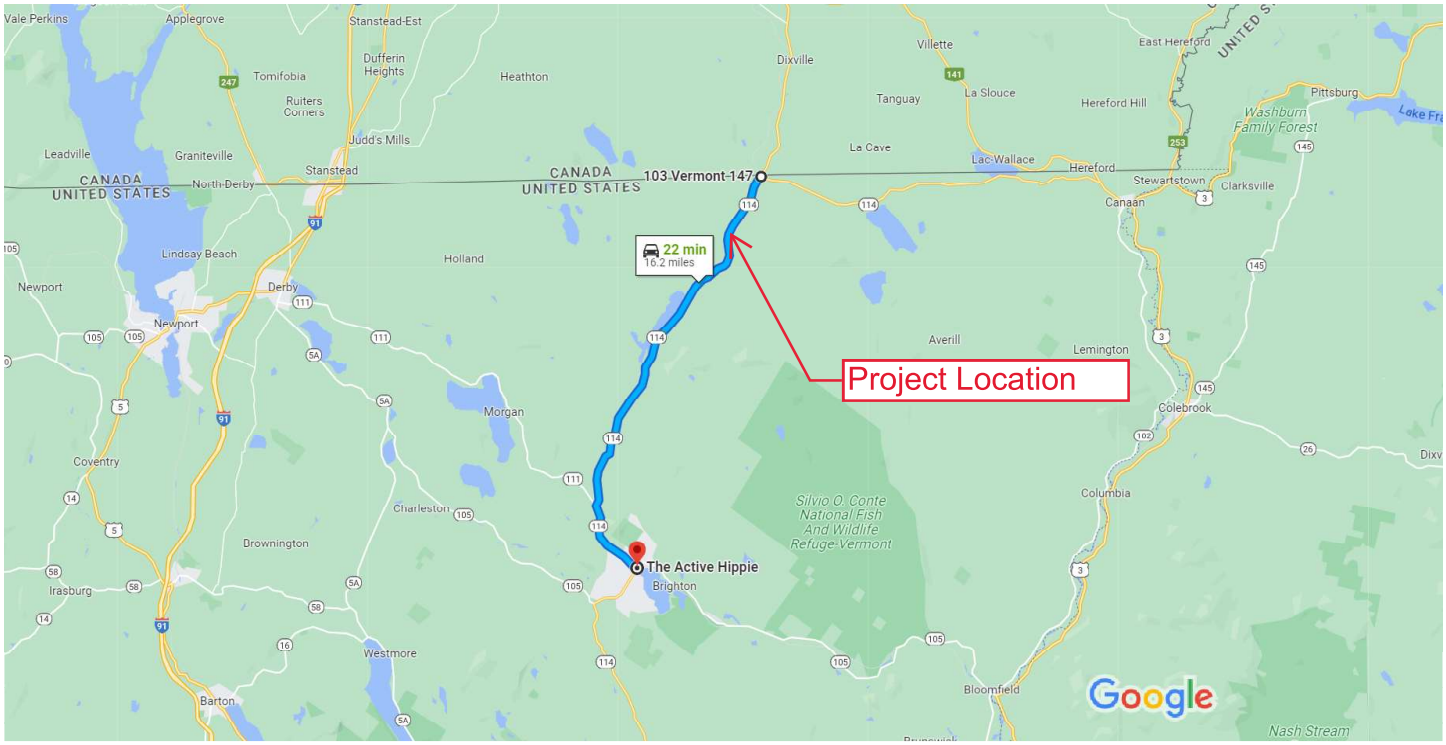
16. Is there anything else we should be aware of? *No.*

Appendix P: Detour Maps

Google Maps

Norton VT114 BR 41 Through Distance

Through Distance = 16.2 miles,
Travel Time = 22 min



Map data ©2023 Google 2 mi

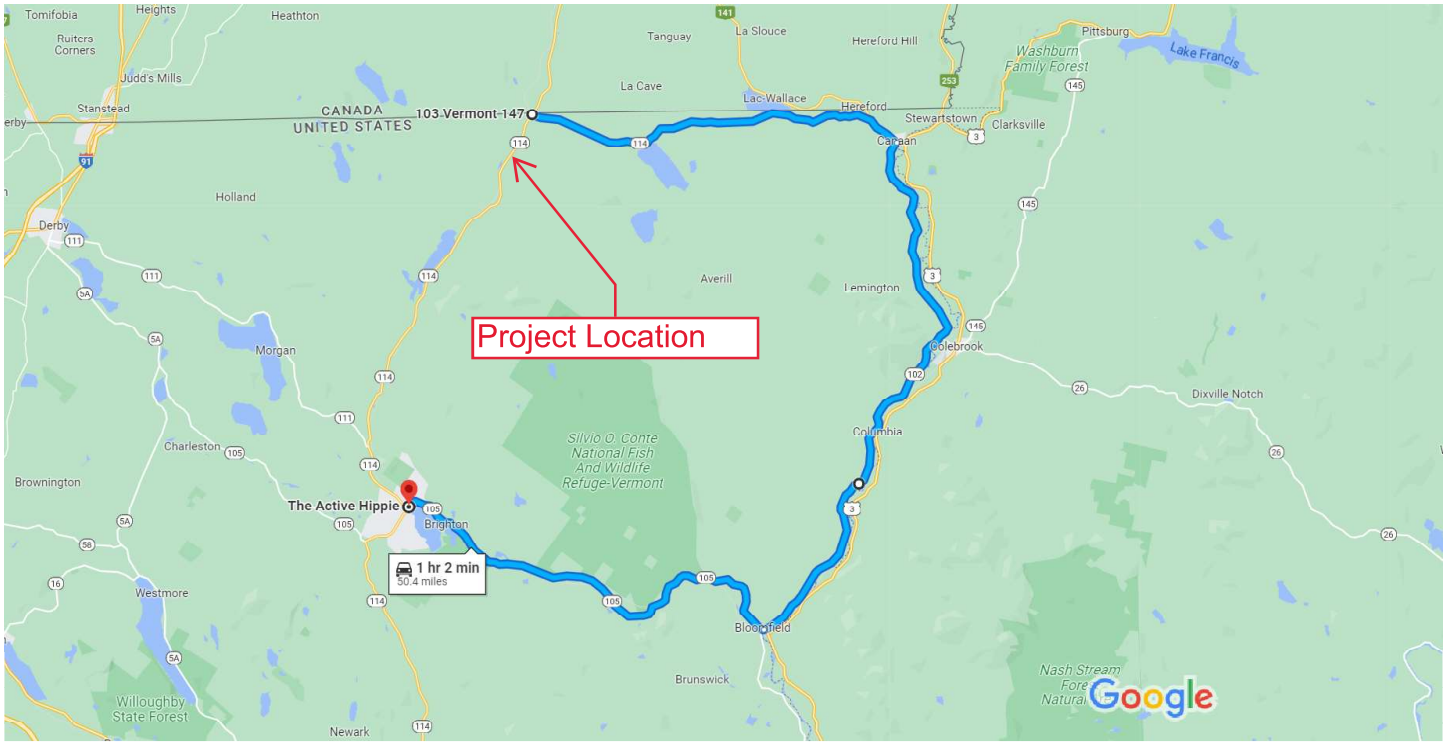
103 VT-147
Norton, VT 05907

1. Head southwest on VT-147 S toward Nelson Rd
   400 ft
2. Merge onto VT-114 S
   16.1 mi
3. Turn right onto Cross St
   Destination will be on the right
   26 ft

Brighton, VT 05846

Google Maps **Norton VT114 BR 41 Regional Detour Distance**

Through Distance = 50.4 miles,
Travel Time = 1 hr 2 min



103 VT-147
Norton, VT 05907

1. Head southwest on VT-147 S toward Nelson Rd
   23 ft
2. Turn left at the 1st cross street onto Nelson Rd/Rte 147 N
   167 ft
3. Turn left onto VT-114 N
   13.5 mi
4. Turn right onto VT-102 S
   20.7 mi
5. Turn right onto VT-105 W
   Destination will be on the right
   16.1 mi

Brighton, VT 05846

Regional Detour Route:
- Through distance = 16.2 miles
- Detour distance = 50.4 miles
- Added distance = 34.2 miles
- End-to-end distance = 66.6 miles

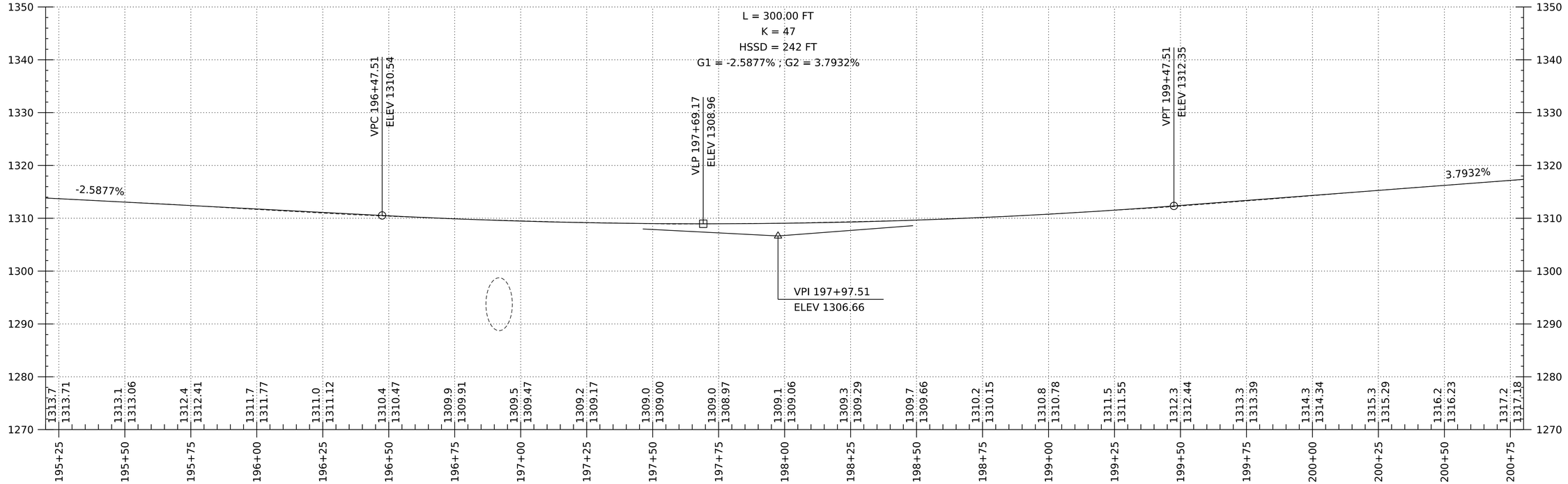
Appendix Q: Plans

EXISTING CONDITION

SCALE 1" = 20'-0"

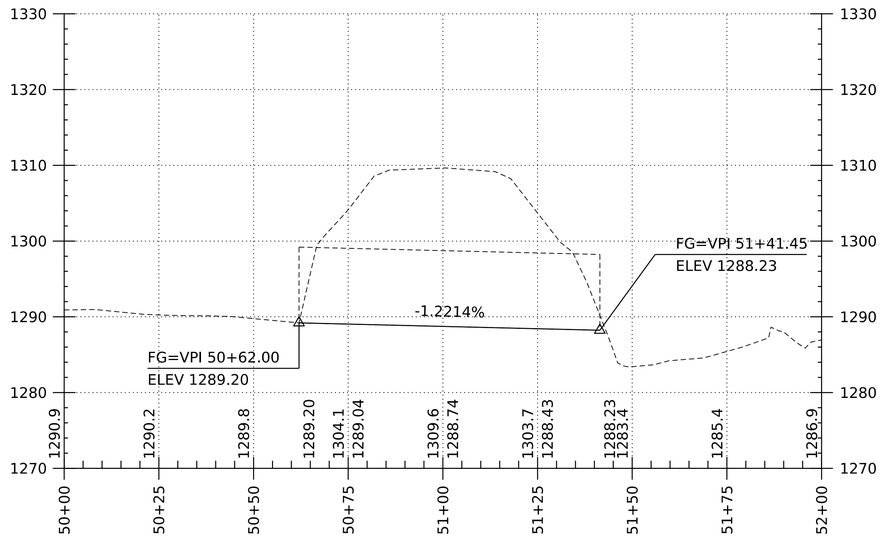
20 0 20

PROJECT NAME:	NORTON		
PROJECT NUMBER:	BF 0321(21)		
FILE NAME:	22b360/s22b360BDR_Existing.dgn	PLOT DATE:	27-OCT-2023
PROJECT LEADER:	L.J.STONE	DRAWN BY:	D.D.BEARD
DESIGNED BY:	------	CHECKED BY:	------
EXISTING CONDITIONS LAYOUT		SHEET 1 OF 19	



VT ROUTE 114 PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"



NUMBER 5 BROOK CHANNEL PROFILE

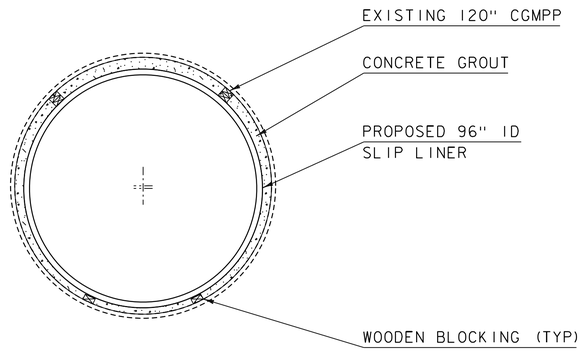
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

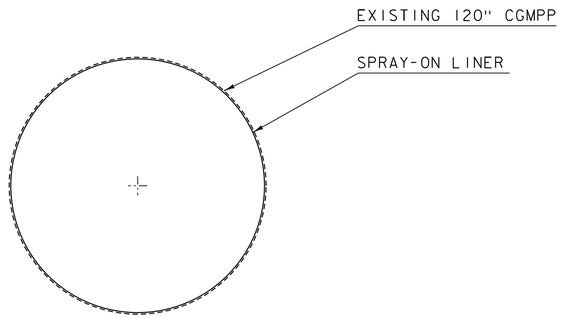
PROJECT NAME: NORTON
PROJECT NUMBER: BF 0321(21)

FILE NAME: s22b360profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
EXISTING PROFILE SHEET

PLOT DATE: 27-OCT-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------



SLIP LINER TYPICAL SECTION



SPRAY LINER TYPICAL SECTION

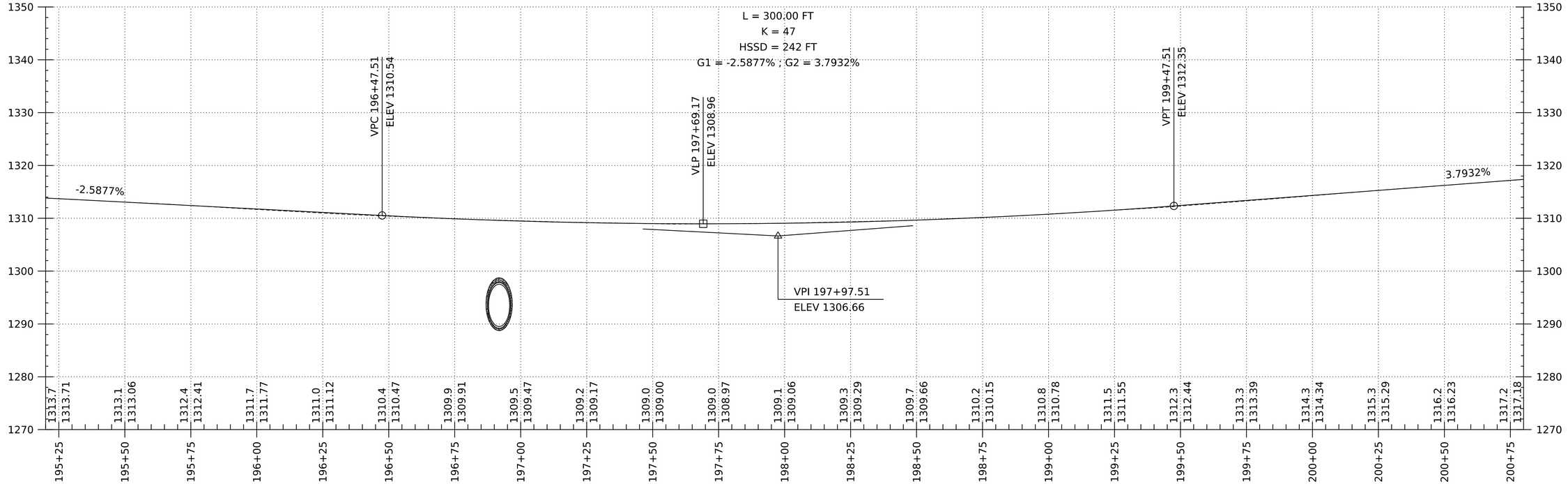
PROJECT NAME: NORTON
PROJECT NUMBER: BF 0239(4)

FILE NAME: 22b360/s22b360typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ----------
REHABILITATION TYPICAL SECTIONS

PLOT DATE: 27-OCT-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ----------
SHEET 3 OF 19

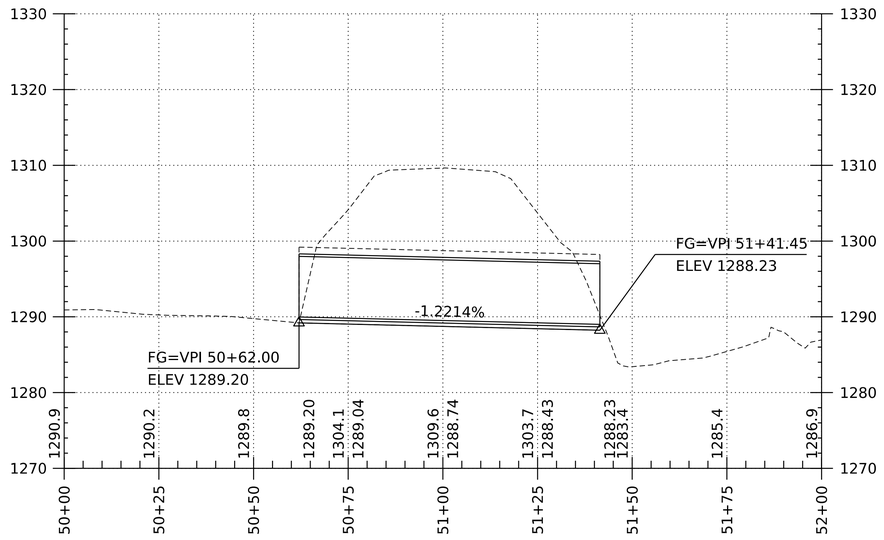
PROJECT NAME:	NORTON
PROJECT NUMBER:	BF 0321(21)

FILE NAME:	22b360/s22b360BDR_Slip Rehab.dgn	PLOT DATE:	27-OCT-2023
PROJECT LEADER:	L.J.STONE	DRAWN BY:	D.D.BEARD
DESIGNED BY:	------	CHECKED BY:	------
SLIP LINER REHABILITATION LAYOUT		SHEET 4 OF 19	



VT ROUTE 114 PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"



NUMBER 5 BROOK CHANNEL PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORTON
PROJECT NUMBER: BF 0321(21)

FILE NAME: s22b360profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
SLIP LINER PROFILE SHEET

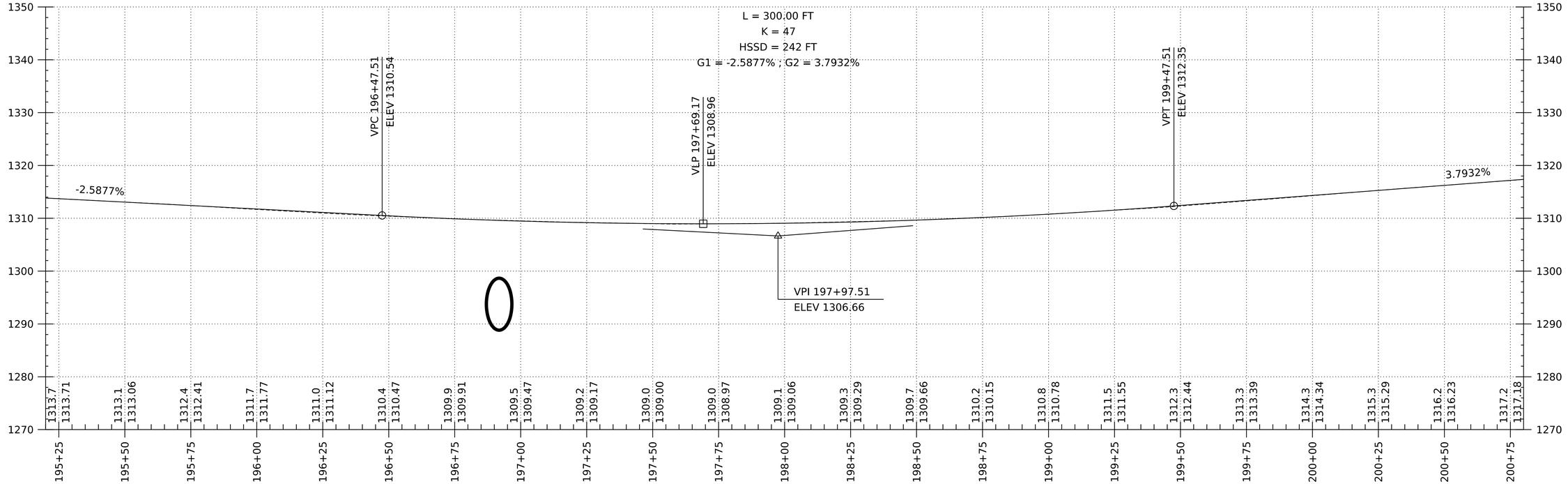
PLOT DATE: 27-OCT-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 5 OF 19

SPRAY LINER REHABILITATION

SCALE 1" = 20'-0"

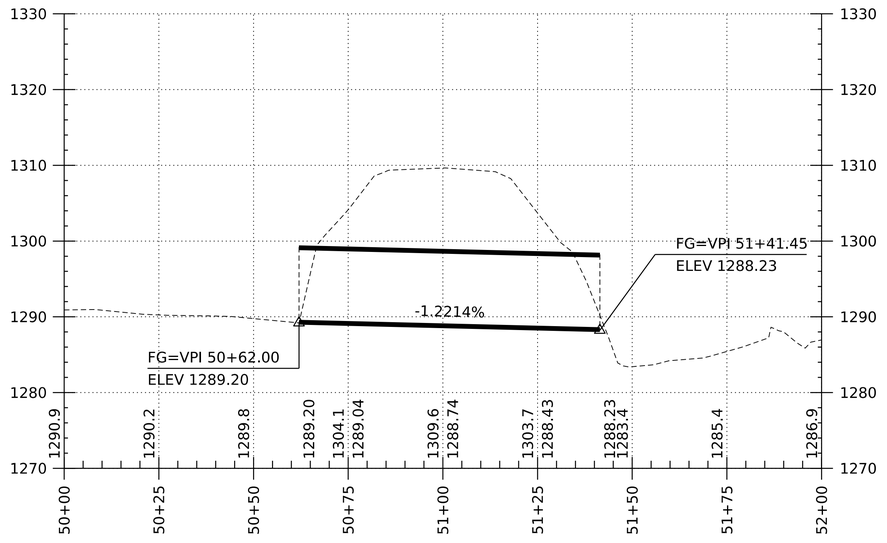
20 0 20

PROJECT NAME:	NORTON		
PROJECT NUMBER:	BF 0321(21)		
FILE NAME:	22b360/s22b360BDR_Spray Rehab.dgn	PLOT DATE:	27-OCT-2023
PROJECT LEADER:	L.J.STONE	DRAWN BY:	D.D.BEARD
DESIGNED BY:	------	CHECKED BY:	------
SPRAY LINER REHABILITATION LAYOUT		SHEET	6 OF 19



VT ROUTE 114 PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"



NUMBER 5 BROOK CHANNEL PROFILE

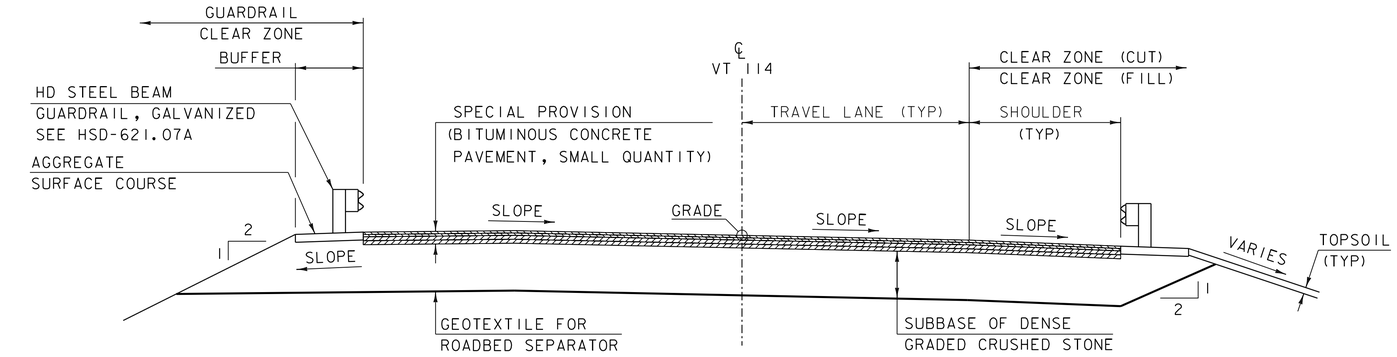
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORTON
PROJECT NUMBER: BF 0321(21)

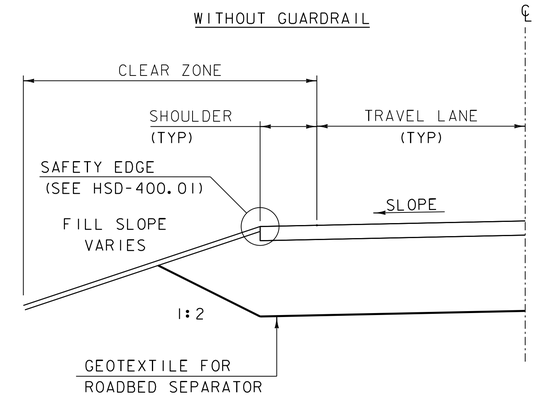
FILE NAME: s22b360profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
SPRAY LINER PROFILE SHEET

PLOT DATE: 27-OCT-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 7 OF 19



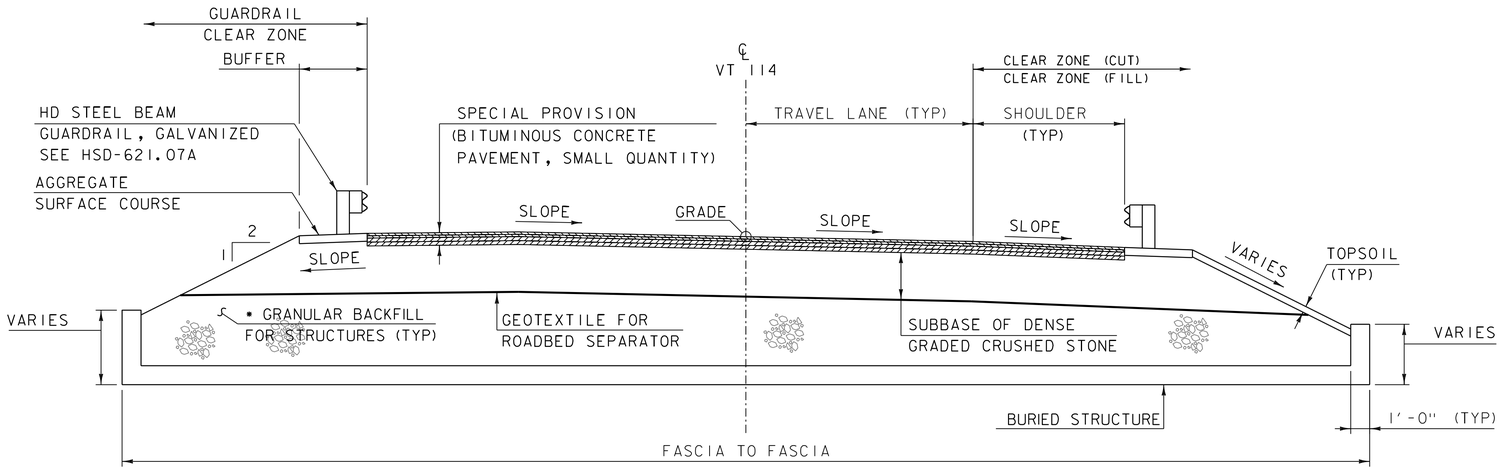
VT ROUTE 114 TYPICAL SECTION

SCALE: 1/4" = 1'-0"



ROADWAY TYPICAL SECTION

NOT TO SCALE



VT ROUTE 114 BURIED STRUCTURE TYPICAL SECTION

SCALE: 1/4" = 1'-0"

ROAD TYPICAL INFORMATION

	LEFT		RIGHT	
	WIDTH	SLOPE	WIDTH	SLOPE
TRAVEL LANE	12'-0"	VARIES	12'-0"	VARIES
SHOULDER	3'-0"	VARIES	3'-0"	VARIES
BUFFER	3'-7"	-0.060	3'-7"	-0.060
FILL SLOPE	---	VARIES	---	VARIES
CLEAR ZONE (CUT)	8'-0"	---	8'-0"	---
CLEAR ZONE (FILL)	14'-0"	---	14'-0"	---
CLEAR ZONE (GUARDRAIL)	4'-9"	---	4'-9"	---

MATERIAL INFORMATION

	THICKNESS	TYPE
WEARING COURSE	1½"	SPECIAL PROVISION (BITUMINOUS CONCRETE PAVEMENT, SMALL QUANTITY) (TYPE IVS)
BINDER COURSE	1½"	SPECIAL PROVISION (BITUMINOUS CONCRETE PAVEMENT, SMALL QUANTITY) (TYPE IVS)
BASE COURSE #2	2½"	SPECIAL PROVISION (BITUMINOUS CONCRETE PAVEMENT, SMALL QUANTITY) (TYPE IIS)
BASE COURSE #1	2½"	SPECIAL PROVISION (BITUMINOUS CONCRETE PAVEMENT, SMALL QUANTITY) (TYPE IIS)
BUFFER	8"	AGGREGATE SURFACE COURSE
SUBBASE	XX"	SUBBASE OF DENSE GRADED CRUSHED STONE
TOPSOIL	4"	TOPSOIL

TACK COAT: EMULSIFIED ASPHALT IS TO BE APPLIED AT A RATE OF 0.025 GAL/SY BETWEEN SUCCESSIVE COURSES OF PAVEMENT AND 0.080 GAL/SY ON COLD PLANED SURFACES AS DIRECTED BY THE ENGINEER.

MATERIAL TOLERANCES

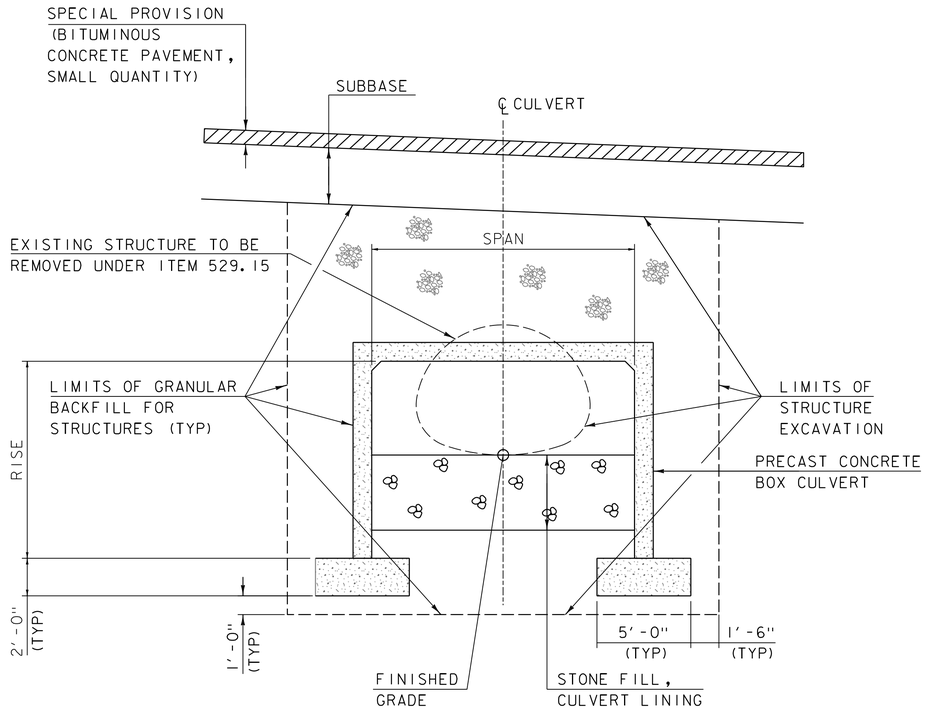
(IF USED ON PROJECT)

SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- 1/4"
- AGGREGATE SURFACE COURSE	+/- 1/2"
SUBBASE	+/- 1"
SAND BORROW	+/- 1"

PROJECT NAME: NORTON
PROJECT NUMBER: L.J.STONE

FILE NAME: 22b360/s22b360typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
ROADWAY TYPICAL SECTION SHEET

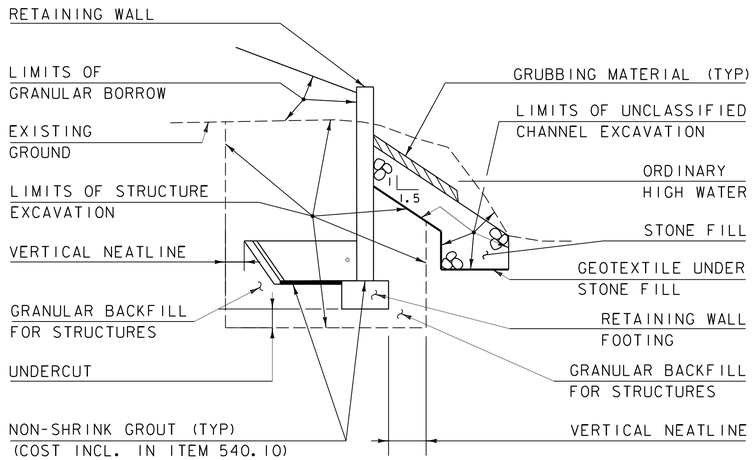
PLOT DATE: 27-OCT-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------



SPAN	22'-0"
RISE	13'-0"
LENGTH	90'-0"

CULVERT TYPICAL SECTION

NOT TO SCALE



RETAINING WALL EARTHWORK TYPICAL SECTION

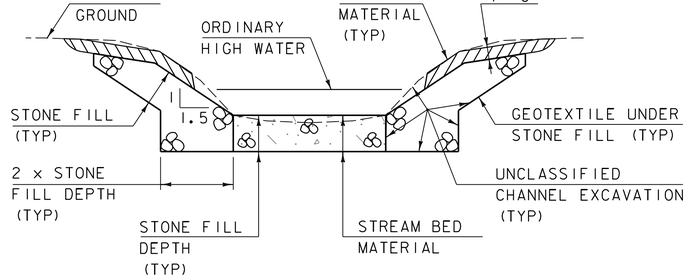
NOT TO SCALE

NOTE:

TOP OF RETAINING WALL FOOTING SHALL BE AT OR BELOW BOTTOM OF BOX CULVERT.

RETAINING WALL - ASSUMED DIMENSIONS

LEVELING PAD	
	DIMENSION
WIDTH	2'-6"
TOE	0'-9"
HEEL	0'-9"
THICKNESS	1'-0"
UNDERCUT	1'-0"
WALL	
THICKNESS	1'-0"
HEIGHT	VARIES
EXCAVATION LIMITS	
VERTICAL NEATLINE	1'-6"
UNDERCUT	1'-0"



TYPICAL CHANNEL SECTION

(NOT TO SCALE)

1) WHENEVER CHANNEL SLOPE INTERSECTS ROADWAY SUBBASE, GRUBBING MATERIAL SHALL BEGIN AT THE BOTTOM OF SUBBASE.

2) THE CONTRACTOR SHALL CREATE A LOW FLOW CHANNEL IN THE STREAM BED MATERIAL AS DIRECTED BY THE ENGINEER.

3) GRUBBING MATERIAL SHALL BE PLACED UNDERNEATH STRUCTURES WHERE THERE IS MORE THAN 6 FEET VERTICALLY FROM ORDINARY HIGH WATER (OHW) TO THE BOTTOM OF SUPERSTRUCTURE AND MORE THAN 6 FEET HORIZONTALLY FROM OHW LINE TO FRONT FACE OF ABUTMENT. THIS MATERIAL SHALL START JUST ABOVE THE OHW ELEVATION AND TERMINATE 3 FEET HORIZONTALLY FROM THE FRONT FACE OF THE ABUTMENT. THIS MATERIAL SHALL NOT BE PLACED UNDERNEATH DOWNSPOUTS. SEE THE CHANNEL SECTIONS FOR ADDITIONAL DETAILING.

MATERIAL INFORMATION

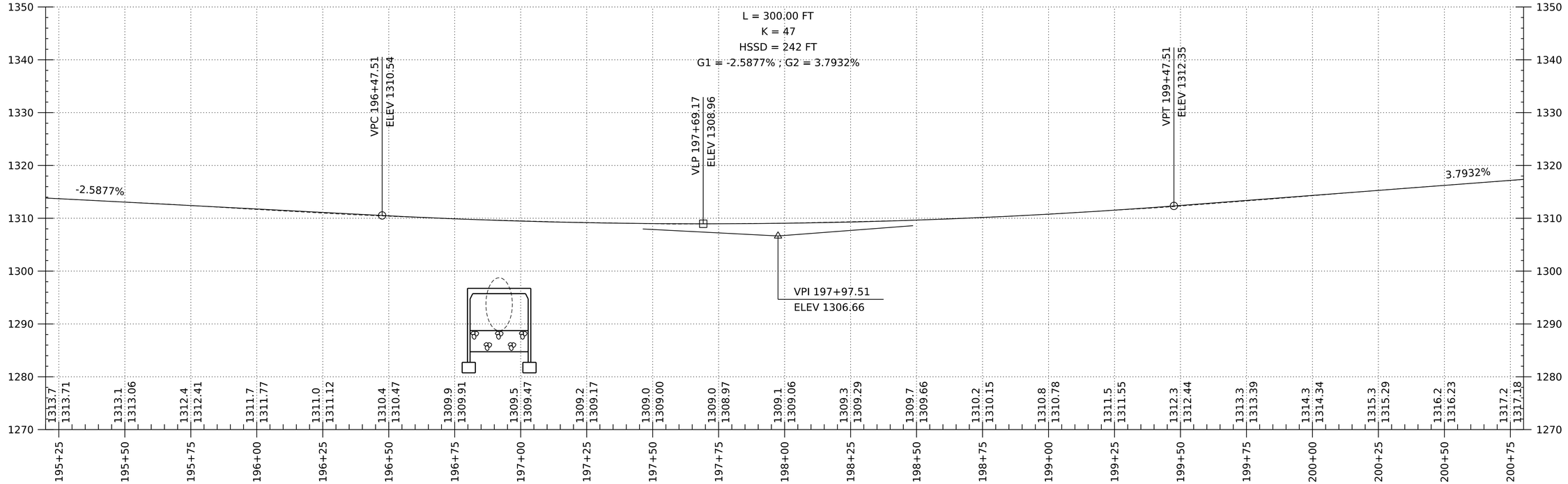
	THICKNESS	TYPE
STONE FILL	4'-0"	TYPE IV
STONE FILL, CULVERT LINING	4'-0"	E-STONE TYPE IV
STONE FILL, STREAM BED MATERIAL	4'-0"	E-STONE TYPE IV

PROJECT NAME: NORTON
PROJECT NUMBER: BF 0239(4)

FILE NAME: 22b360/s22b360typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
3 SIDED FRAME TYPICAL SECTION SHEET

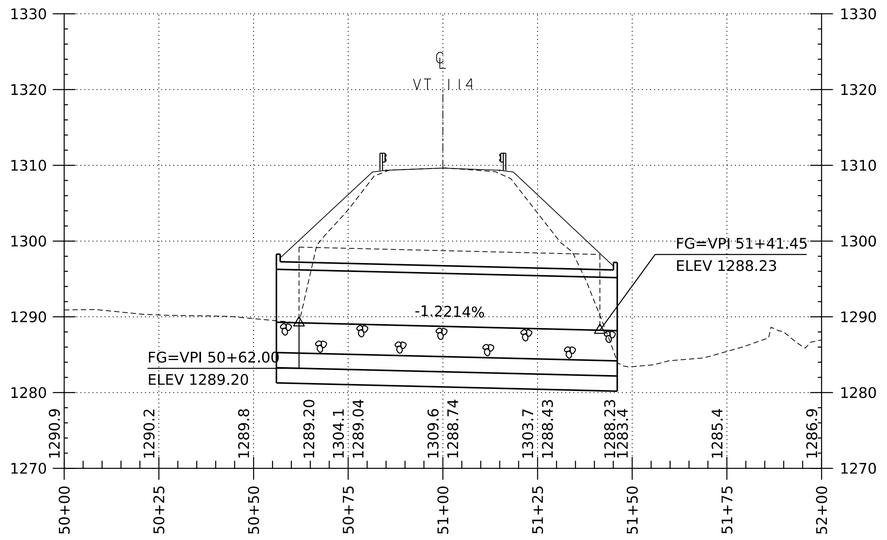
PLOT DATE: 27-OCT-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------

PROJECT NAME:	NORTON		
PROJECT NUMBER:	BF 0321(21)		
FILE NAME:	22b360/s22b360BDR_New Culvert.dgn	PLOT DATE:	27-OCT-2023
PROJECT LEADER:	L.J.STONE	DRAWN BY:	D.D.BEARD
DESIGNED BY:	------	CHECKED BY:	------
NEW CULVERT LAYOUT		SHEET	10 OF 19



VT ROUTE 114 PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"



NUMBER 5 BROOK CHANNEL PROFILE

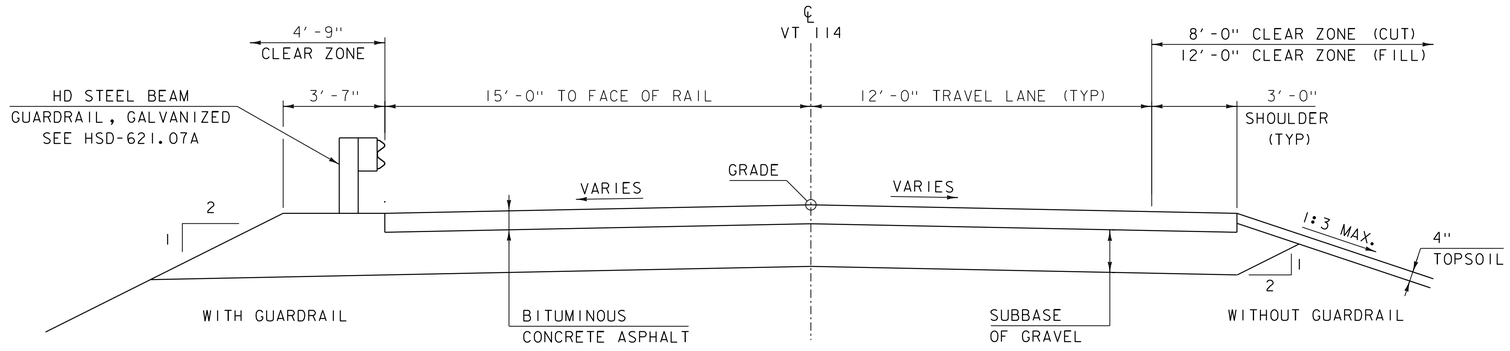
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORTON
PROJECT NUMBER: BF 0321(21)

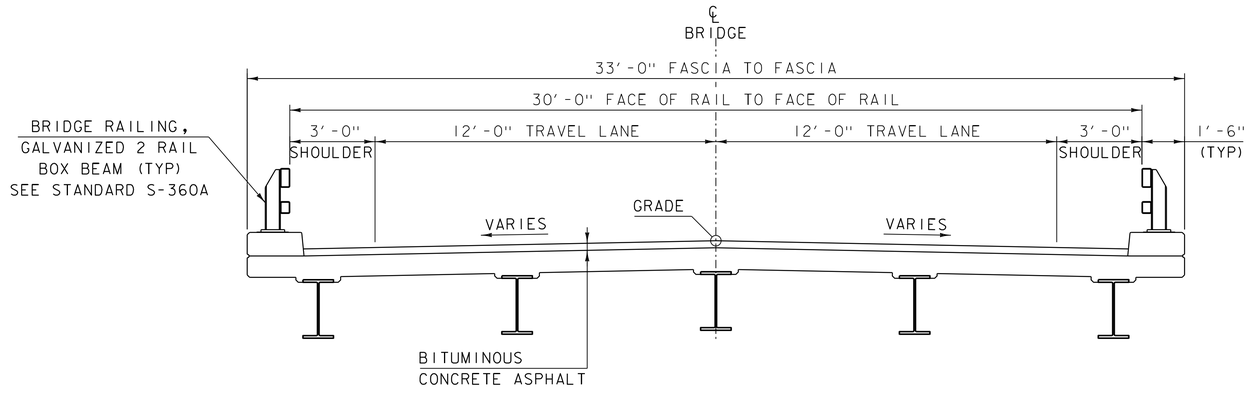
FILE NAME: s22b360profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
THREE SIDED FRAME PROFILE SHEET

PLOT DATE: 27-OCT-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 11 OF 19



PROPOSED VT ROUTE 114 TYPICAL SECTION

SCALE 3/8" = 1'-0"



FLOW

PROPOSED BRIDGE TYPICAL SECTION

SCALE 3/8" = 1'-0"

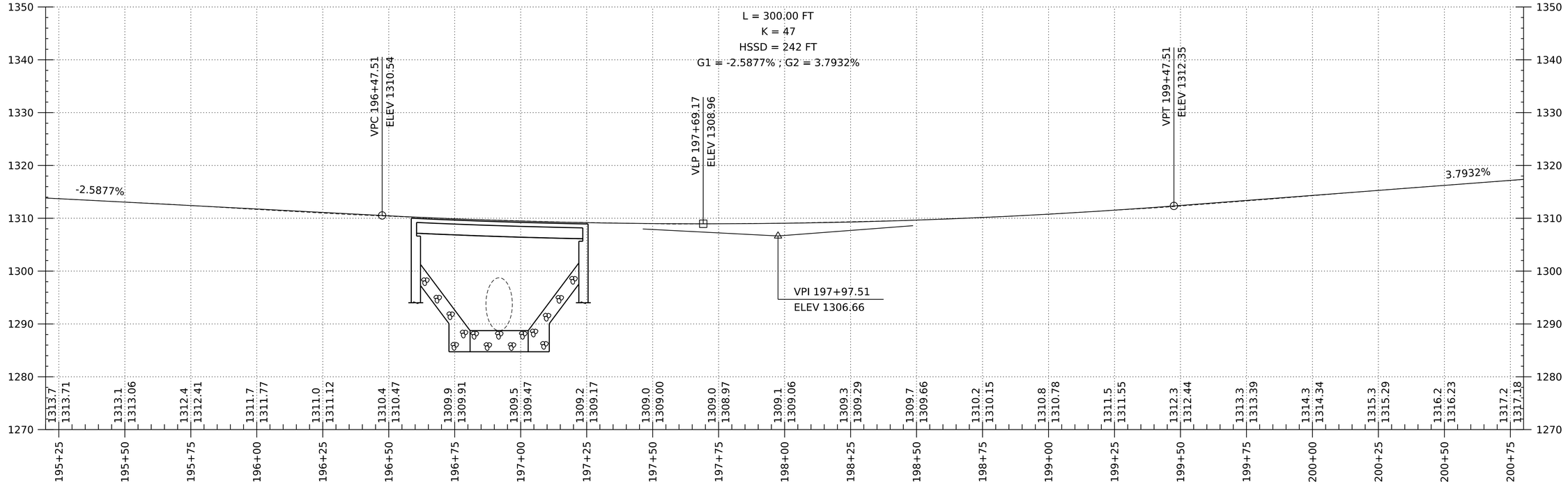
MATERIAL TOLERANCES (IF USED ON PROJECT)	
SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- 1/4"
- AGGREGATE SURFACE COURSE	+/- 1/2"
SUBBASE	+/- 1"
SAND BORROW	+/- 1"

PROJECT NAME: NORTON
PROJECT NUMBER: BF 0239(4)

FILE NAME: 22b360/s22b360typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ----------
NEW BRIDGE TYPICAL SECTIONS

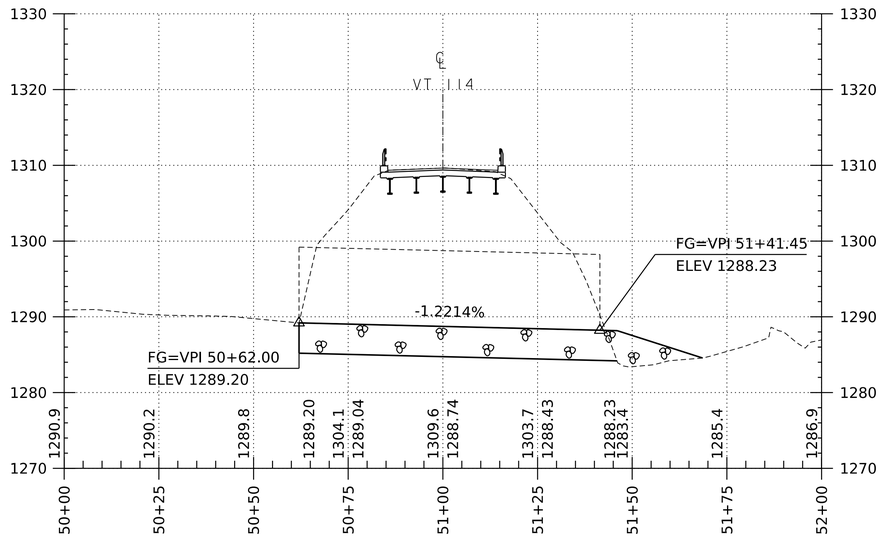
PLOT DATE: 27-OCT-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------

PROJECT NAME:	NORTON		
PROJECT NUMBER:	BF 0321(21)		
FILE NAME:	22b360/s22b360BDR_New Bridge.dgn	PLOT DATE:	27-OCT-2023
PROJECT LEADER:	L.J.STONE	DRAWN BY:	D.D.BEARD
DESIGNED BY:	------	CHECKED BY:	------
NEW BRIDGE LAYOUT		SHEET	13 OF 19



VT ROUTE 114 PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"



NUMBER 5 BROOK CHANNEL PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

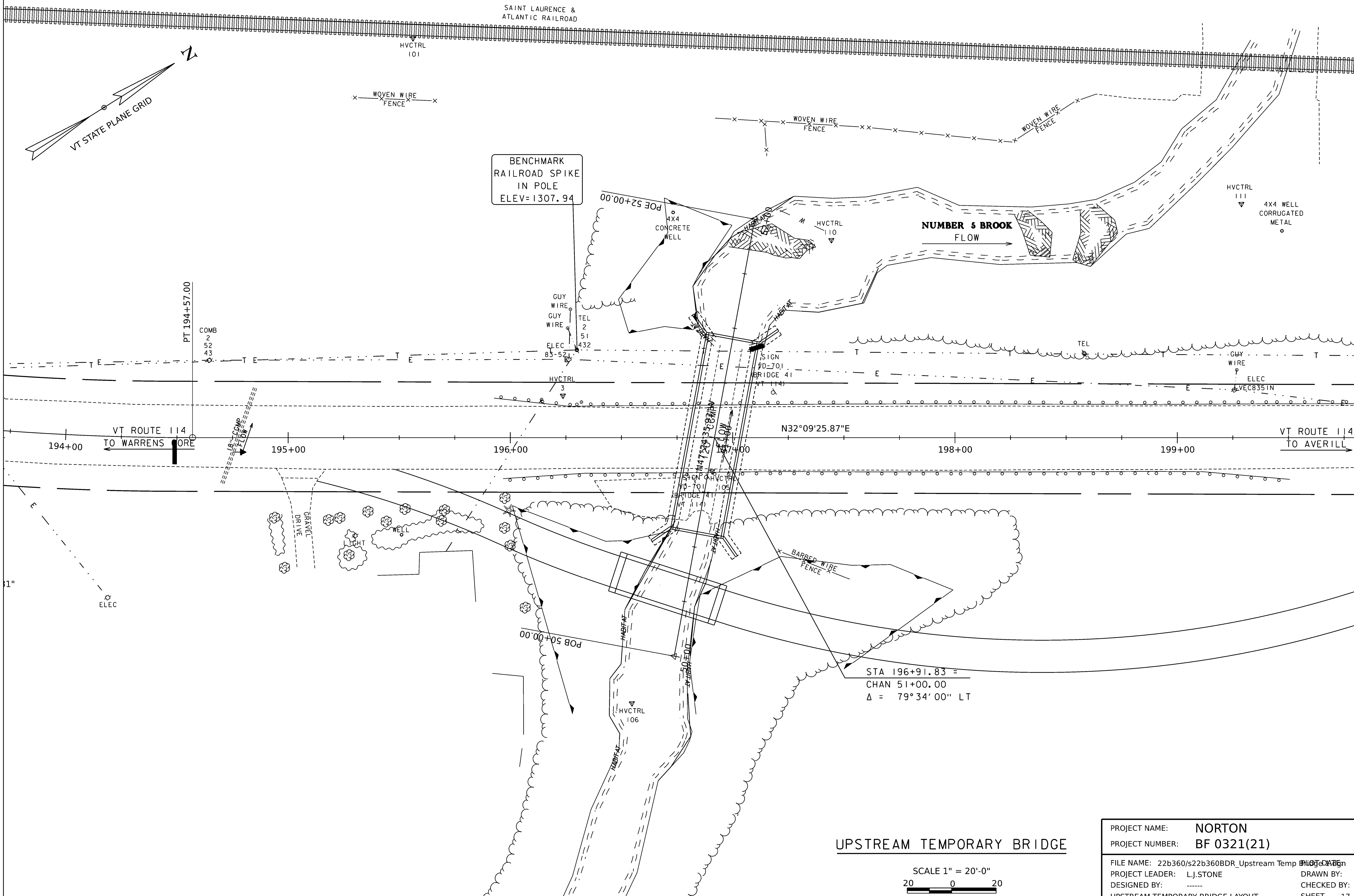
PROJECT NAME: NORTON
PROJECT NUMBER: BF 0321(21)

FILE NAME: s22b360profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
NEW BRIDGE PROFILE SHEET

PLOT DATE: 27-OCT-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 14 OF 19

PROJECT NAME:	NORTON		
PROJECT NUMBER:	BF 0321(21)		
FILE NAME:	22b360/s22b360BDR_Phase 1.dgn	PLOT DATE:	27-OCT-2023
PROJECT LEADER:	L.J.STONE	DRAWN BY:	D.D.BEARD
DESIGNED BY:	------	CHECKED BY:	------
PHASE 1 LAYOUT		SHEET 15 OF 19	

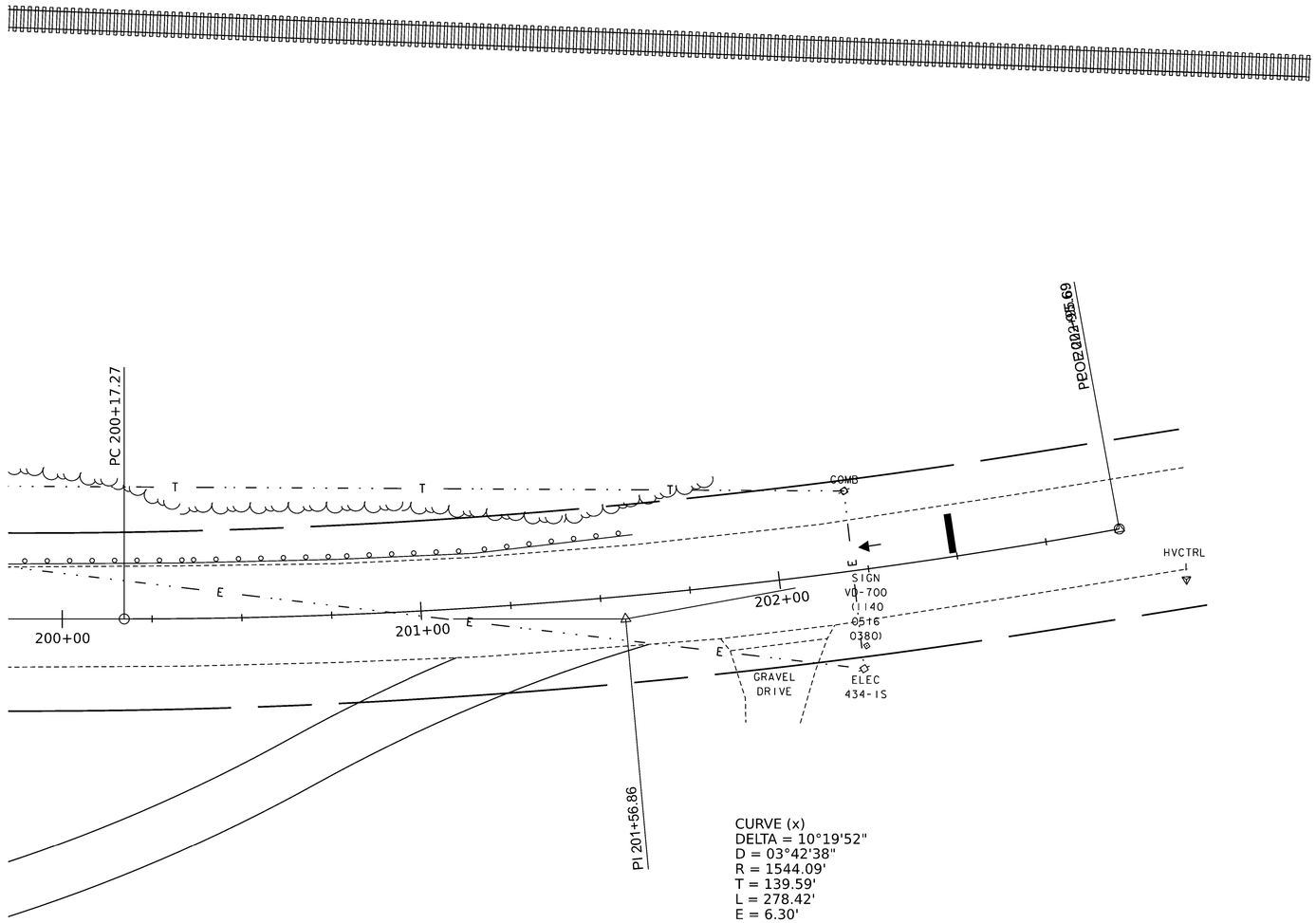
PROJECT NAME:	NORTON		
PROJECT NUMBER:	BF 0321(21)		
FILE NAME:	22b360/s22b360BDR_Phase 2.dgn	PLOT DATE:	27-OCT-2023
PROJECT LEADER:	L.J.STONE	DRAWN BY:	D.D.BEARD
DESIGNED BY:	------	CHECKED BY:	------
PHASE 2 LAYOUT		SHEET 16 OF 19	



UPSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"

PROJECT NAME:	NORTON
PROJECT NUMBER:	BF 0321(21)
FILE NAME: 22b360/s22b360BDR_Upstream Temp Bridge.dgn	PLOT DATE: 27-OCT-2023
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
UPSTREAM TEMPORARY BRIDGE LAYOUT	SHEET 17 OF 19



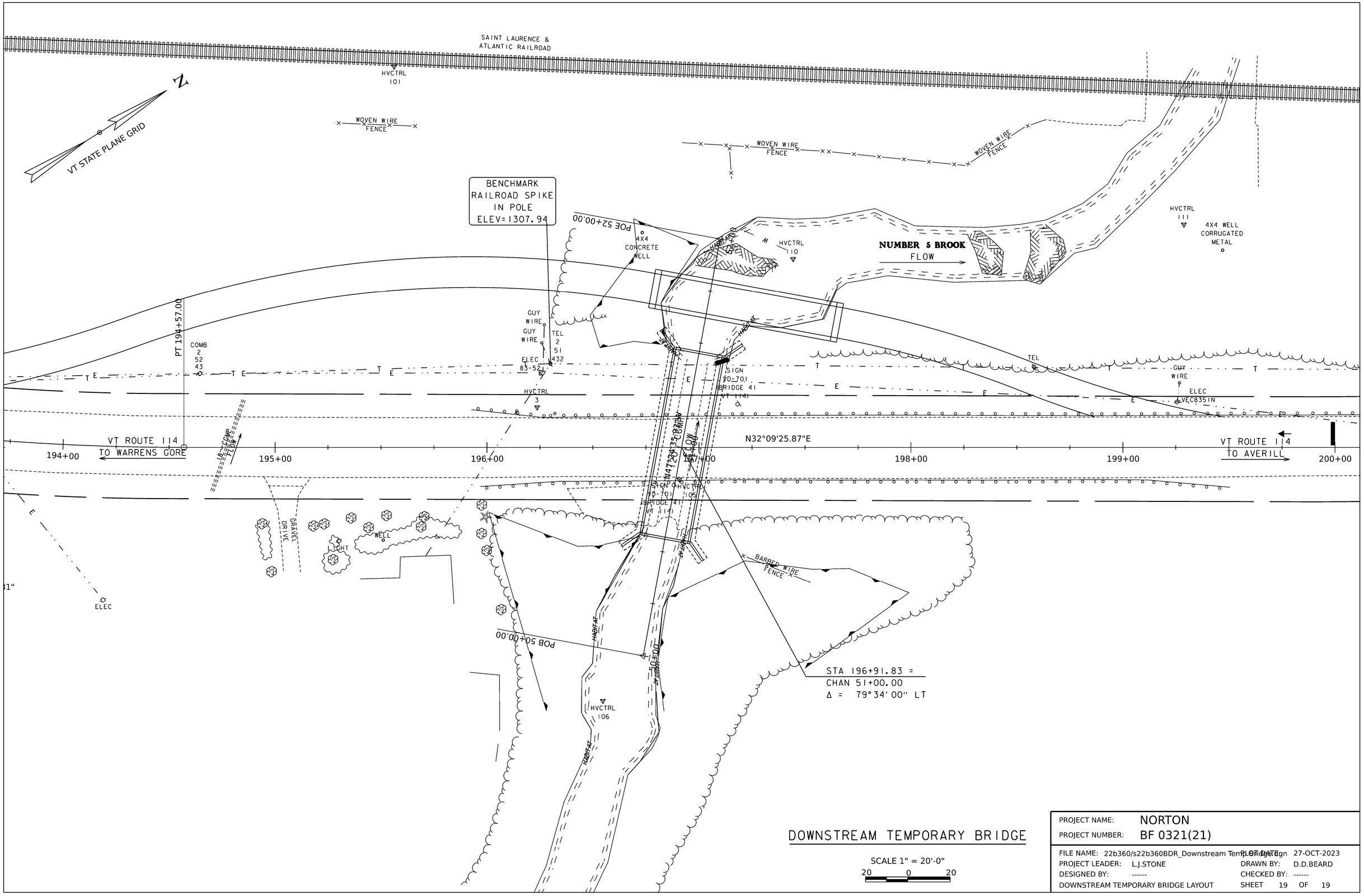
CURVE (x)
DELTA = 10°19'52"
D = 03°42'38"
R = 1544.09'
T = 139.59'
L = 278.42'
E = 6.30'

UPSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORTON
PROJECT NUMBER:	BF 0321(21)
FILE NAME: 22b360/s22b360BDR_Upstream Temp Bridge Layo	PLOT DATE: 27-OCT-2023
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
UPSTREAM TEMPORARY BRIDGE LAYOUT 2	SHEET 18 OF 19



DOWNSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORTON
PROJECT NUMBER:	BF 0321(21)
FILE NAME:	22b360/s22b360BDR_Downstream Temp Bridge Design
PROJECT LEADER:	L.J.STONE
DESIGNED BY:	------
DOWNSTREAM TEMPORARY BRIDGE LAYOUT	
PLOT DATE:	27-OCT-2023
DRAWN BY:	D.D.BEARD
CHECKED BY:	------
SHEET	19 OF 19