STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Sunderland STP CULV(91)

US ROUTE 7, BRIDGE 19-7 OVER UNNAMED BROOK

August 22, 2023

Table of Contents

I. Site Information

Bridge 19-7 is a State-owned bridge located on US Route 7 in the Town of Sunderland approximately 0.5 miles south of the junction with VT Route 313. The bridge is at a skew to the roadway and is located under an average of 10 feet of fill. 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	Principal Arterial, National Highway System
Bridge Type	Corrugated Galvanized Metal Plate Pipe (CGMPP)
Culvert Span	7 feet
Culvert Length	120 feet
Fill Over Culvert	10 feet
Year Built	1979
Ownership	State of Vermont

Need

Bridge 19-7 carries US Route 7 across an Unnamed Brook. The following is a list of deficiencies of Bridge 19-7 and US Route 7 in this location:

1. The culvert is in fair condition. There is noticeable heavy rust scaling, pitting and large perforations scattered along the culvert barrel. The invert haunches throughout the structure.

2. The existing culvert meets the current hydraulic standards but does not meet sediment equilibrium or Aquatic Organism Passage standards.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2027 and 2047.

TRAFFIC DATA	2027	2047
AADT	7,760	8,520
DHV	950	1,050
ADTT	470	615
%T	5.3	6.3
%D	51	51

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on an AADT of 8520, a DHV of 1050, and a design speed of 55 mph for a Principal Arterial.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 3.3	12'/8' (40') guardrail through project limits	12'/8' (40') w/o guardrail 12'/10' (44') with guardrail	Substandard
Bridge Lane and Shoulder Widths	VSS Section 3.7	NA	12'/10' (44')	
Clear Zone Distance	VSS Table 3.4	No Issues Noted	26' fill / 16' cut (1:3 slope), 20' cut (1:4 slope)	
Banking	VSS Section 3.13	Normal Crown	8% (max)	
Speed		55 mph (Posted)	55 mph (design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	$R = \infty$	R_{min} = 9,720' @ NC	
Vertical Grade	VSS Table 3.6	-2.35% (max)	4% (max) for level terrain	
K Values for Vertical Curves	VSS Table 3.1	K_{crest} = 1125	150 crest / 100 sag	
Vertical Clearance	VSS Section 3.8	No Issues Noted	16'-3" (min)	
Bicycle/Pedestrian Criteria	VSS Table 3.8	8' shoulder	6' Shoulder	Restricted access road – No bike/ped allowed
Hydraulics	VTrans Hydraulics Section	HW/D = 1.08 Clearspan: 7'	HW/D < 1.2 Bank Full Width: 14'	Substandard BFW
Structural Capacity	SM, Ch. 3.4.1	Approaching poor condition	Design Live Load: HL-93	Substandard

Inspection Report Summary

Culvert Rating 5 Fair
Channel Rating 8 Very Good

12/02/2020 – Structure is in fair condition and nearing poor condition. Structure has good structural form at this time however has heavy rust scaling, pitting and large perforations scattered along the barrel invert haunches throughout the structure. Structure invert is in need of a concrete invert installed or to be sleeved in near future before deterioration continues. ~SMP/MAC

11/10/2015 – This structure is in fair condition. Small perforations have started to become visible in scattered locations along the top of the water line where rust scale is the heaviest. ~JWW

09/16/2010 – The pipe continues to deteriorate and there is soon to be more holes in the south side in the 4th section from the outlet end. ~DCP/JWW

Hydraulics

While the existing culvert meets the current hydraulic standards, it does not meet sediment equilibrium or Aquatic Organism Passage standards. The existing 7-foot diameter culvert provides a Headwater to Depth ratio (HW/D) of 1.08 during the design storm event. Per the current standards, a culvert with a diameter greater than 60-inches should provide a maximum HW/D of 1.2 during the design storm event. Additionally, the existing structure constricts the channel width,

as it does not meet the 14-foot field measured bankfull width. The VTrans Hydraulics Section has made several recommendations for a replacement structure; these options are outlined in the preliminary hydraulics report in Appendix D. Regardless of the recommendation, Aquatic Organism Passage is required and will need to be incorporated into the design and construction of the project.

Utilities

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

There are no existing utilities present within the project area.

Right-Of-Way

The existing Right-of-Way is plotted on the Existing Conditions Layout Sheet. There is ample ROW through the project area. It is anticipated that no additional ROW will be needed for construction.

Environmental and Cultural Resources

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

Biological:

Wetlands/Floodplains

There are no mapped wetlands within the project area.

Rare, Threatened, and Endangered Species

There are no occurrences of R/T/E species within the project vicinity.

The USFWS IPaC mapping indicates that the project area is within the Northern Long Eared Bat's (NLEB's) habitat range. The NLEB is a federally listed threatened species. Suitable habitats for NLEB's per guidance from USFWS are: trees ≥ 3 inches in diameter that have holes, crevices, cracks or peeling bark. During a site visit by the VTrans Environmental Section, trees that fit this description on both sides of the road were identified. As the project moves forward, additional investigation is warranted to avoid impacts to potential roosting habitat.

Wildlife Habitat

Bridge 19-7 was identified as being a "top priority for wildlife passage" categorization for habitat and also as having "prime fish habitat" category under the AOP analysis.

Hazardous Materials:

According to the Vermont Agency of Natural Resources (VANR) Vermont Hazardous Sites List, there are no hazardous waste sites located in the project area.

Historic:

Bridge 19-7 is not historic and there are no other historic resources in the project area.

Archeological:

The Archaeological ID has been requested and is expected to be completed in October of 2022.

Stormwater:

There are no stormwater concerns for this project.

II. Safety

The project area is not in a high crash area. There have been six recorded crashes within the project area in the last five-year period.

III. Alternatives Discussion

No Action

The culvert is in fair condition but is approaching a poor condition rating. The culvert has heavy rust scaling, pitting and large perforations scattered along the barrel invert haunches throughout the structure. Something will have to be done to improve this culvert in the near future. 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 plate pipe. The culvert is approaching poor condition, however, there is no visible settlement or displacement, and the culvert maintains its shape making rehabilitation feasible at this location. Since the minimum hydraulic opening would be substandard for all options, and any rehabilitation will reduce the waterway area, it is assumed that an improved beveled inlet would be required for each option to optimize hydraulic performance and to funnel the stream into the culvert.

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. The new interior pipe dimension would have a substandard bankfull width. 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. 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 would have an approximate 6-foot diameter. A liner option is anticipated to have the longest life expectancy of the rehabilitation alternatives, since the grout provides an increased structural capacity, prevents fatigue failure, stabilizes the pipe, and extends the design life by approximately 50 years.

b. Spray-On Liner

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 may need to be acquired to provide a staging area at each end to accomplish this alternative.

Advantages: The rehabilitation alternatives would be the most cost-efficient option. It would have minimal impacts to resources and would not interrupt traffic.

Disadvantages: The rehabilitation alternative is only a repair and not a new structure. The life span of the repair work is estimated to be 20 to 50 years. Also, the existing culvert does not meet the ANR standard for bank full width, and the rehabilitation option would have a smaller hydraulic opening. The existing substandard roadway width would remain unchanged for any culvert rehabilitation option.

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

Structure Replacement

A preliminary hydraulics site visit found that a 14-foot minimum span would be required at this location. The possible configurations for a new structure this size would be a new precast box or an open bottom precast concrete arch or frame with a 6-foot-high waterway opening and natural bottom.

Structure Replacement Using Open Cut

Culvert replacement using an open cut is considered a more cost-effective solution than trenchless methods when there is a shallow amount of fill over the culvert.

This option involves removing the existing Corrugated Galvanized Metal Plate Pipe and replacing it with a new precast structure having a minimum span of 14-feet. Since there is approximately 10 feet of fill above the existing culvert, there would not be a considerable amount of earthwork. Any new structure should have flared wingwalls at the inlet and outlet to make a smooth transition between the channel and the culvert. The various considerations under this option include: the roadway width, structure type, culvert length and skew, and roadway alignment.

a. Roadway Width

The existing roadway currently has 12-foot-wide lanes and 8-foot-wide shoulders, which does not meet the minimum standard of 44-feet as set forth in the Vermont State Standards. Since a new 75+ year structure is being proposed, the roadway geometry should meet the minimum standards. A 44-foot width roadway with 12-foot-wide lanes and 10-foot-wide shoulders will be proposed through the project area to meet minimum requirements.

b. Structure Type

The most common structure type for the recommended hydraulic opening is a 4-sided concrete box culvert, or a 3-sided open bottom concrete structure.

It is preferred that the structure be a precast 4-sided concrete box culvert. This type of structure would provide protection against scour and undermining and would require less excavation than an open bottomed structure. Additionally, it would have a shorter construction duration compared to an opened bottom structure, since footings would not have to be placed six feet below the stream bed. Hydraulics has recommended an 8-foot rise box with the invert buried 2-feet resulting in a 14-foot x 6-foot waterway opening. Preliminary borings have been requested. If shallow ledge is not encountered, then a precast box is preferred. If shallow ledge is present, then a 3-sided structure would be recommended to avoid blasting.

If an arch or frame is used, it should be founded either on bedrock or a minimum of 6-feet below the channel bottom. Additionally, full-depth headwalls should be installed.

c. Culvert Size, Length and Skew

The existing culvert has a span of 7 feet, which constricts the natural channel width. If a new structure is chosen Hydraulics has recommended a box with a minimum 14-foot-wide opening. Additional hydraulic requirements have been provided in the preliminary hydraulics report. In order to accommodate a 44-foot-wide roadway, the proposed barrel length will be approximately 125 feet long. The culvert will have a skew of 30 degrees to the roadway to match the existing skew of the channel.

d. Roadway Alignment

The existing roadway alignment meets the minimum standards as set forth by the AASHTO Green Book. As such it is recommended that the alignment remain unchanged. Additionally, due to the close proximity of a TH overpass and an interchange, a change in the alignment would be costly.

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e. 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 bridge, with a brand-new culvert with a 75-year design life. This option would meet the minimum hydraulic standards and minimum roadway width standards.

Disadvantages: This option has the higher upfront costs compared to the rehabilitation options.

IV. 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 utilizing VT Route 7A between exits 2 & 3. The potential State-signed detour is as follows:

- US Route 7, to VT Route 313, and VT Route 7A, back to US Route 7 (12.9 miles)

There are no local bypass routes available. However, US Route 7 through the project area is a limited access highway, with no driveways or Town Highways to maintain. Rerouting traffic onto VT Route 7A adds 3.3 miles to travel distance.

A map of the detour route can be found in Appendix M.

Advantages: Utilizing an off-site detour would eliminate the need to use a temporary bridge or phase construction to maintain traffic. This would decrease the cost and amount of time required to construct a project in this location. The impacts and amount of temporary rights required to construct a project in this location would also be reduced for this option. The safety of both construction workers and the travelling public will be improved by removing traffic from the construction site.

Disadvantages: Traffic flow would not be maintained through the project corridor during construction.

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 must 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 traffic volumes, it is not acceptable to close one lane of traffic, and maintain one lane of traffic, both ways, with a traffic signal. However, the road is fairly wide through the project location, and by constructing a wider width through the project area, 2 lanes of traffic could be maintained. There is approximately 10 feet of vertical fill over the existing culvert, making phased construction possible.

Option 3: Temporary Bridge

From a constructability standpoint, a temporary bridge could be placed either upstream or downstream of the existing structure. The culvert is located in a heavily wooded area, and a temporary bridge on either side would require a significant amount of tree clearing. A temporary bridge on the upstream side would require a significantly less amount of fill and as such would be less expensive to construct. Additionally, a second temporary bridge would need to be constructed over South Road in order to maintain traffic along South Road. South Road is a dead end class 4 road and traffic is minimal.

Additional costs would be incurred to construct a temporary bridge next to the existing culvert, including the cost of fill and potential need for sheet piles, installation and removal of the temporary roadway/bridge and restoration of the disturbed area.

If a temporary roadway is chosen as the preferred method of traffic control, it should be a two-way bridge to accommodate the traffic volumes along with the long temporary roadway approaches that would be required at this site. The bridge is surrounded by wooded areas, both upstream and downstream. A number of trees would need to be cut down for this temporary condition. See the Temporary Bridge Layout Sheet in the Appendix.

Advantages: Traffic flow can be maintained along the US Route 7 corridor.

Disadvantages: This option would require a significant amount of tree clearing. There would be decreased safety to the workers and to vehicular traffic, because of cars driving near the construction site, and construction vehicles entering and exiting the construction site. Two temporary bridges would be required due to the close proximity of the South Road overpass. This traffic control option would be more costly, and time consuming than an offsite detour.

V. Alternatives Summary

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

- Alternative 1: Culvert Rehabilitation with Traffic Maintained on Existing Roadway
    a. Pipe Liner
    b. Spray-On Culvert Liner
- Alternative 2a: New Precast Box Culvert with Traffic Maintained on an Offsite Detour
- Alternative 2b: New Precast Box Culvert with Traffic Maintained with Phased Construction
- Alternative 2c: New Precast Box Culvert with Traffic Maintained on a Temporary Roadway
- Alternative 3a: New Buried Frame with Traffic Maintained on an Offsite Detour
- Alternative 3b: New Buried Frame with Traffic Maintained with Phased Construction
- Alternative 3c: New Buried Frame with Traffic Maintained on a Temporary Roadway

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

VI. Cost Matrix[1]

Sunderland Bridge 19-7: STATEWIDE - SOUTHWEST STP CULV(91) 22B045		Do Nothing	Alternative 1		Alternative 2			Alternative 3		
			Culvert Rehabilitation		New Precast Box			New Buried Frame		
			a. Pipe Liner	b. Spray-on	a. Offsite Detour	b. Phased Construction	c. Temporary Roadway	a. Offsite Detour	b. Phased Construction	c. Temporary Roadway
COST	Bridge Cost	$0	264,223	282,500	759,423	873,337	759,423	1,106,771	1,272,786	1,106,771
	Removal of Structure	$0	113,750	113,750	113,750	130,813	113,750	113,750	130,813	113,750
	Roadway	$0	115,345	119,000	329,701	473,945	329,701	315,396	453,382	315,396
	Maintenance of Traffic	$0	79,040	79,040	112,300	234,100	1,579,040	112,300	234,100	1,579,040
	Construction Costs	$0	572,358	594,290	1,315,174	1,712,194	2,781,914	1,648,217	2,091,081	3,114,957
	Construction Engineering & Contingencies	$0	200,325	208,002	328,794	428,049	695,479	412,054	522,770	622,991
	Accelerated Premium	$0	0	0	52,607	0	0	65,929	0	0
	Total Construction Costs w CEC	$0	772,683	802,292	1,696,574	2,140,243	3,477,393	2,126,200	2,613,852	3,737,949
	Preliminary Engineering[2]	$0	200,000	200,000	300,000	350,000	400,000	350,000	375,000	425,000
	Right of Way	$0	0	0	0	0	0	0	0	0
	Total Project Costs	$0	972,683	1,002,292	1,996,574	2,490,243	3,877,393	2,476,200	2,988,852	4,162,949
	Annualized Costs	$0	19,454	66,819	26,621	33,203	51,699	33,016	39,851	55,506
SCHEDULEING	Project Development Duration[3]	N/A	2 Years	2 Years	2 Years	2 Years	2 Years	2 Years	2 Years	2 Years
	Construction Duration	N/A	3 Months	3 Months	6 Months	9 Months	9 Months	6 Months	9 Months	9 Months
	Closure Duration (If Applicable)	N/A	N/A	N/A	14 days	N/A	N/A	28 days	N/A	N/A
ENGINEERING	Typical Section - Roadway (Feet)	40	40	40	44	44	44	44	44	44
	Typical Section - Bridge (Feet)	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Geometric Design Criteria	No Change	Substandard Roadway Width	Substandard Roadway Width	Meets Minimum Standards	Meets Minimum Standards	Meets Minimum Standards	Meets Minimum Standards	Meets Minimum Standards	Meets Minimum Standards
	Traffic Safety	No Change	Improved	Improved	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	No Change	No Change	Improved	Improved	Improved	Improved	Improved	Improved
	Pedestrian Access	No Change	No Change	No Change	Improved	Improved	Improved	Improved	Improved	Improved
	Hydraulics	Substandard BFW	Substandard BFW	Substandard BFW	Meets Minimum Standards	Meets Minimum Standards	Meets Minimum Standards	Meets Minimum Standards	Meets Minimum Standards	Meets Minimum Standards
	Utilities	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
OTHER	ROW Acquisition	No	No	No	No	No	No	No	No	No
	Road Closure	No	No	No	Yes	No	No	Yes	No	No
	Design Life (Years)	5-10	50	15	75	75	75	75	75	75

[1] Costs are estimates only, used for comparison purposes.
[2] Preliminary Engineering costs are estimated starting from the end of the Project Definition Phase.
[3] Project Development Durations are starting from the end of the Project Definition Phase.

VII. Conclusion

Alternative 2a is recommended; to replace the existing culvert with a new precast concrete box while maintaining traffic on an offsite detour for 14 days.

Structure:
While the structure is less than 50 years old, it is approaching poor condition and is hydraulically substandard. A pipe liner would result in a structure with a span less than 50% of the bank full width. Additionally, this location was identified as top priority for wildlife passage. As such, it is reasonable to assume that a replacement structure is needed.

The VTrans Hydraulics Section has recommended a new 4-sided box culvert with a minimum 14-foot x 8-food opening. The culvert invert should be buried 2-feet and provide a minimum waterway opening of 14.0-foot span x 6.0-foot clear height and will include bed retention sills in the bottom of the structure per the preliminary hydraulics memo. The new culvert should also have headwalls that extend four feet below the channel bottom at the inlet and the outlet to prevent undermining.

Traffic Control:
The recommendation is to close the road for 14 days while the new culvert is being constructed. US Route 7 through the project area is a limited access highway, with no driveways or Town Highways to maintain. As such, there would be minimal extra travel distance for rerouting traffic onto VT Route 7A, which parallels US Route 7 through the project area. This detour adds 3.3 miles to the traveled distance.

Manchester Village would be affected by the increase in traffic and as such, the closure duration should be kept as short as possible. Additionally, during design, the intersections along the detour route should be evaluated to make sure that the additional traffic can be handled with no modifications.

VTrans will work with the Towns of Sunderland, Manchester, and Arlington to determine the best timing of the closure. Continuous traffic counters along US Route 7 show that traffic volumes along the corridor are the lowest in April and May and are the highest in August and October. The bridge closure should occur when traffic is at its lowest and avoid any possible community events that would have an impact on traffic.

VT Route 313 has a low clearance bridge, which is posted for 14-feet. As such, large vehicles and super loads can't come up VT Route 7A through Bennington. These larger vehicles will need to go up through Manchester or utilize US Route 4 through New York.

A temporary bridge is not recommended here due to the high costs and need for a second temporary bridge over TH-16 (South Road). Additionally, a temporary bridge would be in place for an entire construction season. There are super loads coming up through Route 7 including mobile homes and these wide loads would have a hard time navigating a temporary bridge.

Phased construction is not recommended here as it results in reduced lanes widths of 12-feet for an entire construction season. The super loads coming up through Route 7 would not be accommodated with the reduced lane widths for phased construction.

VIII. Appendices

- Appendix A: Site Pictures
- Appendix B: Town Map
- Appendix C: Bridge Inspection Report
- Appendix D: Hydraulics Memo
- Appendix E: Preliminary Geotechnical Information - *Pending*
- Appendix F: Landscape (LA) Clearance for Resource ID
- Appendix G: Natural Resources Memo
- Appendix H: Archeology Memo - *Pending*
- Appendix I: Historic Memo
- Appendix J: Local Input - *Pending*
- Appendix K: Operations Input
- Appendix L: Crash Data
- Appendix M: Detour Map
- Appendix N: Plans

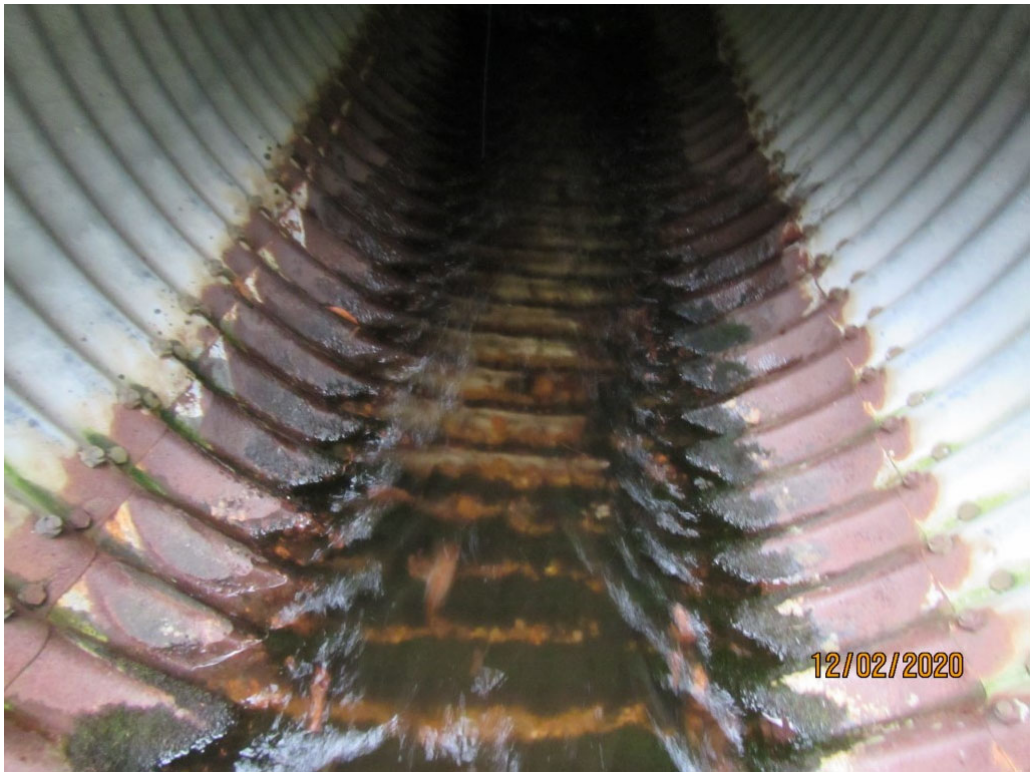
Appendix A: Site Pictures

Picture 1: Looking north on US Route 7 over Bridge 19-7

Picture 2: Looking south on US Route 7 over Bridge 19-7

Picture 3: Looking upstream from US Route 7

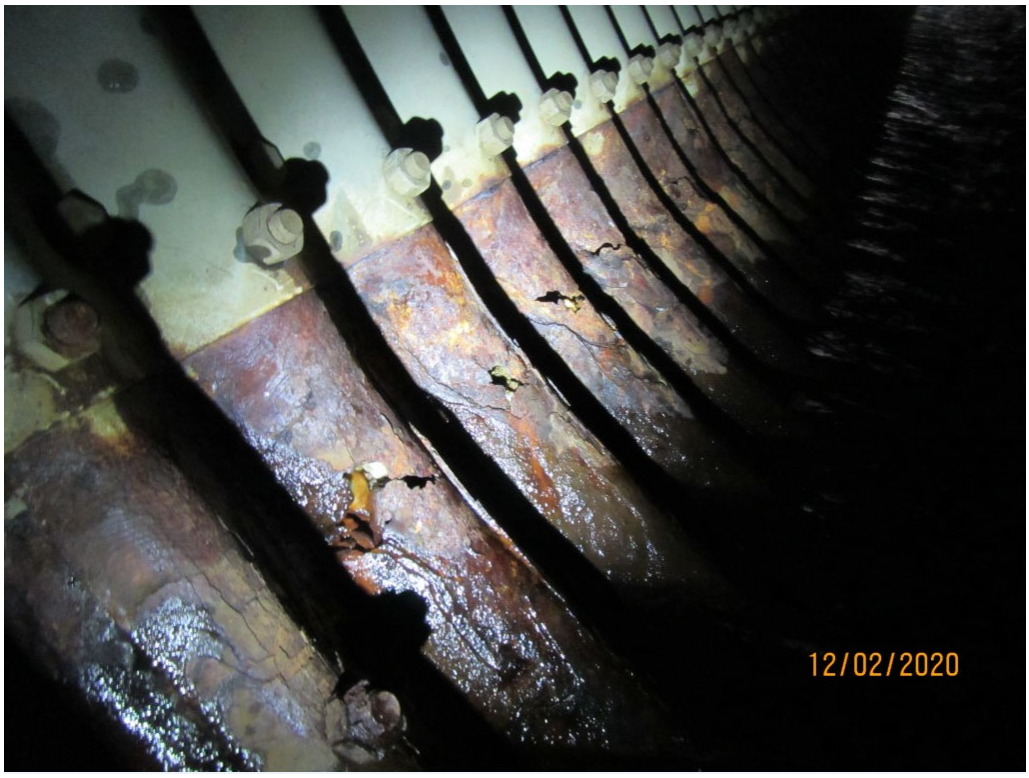
Picture 4: Bridge 19-7 inlet



Picture 5: Rusted invert

Picture 6: Culvert Barrel

Picture 7: Rusted invert



Picture 8: Perforations in the invert

Picture 9: Looking downstream

Picture 10: Culvert outlet

Appendix B: Town Map

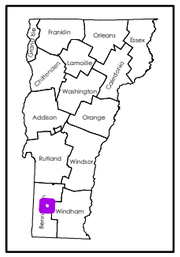
Scale: 1:44,930

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
- 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
March 2021



SUNDERLAND

COUNTY-TOWN CODE: **0215-0**
BENNINGTON COUNTY
DISTRICT # 1
District Long Name: Bennington District
VTrans Four Region: Southwest

SUNDERLAND
US-7 BR 19-7

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

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

Vermont Agency of Transportation ~ Structures Section ~ Bridge Management and Inspection Unit

Inspection Report for : SUNDERLAND **Bridge No.:** 19-7 **District:** 1

Located on: US7 **over** BROOK **approximately** 0.5 MI. SOUTH VT. 313 **Maintained By:** STATE-OWNED

CONDITION

Deck Rating: N NOT APPLICABLE

Superstructure Rating: N NOT APPLICABLE

Substructure Rating: N NOT APPLICABLE

Channel Rating: 8 VERY GOOD

Culvert Rating: 5 FAIR

Federal Str. Number: 30001919-702151

AGE and SERVICE

Year Built: 1979 **Year Reconstructed:** ____

Type of Service On: 1 HIGHWAY

Type of Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 2

ADT: 5700 **Year of ADT:** 1996

GEOMETRIC DATA

Length of Maximum Span (ft): 7

Structure Length (ft): 7

Lt Curb/Sidewalk Width (ft): 0

Rt Curb/Sidewalk Width (ft): 0

Bridge Rdwy Width Curb-to-Curb (ft): 0

Deck Width Out-to-Out (ft): 0

Appr. Roadway Width (ft): 40

Skew: 32

Bridge Median: 0 NO MEDIAN

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 07 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: CGMPP

Number of Main Spans: 1

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: N NOT APPLICABLE

Type of Wearing Surface: N NOT APPLICABLE

Type of Membrane: N NOT APPLICABLE

Deck Protection: N NOT APPLICABLE

CULVERT GEOMETRIC DATA and INDICATORS

Culvert Barrel Length (ft): 120

Average Cover Over Culvert (ft): 10

Waterway Area Through Culvert (sq.ft.): 38

Wingwall/Headwall Rating: 8 VERY GOOD CONDITION

APPRAISAL

Appr. Rdwy. Alignment: 8 EQUAL TO DESIRABLE CRITERIA

INSPECTION

Inspection Date: 122020 **Inspection Frequency (months):** 60

INSPECTION SUMMARY and NEEDS

12/2/2020 Structure is in fair condition and nearing poor condition. Structure has good structural form at this time however has heavy rust scaling, pitting and large perforations scattered along the barrel invert haunches throughout the structure. Structure invert is in need of a concrete invert installed or to be sleeved in near future before deterioration continues. SMP & MAC

11/10/2015 This structure is in fair condition. Small perforations have started to become visible in scattered locations along the top of the water line where rust scale is the heaviest. JWW

09/16/2010 The pipe continues to deteriorate and there is soon to be more holes in the south side in the 4th section from the outlet end. DCP & JWW

Appendix D: Hydraulics Memo

VERMONT

State of Vermont
Structures and Hydraulics Section
219 North Main Street
Barre, VT 05641
vtrans.vermont.gov

Agency of Transportation

TO: Laura Stone, Structures, Scoping Engineer

CC: Nick Wark, Hydraulics Engineer

FROM: Jeff DeGraff, Hydraulics Project Engineer

DATE: October 17, 2022

SUBJECT: Statewide – Southwest STP CULV(91) pin #22B045
Sunderland, US-7 Br19-17, over Unnamed Brook
Coordinates: 43.040410, -73.133340

We have completed our hydraulic study for the above referenced site, and offer the following for your use:

In an email on 8/02/22 ANR indicated a that a minimum span of 14-ft is recommended for this project site.

Design Storm Flow is 2% AEP (Q50).

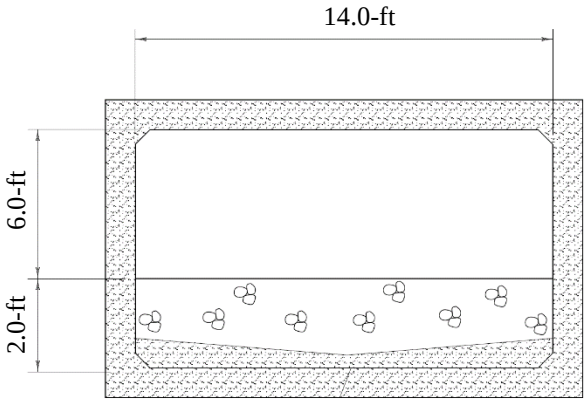
The following options were analyzed:

Existing Conditions: 7.0-ft Round Corrugated Metal Pipe Culvert

- Provides a Headwater to Depth ratio (HW/D) of 1.08 and 1.26 during the design and check storm event, respectively. Headwater depths of 7.53-ft and 8.82-ft were determined during the design and check storm event, respectively.
- The existing culvert meets the current hydraulic standards but does not meet sediment equilibrium or Aquatic Organism Passage standards.

Option 1: Four-Sided Concrete Box (closed bottom) 14-foot Span x 8.0-foot Rise

- There is approximately 1.54-feet and 0.96-feet of freeboard at the design and check AEP, respectively.
- Structure invert is to be buried 2-feet and provide a minimum waterway opening of 14.0-foot span x 6.0-foot clear height.
- Bed retention sills should be added in the bottom of the structure. Sills should be V-shaped 12 inches high at the edges and 6 inches tall at the center. Sills should be spaced no more than 8 feet apart throughout the structure with one sill placed at both the inlet and the outlet.
- Assumes similar skew, alignment, and slope as compared to the existing conditions.
- Does not increase the 100-year base flood elevations.

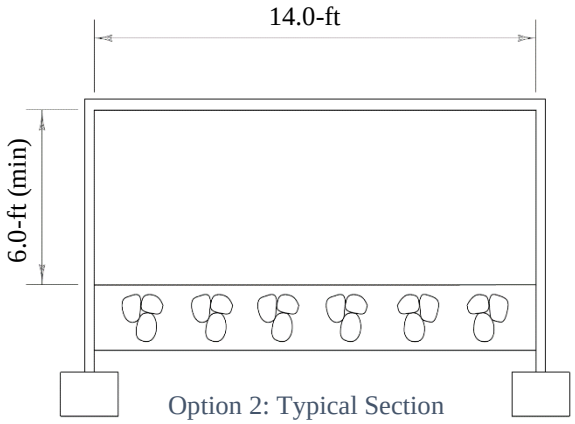


Option 1: Typical Section

VERMONT

Option 2: Bridge (3-sided) 14-foot span x 6.0-foot clear rise

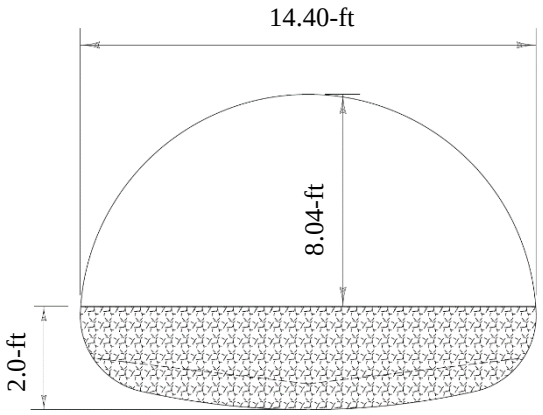
- There is approximately 1.54-feet and 0.96-feet of freeboard at the design and check AEP, respectively.
- Assumes similar skew, alignment, and slope as compared to the existing conditions.
- Does not increase the 100-year base flood elevations.



Option 2: Typical Section

Option 3: Corrugated Metal Plate Pipe Arch 14.40-foot span x 10.04-foot rise

- There is approximately 2.92-feet and 2.24-ft of freeboard at the design and check AEP, respectively.
- Structure invert is to be buried 2-feet and provide a minimum waterway opening of 14.40-foot span x 8.04-foot clear height.
- Bed retention sills should be added in the bottom of the structure. Sills should be V-shaped 12 inches high at the edges and 6 inches tall at the center. Sills should be spaced no more than 8 feet apart throughout the structure with one sill placed at both the inlet and the outlet.
- Assumes similar skew, alignment, and slope as compared to the existing conditions.
- Does not increase the 100-year base flood elevations.



Option 3: Typical Section

For options 1 through 3, E-Stone, Type II will need to be used to grade the channel through the respective structures. Stone Fill, Type II shall be used to protect any disturbed channel banks or roadway slopes at the structure's inlet and outlet.

If Option 2 is chosen, for preliminary design purposes assume the bottom of footing elevation is to be located a 6-ft below the stream or founded on ledge. A final scour analysis and countermeasure design will be performed during the final hydraulic phase.

Other similar sized structures could be considered for this site. If another alternative is considered, coordinate with the Hydraulics Unit to perform additionally analyses.

Please contact us with any questions, or to check substructure configuration scenarios.

Appendix E: Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

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

END

From: Eric Denardo, P.E., Geotechnical Engineer

Date: October 28, 2022

Subject: Statewide-Southwest STP CULV(91) – Sunderland Bridge 19-7 Preliminary Geotechnical Information

1.0 INTRODUCTION

As requested, we have completed our preliminary geotechnical investigation of Bridge 19-7 located on US Route 7 over an unnamed brook in the town of Sunderland, VT. Bridge 19-7 is a corrugated galvanized metal steel plate pipe culvert located approximately 0.5 miles south of the intersection of VT Route 313 and US Route 7. This review included a subsurface investigation, the examination of well log data, hazardous site information on file at the Vermont Agency of Natural Resources (ANR), as well as published geologic maps relating to surficial and bedrock data. 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 shows the project site consists of glacial till (Doll, 1970).

According to the Bedrock Map of Vermont from 2011, published by the USGS and State of Vermont, the project site is underlain with bedrock consisting of Dolostone and Conglomerate from the Vermont Valley Sequence and Middlebury Synclinorium belt of the Dunham Dolostone. (Ratliffe, et. al, 2011).

2.2 Water Well Logs

The Vermont ANR maintains a record of private and public wells drilled in their Atlas database. Published online, these logs may provide general characteristics of the soil strata and depth to bedrock in the area. There were no water well logs found within a 1000 foot (ft) radius of the project site. The closest well was approximately 2200 ft north of the culvert. For this reason, information from this well is not considered pertinent to the project.

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 hazardous sites, hazardous waste generators, or underground storage tanks within 0.5 miles of the project site. The project site itself is not on the hazardous site list and should not be impacted by any sites outside of this radius.

2.4 Record Plans

No historic record plans were located for this project.

3.0 FIELD INVESTIGATION

A field investigation was conducted between August 17, 2022, and August 31, 2022. Two standard penetration borings were advanced in either shoulder at opposite corners of the existing structure, near the outlet (B-101) and inlet (B-102), to evaluate the subsurface profile and aid in design and construction of a replacement structure. A summary of the final location of each boring with corresponding ground surface elevation can be found in Table 3.1 below. The values for Northings and Eastings as well as ground surface elevations are based on the Vermont State Plane Grid Coordinate System NAD 83 and were located by the Geotechnical Engineering Section's Trimble Geoexplorer 600 handheld GPS with a decimeter accuracy. The elevations are based on the North American Vertical Datum, NAVD 88 and were determined by plotting the boring locations on the VTrans survey file x22b045-vt30-br19-7sv.dgn, dated July 2022. The locations and elevations of the borings should be considered accurate only to the degree implied by the method used to determine them.

During drilling operations, split spoon samples and standard penetration tests (SPT) were taken continuously to a depth of 10 ft below ground surface (bgs) then at 5 ft intervals to a depth of 37 ft bgs. Bedrock was not encountered in either boring.

Soil samples were visually identified in the field and SPT blow counts were recorded on the boring logs. Soil and rock samples were preserved and returned to the Construction and Materials Bureau Central Laboratory for testing and further evaluation. Upon completion of the laboratory testing, the boring logs were revised to reflect the results of the laboratory classification results.

Table 3.1 *Boring Locations and Elevations.*

Boring No.	Northing (ft)	Easting (ft)	Station	Offset (ft)	Approximate Ground Surface Elevation (ft)
B-101	197620.8	1471089.3	56+28	-22.4	902.1
B-102	197562.7	1471104.7	55+83	16.5	902.6

4.0 SOIL PROFILE

The field investigation indicates that the soil strata of the project site generally consist of loose to dense silt, sand, and gravel to a depth of 25 ft bgs, and medium dense sand and silt from 25 to 37 ft bgs. Cobbles were noted by the drillers in B-101 between depths of 19.6 and 22.0 ft bgs.

5.0 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
- Precast or steel arch bridge with spread footings founded on soil or piles
- Replacement metal pipe culvert with new headwalls and wingwalls with spread footings founded on soil

- Concrete rigid frame supported on H-piles, micropiles, or spread footings

Based on the materials encountered during drilling, we believe sheet piles can be driven to a depth of at least 35 ft in order to retain the roadway if phased construction is selected. Cobbly material was noted from 19.6 to 22 ft bgs in B-101. This was the only instance of cobbles and should not prevent sheet piling from being used.

When a design alternative, as well as a preliminary alignment has been chosen, the Geotechnical Engineering Section can review the preferred alternative and assist with any further geotechnical analyses and review of foundation elements required.

If you have any questions or would like to discuss this report, please contact us via email. Typed boring logs are attached and are available in the CADD design files:
M:\Projects\22b045\MaterialsResearch

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 10/12/2022.

Enclosures: Boring Logs (2 Pages)

Reviewed by: Stephen Madden, Geotechnical Engineer SPM

cc: Electronic Read File/MG
Project File
END

Z:\Highways\CMB\GeotechEngineering\Projects\Statewide-Southwest STP CULV(91)\REPORTS\Statewide-Southwest STP CULV(91) Sunderland Bridge 19-7 Preliminary Geotechnical Information.docx

STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

Statewide-Southwest
STP CULV(91)
Sunderland, US 7 BR 19-7

Boring No.: **B-101 (Br. 19-7)**
Page No.: 1 of 1
Pin No.: 22b045
Checked By: END

Boring Crew: McGinley, Aubut, Arles
Date Started: 8/17/22 Date Finished: 8/17/22
VTSPG NAD83: N 197620.80 ft E 1471089.30 ft
Station: 56+28.00 Offset: -22.40
Ground Elevation: 902.1 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	3 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 55 TRACK	C_E = 1.52

Groundwater Observations

Date	Depth (ft)	Notes
08/17/22	10.6	WT After Drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Field Note:, Asphalt 0.0'-1.0'					
		Visual Description:, Poorly graded Gravel, white, Dry, Rec. = 1.5 ft, Split sample	10-7-7-12 (14)				
		Visual Description:, Sand with Silt and Gravel, Lt brn, Dry, Split sample					
		A-2-4, SiSa, Lt brn, MTD, Rec. = 1.7 ft	16-15-19-21 (34)	8.7	10.8	58.7	30.5
5		Visual Description:, Poorly graded Sand with Silt, Lt brn, Dry, Rec. = 1.3 ft	13-22-22-22 (44)				
		Visual Description:, Poorly graded Sand with Silt and trace Gravel, Lt brn, Dry, Rec. = 1.2 ft, Gravel in end of sampler	15-14-20-26 (34)				
10		A-1-b, SaGr, brn, Dry, Rec. = 0.7 ft	13-19-16-14 (35)	5.2	46.3	41.5	12.2
15		Visual Description:, Poorly graded Sand trace Gravel, brn, Wet, Rec. = 0.4 ft	9-6-4-8 (10)				
20		Field Note:, Attempted NX core. Appears to be nested cobbles 19.6'-22.0', NX cleanout 18.5'-19.6'					
25		Field Note:, No recovery	15-14-21-26 (35)				
30		A-4, SaSi, Rec. = 1.0 ft, Gravel in end of sampler	9-15-19-27 (34)	21.0	18.8	20.1	61.1
35		Visual Description:, Poorly graded Gravel with Silt, Lt brn, Wet, Rec. = 0.2 ft, Refusal at 35.8' 50 blows per 6"	16-R@3" (R)				
		Hole stopped @ 35.8 ft					
40		Remarks: Hole collapsed @ 11.0'.					

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.

2010 COPY SUNDERLAND.GPJ VERMONT AOT.GDT 10/28/22

STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

Statewide-Southwest
STP CULV(91)
Sunderland, US 7 BR 19-7

Boring No.: **B-102 (Br. 19-7)**
Page No.: 1 of 1
Pin No.: 22b045
Checked By: END

Boring Crew: McGinley, Aubut, Arles
Date Started: 8/18/22 Date Finished: 8/31/22
VTSPG NAD83: N 197562.70 ft E 1471104.70 ft
Station: 55+83.00 Offset: 16.50
Ground Elevation: 902.6 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	3 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 55 TRACK	C_E = 1.52

Groundwater Observations

Date	Depth (ft)	Notes
08/09/22		No water to depth

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Field Note:, Asphalt 0.0'-0.8'					
		Visual Description:, Poorly graded Gravel with trace Sand, white, Dry, Rec. = 1.0 ft	12-13-15-16 (28)				
		A-4, SaSi, Lt brn, Dry, Rec. = 1.6 ft	16-18-23-26 (41)	7.7	19.3	43.4	37.3
5		Field Note:, No recovery, Gravel in end of sampler. Rollercone cleanout 5.9'-6.0'	33-R@3" (R)				
		Field Note:, Attempted core at 6' appears to be cobbles/boulders					
		Visual Description:, Silt and Sand with little Gravel, Lt brn, Dry, Rec. = 0.6 ft	8-7-5-9 (12)				
10		Visual Description:, Coarse to medium Sand and Gravel with trace Silt, Lt brn, Wet, Rec. = 0.7 ft	8-7-11-12 (18)				
		A-2-4, SiGrSa, Lt brn, Wet, Rec. = 0.6 ft	12-13-13-13 (26)	12.0	31.5	41.7	26.8
15		Visual Description:, Coarse to medium Gravel with little coarse Sand, Lt brn, Wet, Rec. = 0.3 ft	5-28-17-7 (45)				
20		Field Note:, No recovery, Refusal @ 5", 50 blows per 6". Rollercone cleanout 20.5'-25.0'	R@5" (R)				
25		A-4, SaSi, Lt brn, MTW, Rec. = 0.6 ft	17-16-20-24 (36)	18.2	17.0	30.9	52.1
30		A-4, SaSi, Lt brn/white, MTD, Rec. = 1.5 ft	10-12-9-16 (21)	26.2	1.9	26.5	71.6
35		Visual Description:, Clay with Gravel, Lt brn, MTW, Rec. = 2.0 ft	6-8-11-14 (19)				
		Hole stopped @ 37.0 ft					
40		Remarks: Hole collapsed @ 12.7'.					

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.

2010 COPY SUNDERLAND.GPJ VERMONT AOT.GDT 10/28/22

Appendix F: Landscape (LA) Clearance for Resource ID

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: July 8, 2022
Project: **STATEWIDE – SOUTHWEST IM CULV(91) 22B045**
Subject: Landscape (LA) Clearance for Resource ID

SUMMARY

I have reviewed the locations for **STATEWIDE – SOUTHWEST IM CULV(91) 22B045** dated 4/18/2022, and have determined that there are potentially minor riparian buffer impacts occurring as a result of the proposed work:

- This project includes 8 culverts:
  - Bridgewater US-4 Br 36
  - Castleton VT-4A Br 9
  - Dorset VT-30 Br 58A
  - Ira VT-4A Br 14
  - Killington US-4 Br 28
  - Londonderry VT-11 Br 25
  - Rupert VT-30 Br 61
  - Sunderland US-7 Br 19-7

DESCRIPTION OF IMPACT

The repair or replacement of culverts may require construction impacts to the riparian buffer and/or tree clearing.

Riparian Buffer:

Riparian and wetland buffers serve an important purpose for the health of Vermont's water quality and wildlife. They prevent erosion on steep embankments, provide shade, food sources and woody debris for healthy aquatic habitat, and provide wildlife corridors along wetlands and streams. With a vegetated riparian buffer, sediment and pollutants like phosphorus are prevented from entering water bodies, keeping our rivers, ponds and lakes clear from algae and cool for fish and other aquatic species to thrive. Revegetating areas where riparian and wetland buffers are impacted establishes a connection between the newly completed project with the existing conditions. Selecting native plants that complement the character of the area will make projects more visually appealing and merge the transportation asset with its surroundings.

Using native trees and shrubs in addition to a seed mix speeds up natural succession, establishing an effective riparian buffer more quickly than using seed alone. Selecting plants that have already started to grow will also have a better chance of establishing before invasive plants have a chance to fill in.

Tree Clearing

Trees and forests play a critical role in maintaining a healthy planet. Trees convert carbon dioxide to oxygen, filtering pollutants from the air and providing clean air to breathe. Roots and leaves work together to prevent soil erosion and control movement of sediment. Roots hold soil in place and soak up water, while leaves catch and slow down rainwater. Providing shade and performing evapotranspiration, trees also cool air and surface temperatures. Additionally, trees provide habitat, food and shelter for countless species, including insects, birds, and mammals.

Clearing of trees and forested areas can result in a loss of these benefits. Minimizing tree clearing, and replanting after construction are excellent ways to maintaining these benefits and support a healthy ecosystem.

RECOMMENDATIONS

1. I recommend re-vegetating the area with native trees and shrubs for river buffers, willow fascines or live stakes (depending on soil conditions at the waters' edge) and a diverse pollinator seed mix.
    a. See the *2022 VTrans Riparian Planting Toolkit* for design guidelines and species (link).

NOTES

1. I would be glad to assist with a plant list and plan (bonnie.donahue@vermont.gov).

Appendix G: Natural Resources Memo

VTrans Statewide – Southwest STP CULV(91) – Wetland and Watercourse Delineation and Rare Species Assessment Report

Bennington and Rutland Counties, Vermont

August 25, 2022

Prepared for:

Vermont Agency of Transportation
219 North Main Street
Barre, VT 05641

Prepared by:

Stantec Consulting Services Inc.
193 Tilley Drive
South Burlington, VT 05403

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION

The Vermont Agency of Transportation (VTrans) proposes to replace or rehabilitate eight road crossing structures located along Vermont state route roadways (US Route 7, US Route 4, Vermont Route 11, Vermont Route 4A, Vermont Route 30) in Bennington and Rutland counties, Vermont, herein referred to as the Statewide- Southwest STP CULV(91) Project (Project). VTrans requested that Stantec Consulting Services Inc. (Stantec) conduct wetland and watercourse delineations and preliminary assessment for rare, threatened, and endangered (RTE) species in the vicinity of the existing eight crossing locations. The field investigations were conducted in July 2022 and are summarized in this report. The crossing locations and structure identifiers assessed in this study are listed in Table 1 and shown in Appendix A.

Table 1. Site Locations, VTrans Statewide- Southwest STP CULV(91)

Structure ID	Road	Town	County
BR 19	US Route 7	Sunderland	Bennington
BR 25	Vermont Route 11	Londonderry	Bennington
BR 58A	Vermont Route 30	Dorset	Bennington
BR 61	Vermont Route 30	Rupert	Bennington
BR 36	US Route 4	Bridgewater	Rutland
BR 28	US Route 4	Killington	Rutland
BR 9	Vermont Route 4A	Castleton	Rutland
BR 14	Vermont Route 4A	Ira	Rutland

2.0 METHODOLGY

2.1 RTE SPECIES AND NATURAL RESOURCE DESKTOP ASSESSMENT

Prior to the field assessment, Stantec conducted a desktop review using information available through the Vermont Agency of Natural Resources (ANR) Natural Resources Atlas and other publicly available and privileged-access database sources to identify potential occurrences of RTE species, special wildlife habitats, or other natural resources of concern within or in the vicinity and with similar habitat(s) to those at a Project site. The information obtained during the desktop assessment was used to support the field investigations. Specific to the potential occurrence of RTE species, particularly those that are federally or

Vermont-listed threatened or endangered[1], and quantify available onsite habitat condition relative to each, Stantec researched the Vermont Natural Heritage Inventory (NHI) database for the presence of known Element Occurrences (EOs) of RTE species within the delineation area and within the vicinity (approximate 1-mile radius) for each Project site.

2.2 WETLAND AND WATERCOURSE DELINEATION

For the purposes of the field delineation, the delineation area consisted of an area within 100 feet along the roadway, centered on the existing crossing structure and approximately 50 feet laterally beyond the edge of the road shoulder. Wetland boundaries were delineated using the technical criteria provided in the U.S. Army Corps of Engineers (USACE) *Corps of Engineers Wetlands Delineation Manual*[2] and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*[3]. Wetland communities were classified according to the *Classification of Wetlands and Deepwater Habitats of the United States*[4]. Hydric soil determinations were made in accordance with the USACE manuals and the *Field Indicators for Identifying Hydric Soils in New England, Version 4*[5]*.* Anticipated wetland regulatory classifications were assigned based on ANR's Vermont Wetland Rules (VT Code R. 12 004 056). Where appropriate, wetland resources were flagged with pink flagging pre-labeled with "WETLAND DELINEATION" and each flag was labeled with a unique alpha-numeric code. Wetland Determination Data Forms and Vermont Wetland Evaluation Forms were completed for each wetland delineated and representative photographs were taken, as appropriate, to document existing conditions. Wetland flags were located using a Global Positioning System (GPS) receiver with a stated submeter accuracy of 1 meter or better.

Watercourses (e.g., perennial streams) and intermittent streams observed during the delineations were identified based on the definitions in ANR's Environmental Protection Rule Chapter 27 Vermont Stream Alteration Rule as well as the technical guidance available from the USACE on the identification of an Ordinary High Water Mark (OHWM)[6] and definition of a tributary as described in the Clean Water Rule[7]. Data was collected on flow regime, bankfull and OHWM widths, dominant substrates, and observations

[1] Federally listed species are protected under the U.S. Endangered Species Act and Vermont-listed species are protected under 10 V.S.A. §123.
[2] Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
[3] U.S. Army Corps of Engineers. 2011. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*, ed. J.S. Wakeley, R.W. Lichvar, C.V. Noble, and J.F. Berkowitz, ERDC/EL TR-12, Vicksburg, MS: U.S. Army Engineer Research and Development Center.
[4] Federal Geographic Data Committee. 2013. *Classification of Wetlands and Deepwater Habitats of the United States*. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.
[5] New England Hydric Soils Technical Committee. 2017. *Field Indicators for Identifying Hydric Soils in New England (Version 4)*.
[6] U.S. Army Corps of Engineers. 2005. *Regulatory Guidance Letter: Ordinary High Water Mark Identification. December 8, 2005. No. 05-05*.
[7] U.S. Army Corps of Engineers. 2015. *33 Code of Federal Regulations, Part 328, "Waters of the United States". June 29, 2015*.

on evidence of biological use. The stream flags were located with the GPS receiver and representative photographs were taken to document existing conditions.

2.3 RTE SPECIES ASSESSMENT

Concurrent with the delineation, meander surveys were conducted within the delineation area to characterize on site vegetative assemblages. Incidental observations were made of occurrences of RTE plant and/or wildlife species as well as of habitats that may be potentially suitable for RTE species known from the vicinity of the site based on the desktop assessment. If RTE species were observed, appropriate data were collected on population size, condition, vigor, associated habitat, and other pertinent landscape features. Representative photographs were taken of key identifying features and the associated habitat. If observed, populations were located using a combination of GPS and aerial photo interpretation, where appropriate.

In addition, observations were made in the field regarding the presence of trees with evidently peeling or exfoliating bark, cavities, and/or crevices, as such trees are identified as potential RTE bat roost habitat. Representative photographs were taken of potential bat roost trees as appropriate. Observations of the bark and trunk features were limited to those readily observable from ground level.

2.4 WILDLIFE HABITAT AND AQUATIC ORGANISM PASSAGE

Data from previous assessments regarding wildlife habitat connectivity and aquatic organism passage (AOP) was reviewed to assess the potential for wildlife connectivity and crossing at the eight Project sites. The primary data source reviewed was the 2017 Stantec report *Hot 200 Culvert Study*[8] (Hot 200). The Hot 200 study assessed many structural and fluvial geomorphic parameters of culverts across the state of Vermont. Three of the assessment criteria were queried:

- AOP: The Hot 200 study ranked each culvert as one of five individual categorizations for its AOP condition and potential use of a liner for restoration/rehabilitation of the existing culvert. Five ranking categories were used:

    1. Prime fish habitat, liner should not be considered
    2. High slope, large outlet drop, hydraulically undersized. Poor liner candidate
    3. Low slope, no outlet drop, hydraulically adequate. Good liner candidate
    4. Over 1 foot of standing water in the culvert. Liner will not limit AOP
    5. Natural barrier within 100 feet of culvert (upstream or downstream) preventing natural AOP

[8] Hot 200 Culvert Study: Stantec, 2017 (project 195311430 under contract for VTrans)

- Wildlife: The Hot 200 study included consideration of the range of wildlife that may utilize the culvert for accessing habitat(s) on one or both sides of the crossing. Wildlife species considered included small amphibians up to large mammals and field observations as well as habitat block mapping conducted by the ANR were utilized in the analysis. Wildlife conditions were ranked on a scale of one to three:

    1. Top priority for wildlife passage
    2. Moderate need for wildlife passage
    3. Little to no need for extra provisions for wildlife passage

- Bankfull width to Culvert Span Ratio: In the hot 200 study, bankfull width measurements were taken at multiple locations upstream and downstream from each culvert site assessed. The culvert span was also measured in the field, and a ratio was established to determine which culverts were relatively more appropriately sized for the natural channel conditions and which culverts were relatively undersized (i.e., a greater difference between the span of the culvert and the larger bankfull width of the channel). The higher the ratio number, the greater the difference between the (wider) bankfull width and the (narrower) culvert span, indicating that the culvert width dimension is undersized in consideration of providing wildlife passage and/or AOP.

3.0 RESULTS

The field surveys were conducted between July 18 and July 20, 2022. Table 1 summarizes the eight crossing locations and features observed and identified in the field. Appendix A includes figures of each bridge location that was surveyed and the associated delineated resources.

Table 2. Crossing Structure Survey Site Summary

Structure Number	Town	Date Surveyed	Wetlands Present	Streams Present	RTE Species Present / Suspected	Potential Bat Roost Trees Present
BR 9	Castleton	7/18/22	No	Yes	No	Yes
BR 14	Ira	7/18/22	No	Yes	No	Yes
BR 19	Sunderland	7/19/22	No	Yes	No	Yes
BR 25	Londonderry	7/19/22	Yes	Yes	No	No
BR 28	Killington	7/18/22	No	Yes*	No	Yes
BR 36	Bridgewater	7/18/22	No	Yes	No	Yes
BR 58A	Dorset	7/18/22	No	Yes	No	Yes
BR 61	Rupert	7/19/22	No	Yes	No	Yes

*Stream is present within Stantec's Study Area but not observed at the VTrans structure

3.1 SURVEY AREA DESCRIPTION

The Project sites and Stantec's survey limits are located in landscapes with scattered rural residential and agricultural development and the roadway corridor with associated transportation infrastructure. Given that the Project will address a series of road crossing structures, the ecological conditions are characterized by a stream and/or the presence of surface waters (including wetlands). Surrounding upland floodplains and riparian areas generally consist or hardwood to mixed forests. Characteristic tree species observed at Project sites include sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), gray birch, American basswood (*Tilia americana*), ash-leaf maple (*Acer negundo*), eastern hemlock (*Tsuga canadensis*), and white ash (*Fraxinus americana*). Non-native invasive species, most notably garlic mustard (*Alliaria petiolata*), Morrow's honeysuckle (*Lonicera morrowii*), glossy false-buckthorn (*Frangula alnus*), and European buckthorn (*Rhamnus cathartica*), are well established at multiple Project sites. As the culverts are located within existing, developed road corridors, the vegetative conditions along roadways are maintained through routine mowing and have in some areas been planted with a grass and forb seed mix typical of roadsides, lawns, and construction revegetation practices.

3.2 WETLAND AND WATERCOURSE DELINEATION

Wetlands were delineated at only the BR 25 culvert crossing site, with a total of two wetlands present. Both of these delineated wetlands are anticipated to be Class 2 wetlands under the Vermont Wetland Rules, pending confirmation of this classification by the Vermont Department of Environmental Conservation (DEC) Wetlands Program. Table 2 summarizes the results of the wetland delineation. Representative Photographs are provided in Appendix B. Completed Vermont Wetland Evaluation Forms are provided in Appendix C.

Watercourses (i.e., streams) were delineated within the survey limits of all eight of the Project sites. Seven of the eight crossing structures were found to convey stream channels, and one culvert (BR 28) was found to not be associated with any stream (or ditch). Of the streams delineated, one stream exhibited indication of a perennial flow regime and all other channels were assessed as intermittent. It is notable that drought conditions have developed in parts of Vermont during the 2022 growing season, according to the National Drought Mitigation Center, however, there were not drought conditions present at the Project sites at the time of Stantec's field assessments. Conditions at all eight crossing sites were ranked as "Abnormally Dry" as of July 19, 2022, but did not meet the rank as either moderate, severe, or extreme drought. Table 3 summarizes the results of the watercourse delineation. Representative Photographs are provided in Appendix B.

Table 3. Summary of Delineated Wetlands

Structure Number/ Identifier	Town	Wetland Identifier	Wetland Community Classification[1]	Dominant and Characteristic Vegetation	Hydric Soil Criteria	Evidence of Hydrology	Anticipated VT Wetland Class	Additional Notes
BR 25	Londonderry	BR25-W1	PEM	Shrubs: gray willow (*Salix bebbiana*) Herbs: purple-stem American-aster (*Symphyotrichum puniceum*), late goldenrod (*Solidago gigantea*), reed canary grass (*Phalaris arundinacea*)	Depleted Matrix	Saturation, geomorphic position, oxidized rhizospheres on living roots	Class II	Wetland extends to south/southeast beyond limits of investigation area; ongoing disturbance in wetland from agriculture; diffuse flow within wetland becomes channelized and develops into stream BR25-S1
BR 25	Londonderry	BR25-W2	PEM	Herbs: broad-leaf cat-tail (*Typha latifolia*) reed canary grass (*Phalaris arundinacea*), eastern marsh fern (*Thelypteris palustris*), true forget-me-not (*Myosotis scorpioides*)	Depleted Matrix	Surface water, high water table, saturation, saturation visible on aerial imagery, geomorphic position, oxidized rhizospheres on living roots	Class II	Topographically defined wetland boundary in natural depressional area bounded by farm access driveway and Route 11

Table 4. Summary of Delineated Watercourses

Structure Number/ Identifier	Town	Stream Identifier	Stream Name	Flow Type	Bankfull Width (ft)	Ordinary High Water Mark Width (ft)	Dominant Substrates	Additional Notes
BR 9	Castleton	BR9-S1	Unnamed	Intermittent	5	5	Sand – Silt – Gravel	Downgradient end of culvert north side of Rte 4A is excavated ditch and not a natural stream channel; recently excavated ditch channel (2022) assumed jurisdictional because conveys flow from natural stream channel upgradient and appears to convey flow towards east to confluence with another natural stream channel.
BR 14	Ira	BR14-S1	Unnamed tributary to Castleton River	Intermittent	15	13	Gravel – Cobble	Observed two white-tailed deer traveling through bridge as alternative to crossing Rte 4A during fieldwork; substrate in stream bed noted to be larger upstream and downstream than within and immediately downstream from bridge crossing.
BR 19	Sunderland	BR19-S1	Unnamed tributary to Fayville Branch	Perennial	12–13	12	Cobble – Gravel	Forested uplands in riparian corridor provide dense shade to channel.
BR 25	Londonderry	BR25-S1	Unnamed	Intermittent	4	4	Sand – Silt – Gravel	Channel develops from diffuse flow through wetland that occurs at outlet of culvert and extends beyond edge of investigation area downgradient in natural swale between hay/pasture fields
BR 28	Killington	BR28-S1	Unnamed tributary to Kent Brook	Intermittent	9	4	Cobble – Boulder	Map data (VHD, USGS) indicates Kent Brook passes under Rte 4 at BR 28 location, but no stream channel and no crossing structure observed in the field; Stream BR28-S1 is tributary to the BR 28 crossing, flowing generally west to east through culvert under private driveway to the west of BR 28; BR28-S1 is step-pool type habitat with dense shade from surrounding forest, steep slopes in riparian corridor
BR 36	Bridgewater	BR36-S1	Unnamed tributary to Ottaqueechee River	Intermittent	9	6	Cobble – Gravel	Culvert observed to be at grade with inlet and outlet stream channel; channel somewhat shaded by herbaceous and shrub vegetation on south side of Rte 4; PSS-PEM wetland complex and small River Cobble Shore natural community[1] (per Stantec incidental observation) occurs along Ottaqueechee River outside of Stantec delineation area.
BR 58A	Dorset	BR58A-S1	Unnamed	Intermittent	4	3	Sand – Silt – Gravel	Channel appears to have been straightened/excavated previously to accommodate surrounding agricultural use; no channel present upstream (inlet) end of culvert.
BR 61	Rupert	BR61-S1	Unnamed tributary to Mettowee River	Intermittent	12	12	Cobble – Gravel	Mild evidence of bank instability in sloughing, exposed roots, bank shelf; structure (barn?) is threatened and actively collapsing into the channel within approximately 150 feet north from investigation area.

[1] Thompson, E.S., E. Sorenson, and R.J. Zaino. 2019, Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont, 2nd Edition. Published by The Nature Conservancy, Vermont Department of Fish and Wildlife, and Vermont Land Trust, distributed by Chelsea Green Publishing.

3.3 RTE SPECIES ASSESSMENT

3.3.1 Database Review

The RTE species database review was conducted in July 2022. From the database review, no EOs were identified within or immediately adjacent to any of the eight Project crossing sites. Available EO records within an approximately 1-mile radius were assessed to inform the potential target species or habitats during Stantec's July 2022 field survey. EOs from the vicinity were referenced against the known habitat criteria for each species and compared to available habitats within each Project site.

Additionally, the USFWS Information, Planning, and Conservation System (IPaC) database was queried for a list of federally listed Endangered and Threatened species within any of the eight Project sites. From the IPaC database review, all eight crossings are within the range of the northern long-eared bat (*Myotis septentrionalis*; MYSE); however, currently there is no designated critical habitat for MYSE.[9]

Stantec then reviewed the Vermont Fish and Wildlife Department map database for observed and potential summer habitat as well as known winter hibernacula for the Indiana bat (*Myotis sodalis*; MYSO). Of the eight crossing sites, two were identified: BR 58A in Dorset, which is a town known for a winter hibernaculum site, and BR 61 in Rupert, which is recognized as a town in the potential summer range for Indiana bat.

3.3.2 Field Survey – RTE Plants

The RTE plant assessment was conducted concurrent with wetland and watercourse delineations between July 18 and 20, 2022. The goal of the RTE plant assessment was to identify the presence of RTE plants that have not previously been documented onsite and/or identify additional potential habitats for RTE plants based on those species known from the neighboring landscape. Field survey methods were meander-based assessments and recorded representative vegetative assemblages, with particular attention towards any on site conditions that were suitable habitat for state- or federally protected species known to occur within the vicinity of the Project sites based on the NHI database query radius. No RTE plants were observed during the field survey. Further consultation with ANR may be necessary to determine if follow up targeted surveys are recommended at one or more of the crossing locations depending on the nature of the proposed Project construction activities and the information presented herein.

3.3.3 Field Survey – RTE Animals

As described above, Stantec conducted a database review to determine if there are any known hibernacula or summer roost locations for MYSE or MYSO (or other RTE bats) at any of the Project sites or vicinity. According to the Vermont Fish and Wildlife Department Regulatory Review Guidance for

[9] No critical habitat for the northern long-eared bat has been designated nationwide.

Protecting Northern Long-eared Bats and Their Habitats[10], the typical size of trees present at all eight of the Project crossing sites meet the minimum criteria for potential roosting habitat for MYSE, although they may not have the exfoliating bark and/or hollows that render them suitable roosting trees. Observations of every tree within the delineation area to identify individual trees with suitable roosting habitat was not performed; however, incidental observation of trees exhibiting particularly high roost suitability and/or roosting features (exfoliating or peeling bark, cracks and crevices, cavities) were made.

General observation of other RTE animal species were made during Stantec's July 2022 fieldwork. There were no detailed, target, or specific presence/absence surveys for RTE animals, and there are no EO records from the NHI database for RTE animals at any of the eight crossing sites. No observations of RTE animals were made during the July 2022 field assessment. Stantec observed two male white-tailed deer (*Odocoileus virginiana*) utilizing BR 14 in Ira as a travelway to cross under Vermont Route 4A. Stantec also observed two relatively large (approximately 2-foot) snake sheds and a bird nest of an unidentified species along the concrete blocks at BR 9 in Castleton.

3.4 WILDLIFE HABITAT AND AOP

Of the eight Project crossing sites, six had been previously assessed as part of Stantec's 2017 Hot 200 study and so data from the Hot 200 was reviewed. The six sites included in the Hot 200 study are:

- BR 9 (Castleton, Vermont Route 4A);
- BR 19 (Sunderland, US Route 7);
- BR 25 (Londonderry, Vermont Route 11);
- BR 28 (Killington, US Route 4);
- BR 58A (Dorset, Vermont Route 30); and
- BR 61 (Rupert, Vermont Route 30).

For the two Project sites not included in the Hot 200 study—BR 14 in Ira (Vermont Route 14) and BR 36 in Bridgewater (US Route 4)—inspection records from the VT Culverts database available online via the Vermont Association of Planning & Development Agencies (VAPDA) were reviewed. Inspection notes from the VT Culverts database are generally focused on the structural condition of a culvert crossing and do not represent an assessment of wildlife habitat or AOP; however, the notes may be interpreted to anticipate possible wildlife habitat and/or AOP concerns.

Detailed results of this assessment are presented in the Records Review of Habitat and Aquatic Organism Passage summary table in Appendix D. In high level summary, the BR 19 crossing in Sunderland and BR 28 in Killington were identified in the Hot 200 study as being a "top priority for wildlife

[10] Vermont Fish and Wildlife Department. 2017. Regulatory Review Guidance for Protecting Northern Long-Eared Bats and Their Habitats.

passage" categorization for habitat and also as having "prime fish habitat" category under the AOP analysis. BR 28 in Killington was also found to have the highest BFW to culvert span ratio of all eight Project sites (where data is available) indicating a high potential for improving AOP. In contrast, BR 58A in Dorset was categorized as "little or no need for extra provisions for wildlife passage" and "natural barrier within 100 feet of crossing" for the wildlife habitat and AOP analyses, respectively.

4.0 CONCLUSIONS

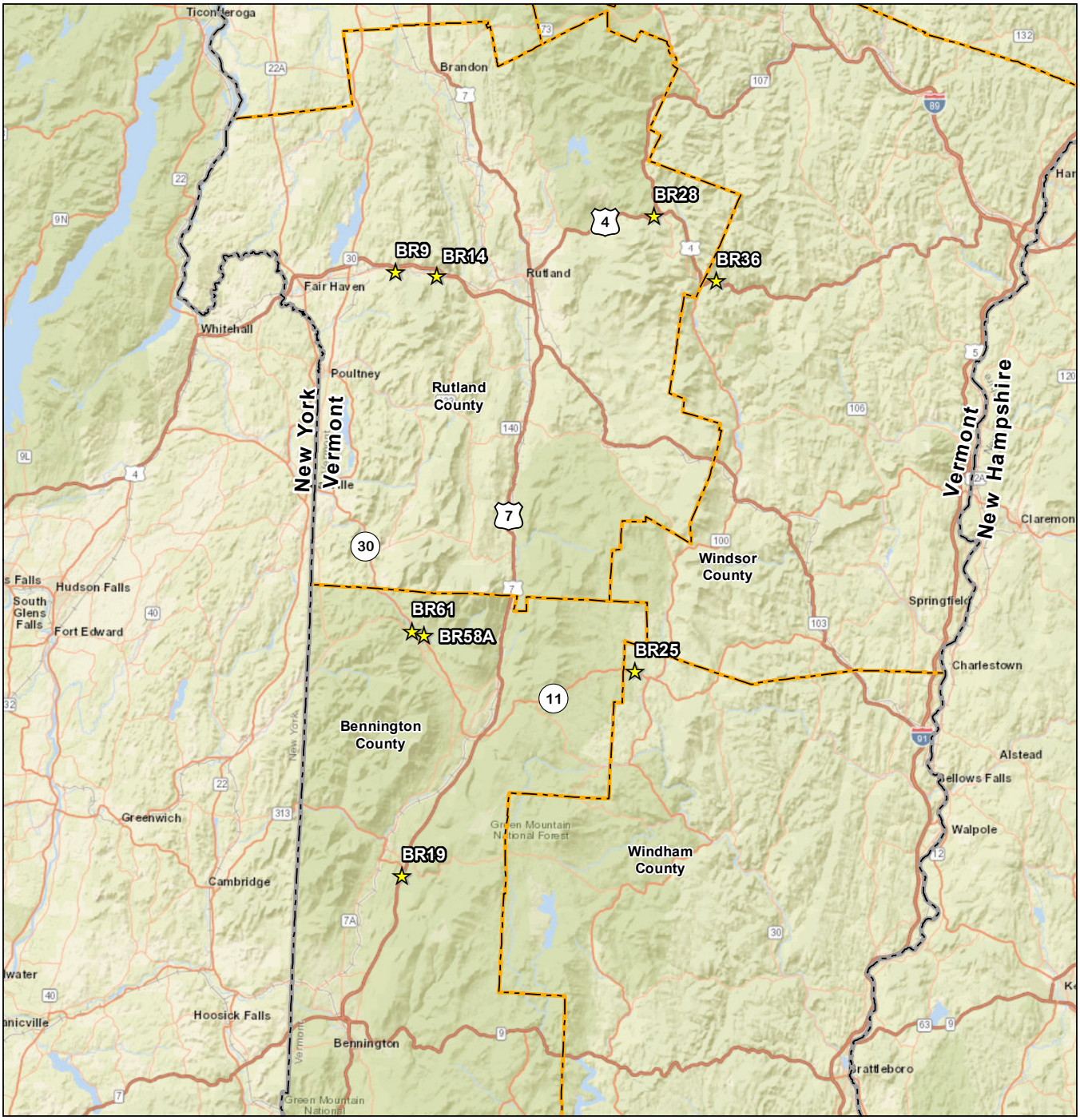
Stantec conducted a delineation of wetlands and surface waters as well as made observations of RTE species and potential habitats within the proximity of eight road crossing structures located in Bennington, Rutland, and Windsor counties in Vermont in support of VTrans' Statewide- Southwest STP CULV(91) Project. The field surveys were informed by a pre-field desktop and database review.

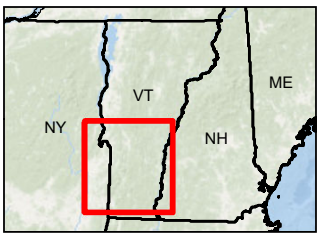
Data were collected for assessed resources at each crossing site as described above and shown in the appendices. Based on Stantec's assessments, there are streams present at seven of the eight crossing locations, and streams were observed within the investigation area (which included the Project crossing structure and nearby vicinity as shown in the Appendix A maps) at all eight sites. Wetlands were delineated at one of the crossing sites, and are anticipated to be considered Class II and, therefore, State-significant. Streams and wetlands are subject to state and federal regulation, and State-significant wetlands and their buffers are regulated by the Vermont DEC. Based on the delineated wetland and water resources and pending the development of Project site plans, Stantec recommends consultation with the USACE and the Vermont DEC Wetlands Program to determine if and what applicable permit authorizations are required prior to Project construction.

No observations of RTE plants were made, and there are no known EO records for RTE plants at any of the Project locations. Although no occurrences or known habitat for RTE animals are present at any of the crossing sites, Stantec observed trees and forested areas that could be considered potentially suitable for summer roosting habitat by RTE bats, notably MYSE and MYSO. Pending the timing of construction and/or the final design for Project crossing structure replacements, follow up survey(s) for RTE species may be recommended. The database review for wildlife habitat and AOP considerations could inform prioritization of site(s) for funding, design, and construction. Based on available data from previous assessments of wildlife habitat and AOP conditions, BR 28 in Killington and BR 19 in Sunderland are the highest priority sites for improving wildlife crossing and AOP.

APPENDICES

Appendix A WETLAND AND WATERCOURSE DELINEATION MAPS





Legend

- Crossing Structure Location
- County Line
- State Line

0 10 Miles

(At original document size of 8.5x11)
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N

Stantec

Notes

1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Base features obtained from the Vermont Center for Geographic Information (VCGI).
3. Background: Topographic base map provided by ArcGIS online World Topographic Map.

Project Location
Rutland, Bennington, Winsor, Windham Counties Vermont

Prepared by PWB on 2022-08-18
TR by KWH on 2022-08-18
IR Review by CAF on 2022-08-18

Client/Project 195601752
VTrans
Statewide- Southwest STP CULV(91)
Rutland and Bennington Counties

Figure No.
1

Title
Project Location Index Map

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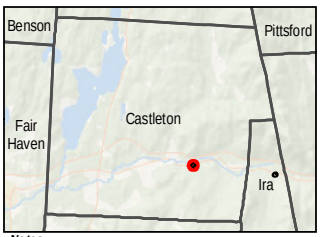

Legend

- GPS-Located Culvert
- Jurisdictional Ditch
- Delineated Intermittent Stream (OHW/Stream Center)
- Approximate Survey Limits
- Parcel Boundary

Vermont Regulatory Resource Layers (not all layers are present within map extent)

- VHD Stream
- Vermont DEC River Corridor
- NWI Wetland
- VSWI Wetland
- 100 Year Flood Zone (Zone A and AE)
- Floodway

0 40 Feet
(At original document size of 8.5x11)
1:600

N

Notes

1. Wetland and waters delineations conducted by Stantec (Fenner) between July 18-20, 2022. Delineation and proposed classification has not been field verified by VT DEC and/or USACE.
2. Wetland boundaries and streams were located utilizing an EOS Arrow GNSS/GPS Receiver. Expected accuracy of GPS data is within 1-2 meters of actual position.
3. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
4. Data Sources: Vermont Center for Geographic Information (VCGI), FEMA.
5. Background: VCGI Color Imagery Service

Stantec

Project Location
Rutland and Bennington Counties
Vermont

Prepared by PWB on 2022-08-03
TR by KWH on 2022-08-03
IR Review by CF on 2022-08-03

Client/Project 195601752
VTrans
Statewide- Southwest STP CULV(91)
Rutland and Bennington Counties

Figure No.
BR 9

Title
Wetland and Waters Delineation Map

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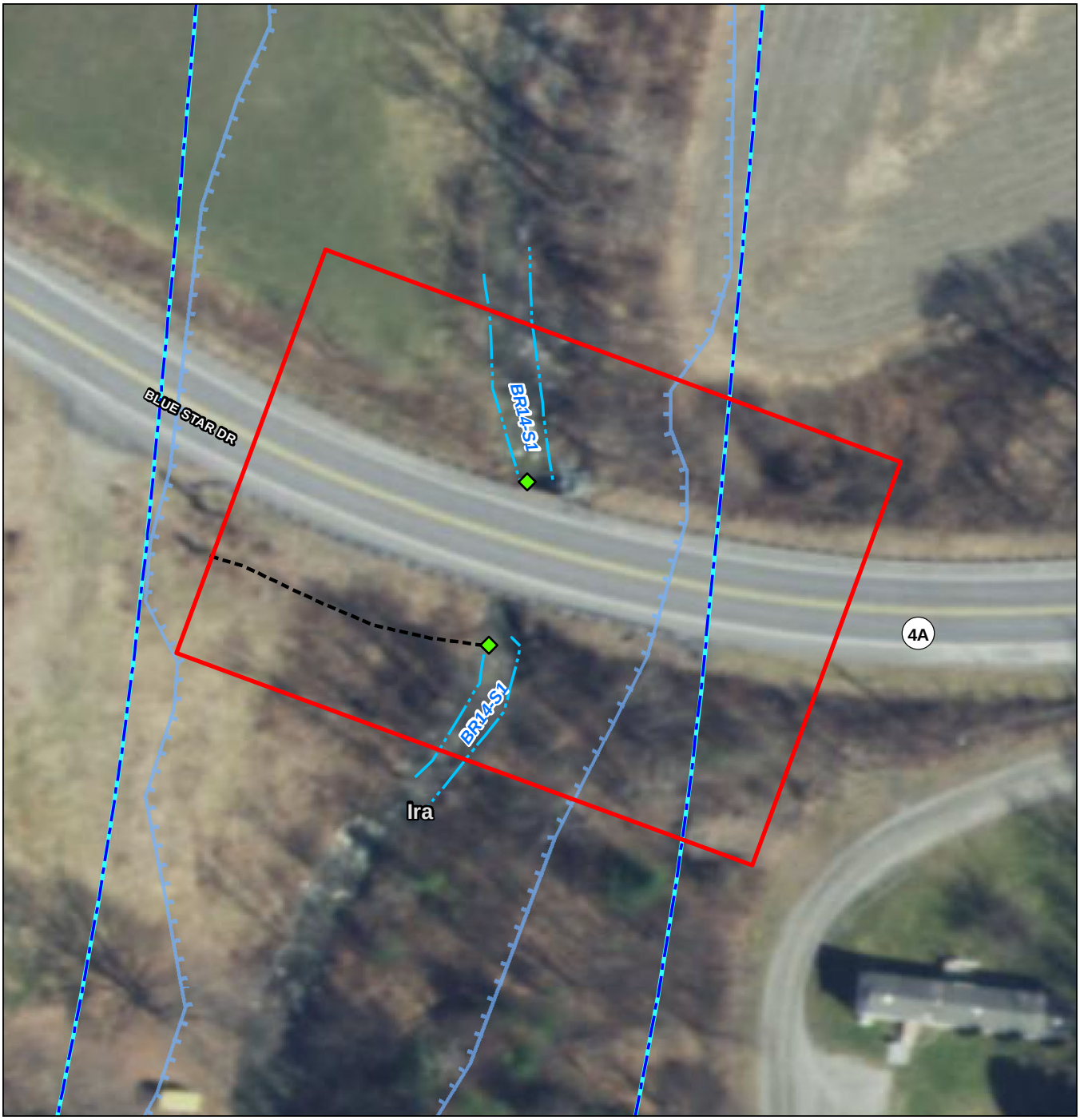

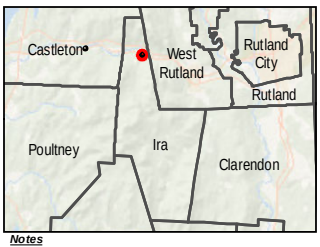

Legend

- GPS-Located Bridge Edge
- Jurisdictional Ditch
- Delineated Intermittent Stream (OHW/Stream Center)
- Approximate Survey Limits

Vermont Regulatory Resource Layers (not all layers are present within map extent)

- VHD Stream
- Vermont DEC River Corridor
- NWI Wetland
- VSWI Wetland
- 100 Year Flood Zone (Zone A and AE)
- Floodway

0 40 Feet
(At original document size of 8.5x11)
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N

Stantec

Project Location
Rutland and Bennington Counties
Vermont

Prepared by PWB on 2022-08-03
TR by KWH on 2022-08-03
IR Review by CF on 2022-08-03

Client/Project
195601752
VTrans
Statewide- Southwest STP CULV(91)
Rutland and Bennington Counties

Figure No.
BR 14

Title
Wetland and Waters Delineation Map

Notes

1. Wetland and waters delineations conducted by Stantec (Fenner) between July 18-20, 2022. Delineation and proposed classification has not been field verified by VT DEC and/or USACE.
2. Wetland boundaries and streams were located utilizing an EOS Arrow GNSS/GPS Receiver. Expected accuracy of GPS data is within 1-2 meters of actual position.
3. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
4. Data Sources: Vermont Center for Geographic Information (VCGI), FEMA.
5. Background: VCGI Color Imagery Service

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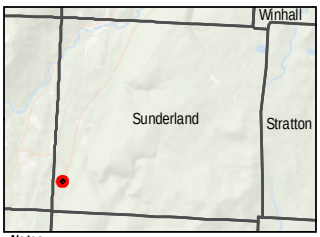

Legend

- GPS-Located Culvert
- Delineated Perennial Stream (OHW/Stream Center)
- Approximate Survey Limits
- Parcel Boundary

Vermont Regulatory Resource Layers (not all layers are present within map extent)

- VHD Stream
- Vermont DEC River Corridor
- NWI Wetland
- VSWI Wetland
- 100 Year Flood Zone (Zone A and AE)
- Floodway

0 40 Feet
(At original document size of 8.5x11)
1:600

N

Stantec

Project Location
Rutland and Bennington Counties
Vermont

Prepared by PWB on 2022-08-03
TR by KWH on 2022-08-03
IR Review by CF on 2022-08-03

Client/Project
VTrans
Statewide- Southwest STP CULV(91)
Rutland and Bennington Counties

195601752

Figure No.
BR 19

Title
Wetland and Waters Delineation Map

Notes

1. Wetland and waters delineations conducted by Stantec (Fenner) between July 18-20, 2022. Delineation and proposed classification has not been field verified by VT DEC and/or USACE.
2. Wetland boundaries and streams were located utilizing an EOS Arrow GNSS/GPS Receiver. Expected accuracy of GPS data is within 1-2 meters of actual position.
3. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
4. Data Sources: Vermont Center for Geographic Information (VCGI), FEMA.
5. Background: VCGI Color Imagery Service

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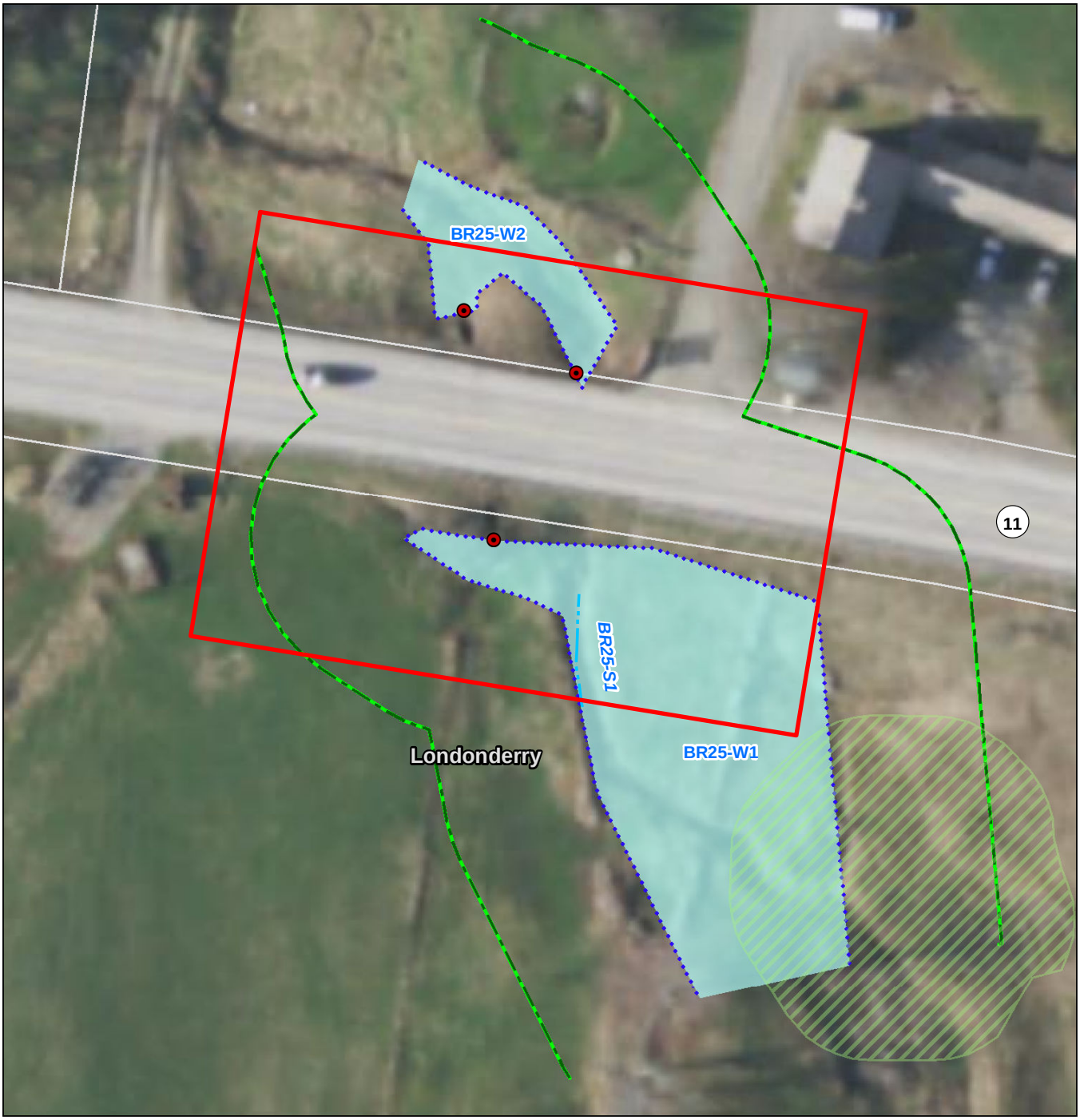

Legend

- GPS-Located Culvert
- Delineated Intermittent Stream (OHW/Stream Center)
- Delineated Wetland
- Class II Wetland Buffer
- Approximate Survey Limits
- Parcel Boundary

Vermont Regulatory Resource Layers (not all layers are present within map extent)

- VHD Stream
- Vermont DEC River Corridor
- NWI Wetland
- VSWI Wetland
- 100 Year Flood Zone (Zone A and AE)
- Floodway

0 40 Feet
(At original document size of 8.5x11)
1:600

N

Notes

1. Wetland and waters delineations conducted by Stantec (Fenner) between July 18-20, 2022. Delineation and proposed classification has not been field verified by VT DEC and/or USACE.
2. Wetland boundaries and streams were located utilizing an EOS Arrow GNSS/GPS Receiver. Expected accuracy of GPS data is within 1-2 meters of actual position.
3. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
4. Data Sources: Vermont Center for Geographic Information (VCGI), FEMA.
5. Background: VCGI Color Imagery Service

Stantec

Project Location
Rutland and Bennington Counties
Vermont

Prepared by PWB on 2022-08-03
TR by KWH on 2022-08-03
IR Review by CF on 2022-08-03

Client/Project 195601752
VTrans
Statewide- Southwest STP CULV(91)
Rutland and Bennington Counties

Figure No.
BR 25

Title
Wetland and Waters Delineation Map

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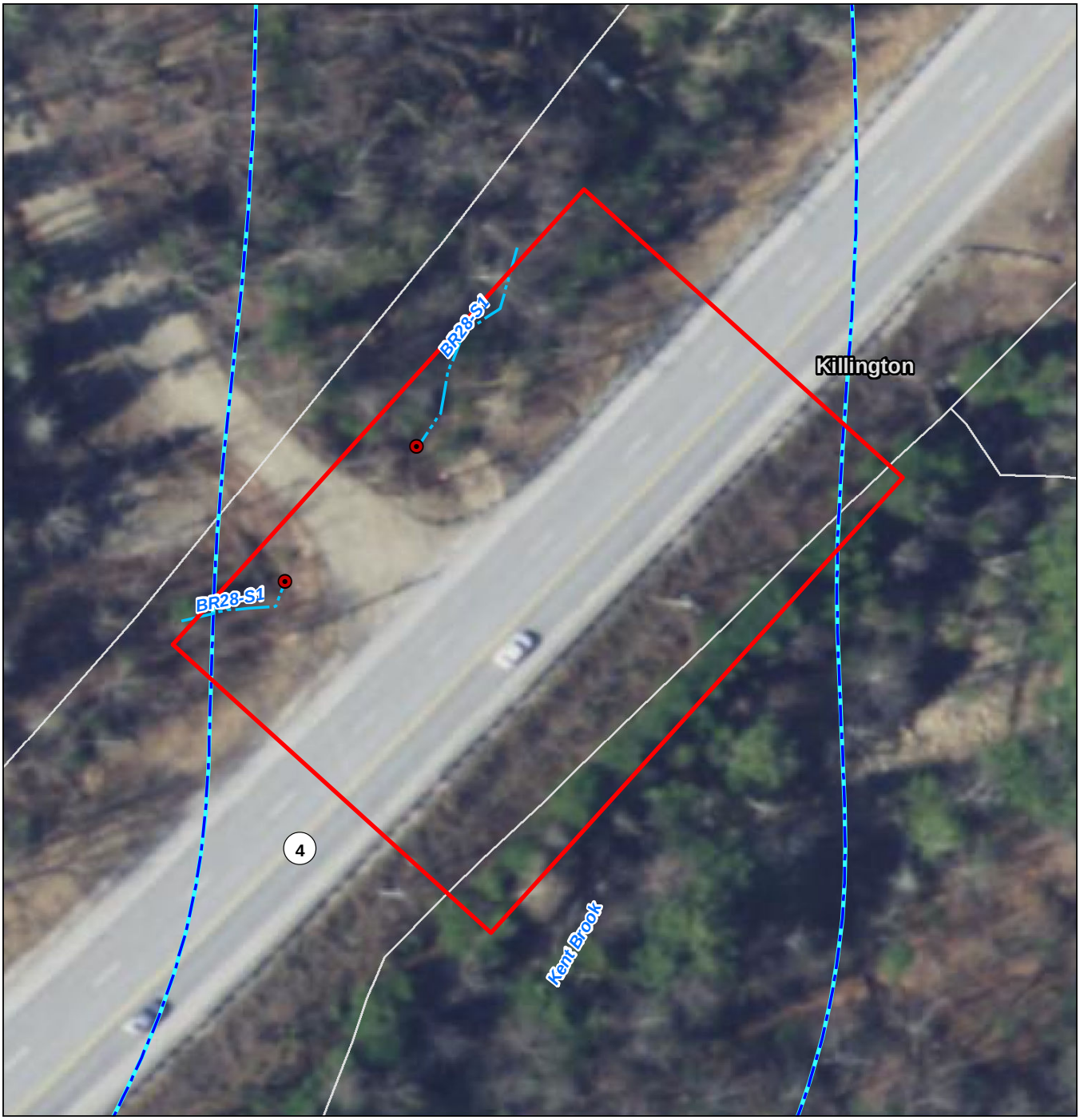

Legend

- GPS-Located Culvert
- Delineated Intermittent Stream (OHW/Stream Center)
- Approximate Survey Limits
- Parcel Boundary

Vermont Regulatory Resource Layers
(not all layers are present within map extent)

- VHD Stream
- Vermont DEC River Corridor
- NWI Wetland
- VSWI Wetland
- 100 Year Flood Zone (Zone A and AE)
- Floodway

0 40 Feet
(At original document size of 8.5x11)
1:600

N

Stantec

Notes

1. Wetland and waters delineations conducted by Stantec (Fenner) between July 18-20, 2022. Delineation and proposed classification has not been field verified by VT DEC and/or USACE.
2. Wetland boundaries and streams were located utilizing an EOS Arrow GNSS/GPS Receiver. Expected accuracy of GPS data is within 1-2 meters of actual position.
3. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
4. Data Sources: Vermont Center for Geographic Information (VCGI), FEMA.
5. Background: VCGI Color Imagery Service

Project Location
Rutland and Bennington Counties
Vermont

Prepared by PWB on 2022-08-03
TR by KWH on 2022-08-03
IR Review by CF on 2022-08-03

Client/Project 195601752
VTrans
Statewide- Southwest STP CULV(91)
Rutland and Bennington Counties

Figure No.
BR 28

Title
Wetland and Waters Delineation Map

V:\195601752\03_data\gis_cad\gis\MXDs\Vtrans_Culverts_2022\01752_00_Culverts_WetlandDelin_08_2022.mxd Revised: 2022-08-08 By: pbarbera

Notes

1. Wetland and waters delineations conducted by Stantec (Fenner) between July 18-20, 2022. Delineation and proposed classification has not been field verified by VT DEC and/or USACE.
2. Wetland boundaries and streams were located utilizing an EOS Arrow GNSS/GPS Receiver. Expected accuracy of GPS data is within 1-2 meters of actual position.
3. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
4. Data Sources: Vermont Center for Geographic Information (VCGI), FEMA.
5. Background: VCGI Color Imagery Service

Legend

- GPS-Located Culvert
- Delineated Intermittent Stream (OHW/Stream Center)
- Approximate Survey Limits
- Parcel Boundary

Vermont Regulatory Resource Layers
(not all layers are present within map extent)

- VHD Stream
- Vermont DEC River Corridor
- NWI Wetland
- VSWI Wetland
- 100 Year Flood Zone (Zone A and AE)
- Floodway

0 40 Feet
(At original document size of 8.5x11)
1:600

N

Stantec

Project Location
Rutland and Bennington Counties
Vermont

Prepared by PWB on 2022-08-03
TR by KWH on 2022-08-03
IR Review by CF on 2022-08-03

Client/Project 195601752
VTrans
Statewide- Southwest STP CULV(91)
Rutland and Bennington Counties

Figure No.
BR 36

Title
Wetland and Waters Delineation Map

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Notes

1. Wetland and waters delineations conducted by Stantec (Fenner) between July 18-20, 2022. Delineation and proposed classification has not been field verified by VT DEC and/or USACE.
2. Wetland boundaries and streams were located utilizing an EOS Arrow GNSS/GPS Receiver. Expected accuracy of GPS data is within 1-2 meters of actual position.
3. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
4. Data Sources: Vermont Center for Geographic Information (VCGI), FEMA.
5. Background: VCGI Color Imagery Service

Legend

- GPS-Located Culvert
- Delineated Intermittent Stream (OHW/Stream Center)
- Approximate Survey Limits
- Parcel Boundary

Vermont Regulatory Resource Layers (not all layers are present within map extent)

- VHD Stream
- Vermont DEC River Corridor
- NWI Wetland
- VSWI Wetland
- 100 Year Flood Zone (Zone A and AE)
- Floodway

0 40 Feet
(At original document size of 8.5x11)
1:600

N

Stantec

Project Location
Rutland and Bennington Counties
Vermont

Prepared by PWB on 2022-08-03
TR by KWH on 2022-08-03
IR Review by CF on 2022-08-03

Client/Project 195601752
VTrans
Statewide- Southwest STP CULV(91)
Rutland and Bennington Counties

Figure No.
BR 58A

Title
Wetland and Waters Delineation Map

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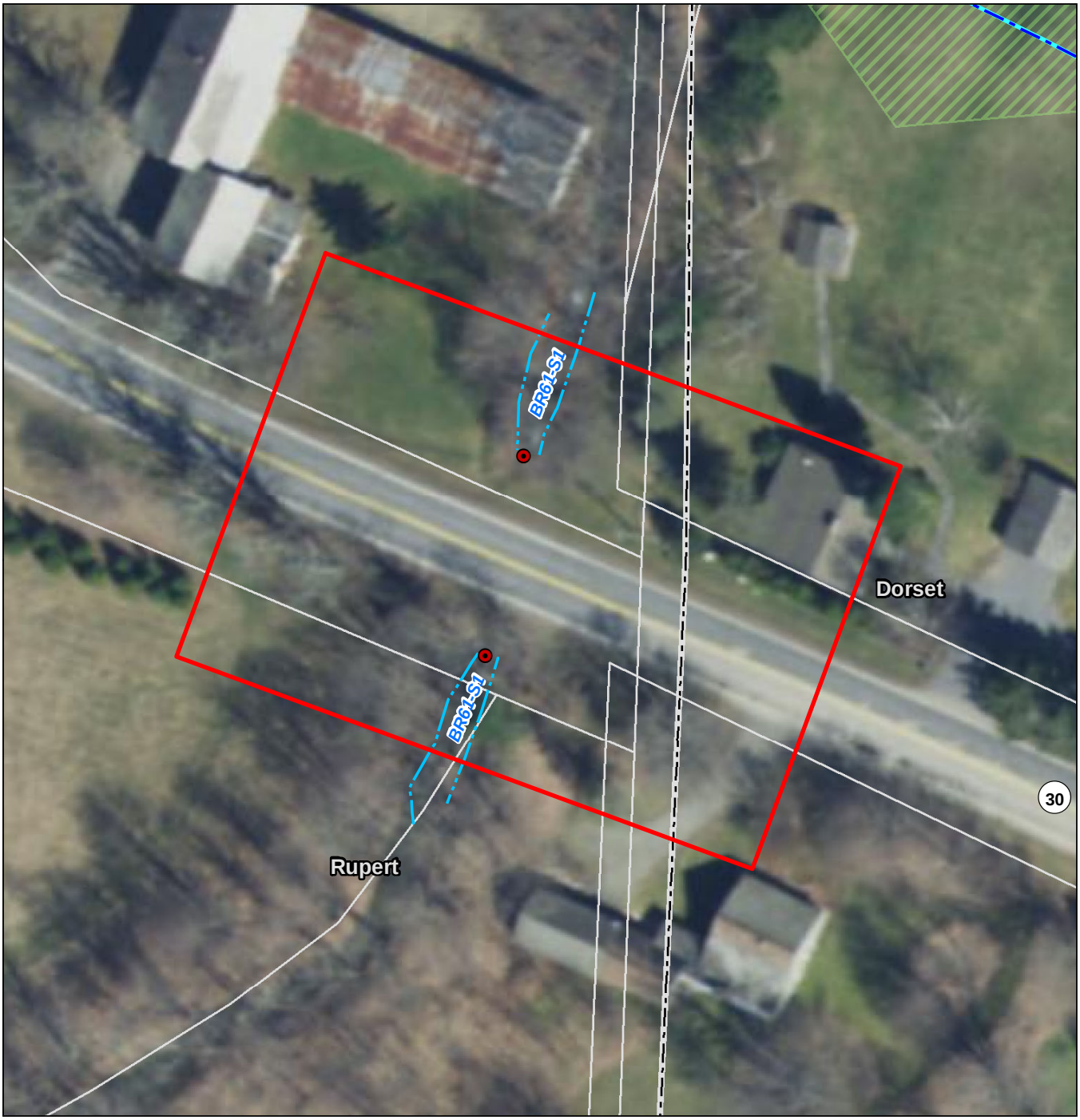

Legend

- GPS-Located Culvert
- Delineated Intermittent Stream (OHW/Stream Center)
- Approximate Survey Limits
- Municipal Boundary
- Parcel Boundary

Vermont Regulatory Resource Layers (not all layers are present within map extent)

- VHD Stream
- Vermont DEC River Corridor
- NWI Wetland
- VSWI Wetland
- 100 Year Flood Zone (Zone A and AE)
- Floodway

0 40 Feet
(At original document size of 8.5x11)
1:600

N

Notes

1. Wetland and waters delineations conducted by Stantec (Fenner) between July 18-20, 2022. Delineation and proposed classification has not been field verified by VT DEC and/or USACE.
2. Wetland boundaries and streams were located utilizing an EOS Arrow GNSS/GPS Receiver. Expected accuracy of GPS data is within 1-2 meters of actual position.
3. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
4. Data Sources: Vermont Center for Geographic Information (VCGI), FEMA.
5. Background: VCGI Color Imagery Service

Stantec

Project Location
Rutland and Bennington Counties
Vermont

Prepared by PWB on 2022-08-03
TR by KWH on 2022-08-03
IR Review by CF on 2022-08-03

Client/Project 195601752
VTrans
Statewide- Southwest STP CULV(91)
Rutland and Bennington Counties

Figure No.
BR 61

Title
Wetland and Waters Delineation Map

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Appendix B REPRESENTATIVE PHOTOGRAPHS

Photo 1. View looking south through the **BR 9** culvert under VT-4A in Castleton. Stantec, July 18, 2022

Photo 2. A representative view of recent ditch excavation work on the north side of VT-4A, downgradient from the **BR 9** culvert crossing. Photo view looking generally west. Stantec, July 18, 2022.

Photo 3. A view looking generally south (upgradient) from the inlet of **BR 9** culvert. Photo view shows the intermittently dry streambed of Stream BR9-S1. Stantec, July 18, 2022.

Photo 4. A representative view of conditions in the **BR 14** culvert crossing of VT-4A in Ira. Photo view looking generally north. Stantec, July 18, 2022.

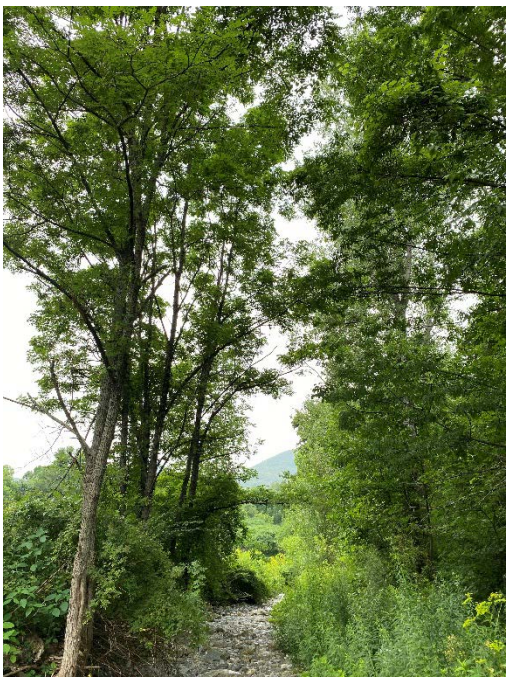

Photo 5. Photo view looking generally north along the delineated channel of intermittent Stream BR14-S1, taken from the outlet (north) end of the **BR 14** VT-4A crossing. Stantec, July 18, 2022.

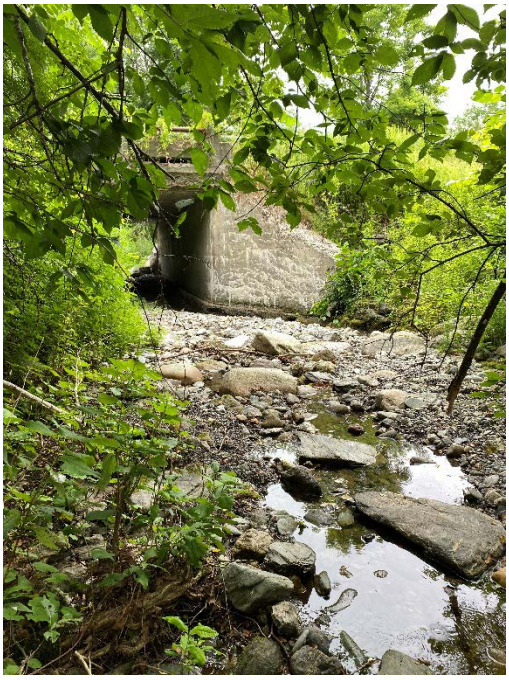

Photo 6. A view of **BR 14** in Ira, looking north towards the inlet (south) end of the crossing structure. Stantec, July 18, 2022.

Photo 7. Photograph taken from the north edge of US-4 in Killington towards the sign for **BR 28**. Photo view shows steep slope down towards forest where Stream BR28-S1 was delineated. Stantec, July 18, 2022

Photo 8. A view looking generally south towards US-4 and the assumed approximate location of the upgradient/inlet end of the **BR 28** culvert (culvert not found in field, appears to have been buried by fill, debris, organic material, other). Stantec, July 18, 2022.

Photo 9. A view looking generally west along the edge of US-4 at the sign for **BR 28** and the assumed approximate location of the downgradient/outlet end of the **BR 28** culvert (culvert not found in field). Stantec, July 18, 2022.

Photo 10. Representative conditions of Stream BR28-S1 and adjacent forest to the north of the US-4 corridor on the upgradient end of the **BR 28** crossing. Photo view looking generally to the east. Stantec, July 18, 2022.

Photo 11. Photo view looking to the north from the downgradient end of **BR 36** crossing under US-4 in Bridgewater. Stantec, July 18, 2022.

Photo 12. Representative conditions in Stream BR36-S1, looking downstream (generally south) from the **BR 36** outlet. Stream BR28-S1 confluences into Ottaqueechee River beyond photo view. Stantec, July 18, 2022.

Photo 13. A representative view of upstream conditions on the north side of US-4 in Bridgewater, with culvert inlet of **BR 36** visible in the photo foreground. Stantec, July 19, 2022

Photo 14. Stream channel conditions (intermittent) and surrounding forest cover on the south side of **BR 61** in Dorset, upgradient from the crossing under VT-30. Stantec, July 19, 2022.

Photo 15. Photo view looking north towards the inlet of **BR 61** where it crosses VT-30. Photo view shows culvert dry streambed conditions and some evidence of dynamic channel with exposed roots on mature trees. Stantec, July 19, 2022.

Photo 16. A representative view of Stream BR61-S1 with the culvert **BR 61** visible in photo background, looking upstream (north) from the southern edge of the investigation area. Stantec, July 18, 2022.

Photo 17. Photo view looking at the inlet of the **BR 58A** culvert structure in Rupert where it crosses VT-30. Culvert inlet is on the north side of VT-30 within a mowed/maintained lawn area. Stantec, July 19, 2022.

Photo 18. A view looking north from the inlet (north) end of **BR 58A**. Photo view shows edge of wetland area in the background (within tall herbs/shrubs), beyond the limits of the investigation area.

Stantec, July 19, 2022.

Photo 19. Photograph taken looking generally north at the outlet end of **BR 58A** where Stream BR58A-S1 flows generally south. Stantec, July 19, 2022

Photo 20. A view looking generally south at the culvert inlet of **BR 19** where Stream BR19-S1 flows into the crossing structure towards its confluence with Fayville Branch, crossing under US-7 in Sunderland. Stantec, July 19, 2022.

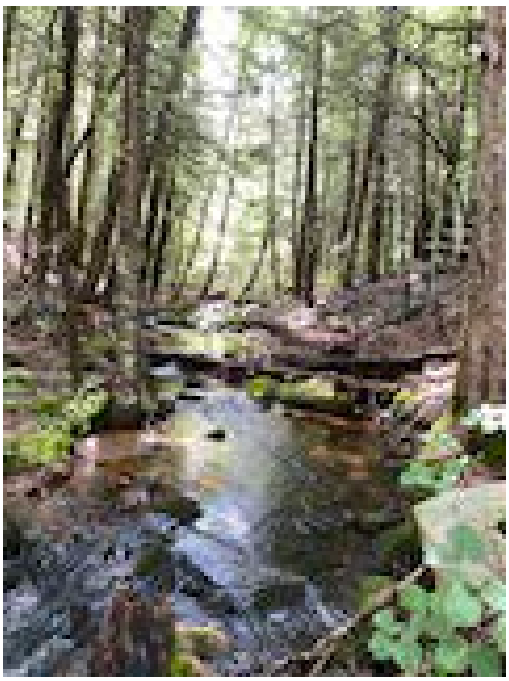

Photo 21. A view looking east (upstream) at conditions of Stream BR19-S1 and surrounding forest before it flows into **BR 19-7**. Stantec, July 19, 2022.

Photo 22. A view looking at the outlet of BR 19-7 on the east side of US-7, photo view looking generally east at vegetative cover downgradient from the crossing culvert. Stantec, July 19, 2022.

Photo 23. Photo view looking generally north (upgradient) at the outlet end of **BR 25** where it crossed VT-11 in Londonderry. Stantec, July 19, 2022.

Photo 24. Representative conditions on the south of VT-11 downgradient from **BR 25** in Stream BR25-S1, at where a stream channel originates from diffuse overland flow of water through Wetland BR25-W1. Stantec, July 19, 2022.

Photo 25. Photo view looking generally south (downgradient) at the inlet end of **BR 25** where it crosses under VT-11 in Londonderry. Stantec, July 19, 2022.

Photo 26. Representative conditions looking north from the edge of VT-11 towards Wetland BR25-W1, upgradient from the BR 25 culvert crossing. Stantec, July 19, 2022.

Appendix C VERMONT WETLAND EVALUATION FORMS

VERMONT WETLAND EVALUATION FORM

Wetland ID#:_____ Project #:_____

Date: _____ Investigator:_____

SUMMARY OF FUNCTIONAL EVALUATION:
Each function gets a score of 0= not present; L = Low; P = Present; or H = High.

1. Water Storage for Flood Water and Storm Runoff ☐	**6. Rare, Threatened, and Endangered Species Habitat** ☐
2. Surface & Ground Water Protection ☐	**7. Education and Research in Natural Sciences** ☐
3. Fish Habitat ☐	**8. Recreational Value and Economic Benefits** ☐
4. Wildlife Habitat ☐	**9. Open Space and Aesthetics** ☐
5. Exemplary Wetland Natural Community ☐	**10. Erosion Control through Binding and Stabilizing the Soil** ☐

Note:

- ***When to use this form:*** This is a field form to help you compile data needed to evaluate the 10 possible functions and values of a wetland as described in the Vermont Wetland Rules. All information in this form is replicated in the applications for both wetland determinations and wetland permits.
- ***Both a desktop review and field examination*** should be employed to accurately determine surrounding land use, hydrology, hydroperiod, vegetation, position in the landscape, and physical attributes.
- ***The entire wetland or wetland complex*** in question must be evaluated to determine the level of function in all ten (10) categories for accurate classification. A wetland complex can be defined as a series of interconnected wetland types.
- ***The surrounding upland and outflow area*** of the wetland should be examined to determine land use, development, nearby natural resources, and hydrology. The surrounding land use, previous development, and cumulative impacts may play a role in the current function of the wetland. For best results please read all descriptions prior to scoring activity.
- ***Evaluation***: The first portion in each section determines whether the wetland does or does not provide the function. If none of the conditions listed in the first section are met, proceed

to the next section. If any of these conditions are met, determine if the wetland provides this function at a higher or lower level based on the information listed in the subsequent sections.

- ***Presumptions:*** Please note that many wetlands are already presumed to be significant under the Vermont Wetland Rules. A wetland is presumed to be significant if:
    - The wetland is mapped on the VSWI map
    - The wetland is contiguous to a VSWI mapped wetland
    - The wetland meets the presumptions of significance under Section 4.6
    - The wetland has a preliminary determination that it is Class II

1. Water Storage for Flood Water and Storm Runoff

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Constricted outlet or no outlet and an unconstricted inlet.
- ☐ Physical space for floodwater expansion and dense, persistent, emergent vegetation or dense woody vegetation that slows down flood waters or stormwater runoff during peak flows and facilitates water removal by evaporation and transpiration.
- ☐ If a stream is present, its course is sinuous and there is sufficient woody vegetation to intercept surface flows in the portion of the wetland that floods.
- ☐ Physical evidence of seasonal flooding or ponding such as water stained leaves, water marks on trees, drift rows, debris deposits, or standing water.
- ☐ Hydrologic or hydraulic study indicates wetland attenuates flooding.

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level:

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

- ☐ Significant flood storage capacity upstream of the wetland, and the wetland in question provides this function at a negligible level in comparison to upstream storage (unless the upstream storage is temporary such as a beaver impoundment).
- ☐ Wetland is contiguous to a major lake or pond that provides storage benefits independently of the wetland.
- ☐ Wetland's storage capacity is created primarily by recent beaver dams or other temporary structures.
- ☐ Wetland is very small in size, not contiguous to a stream, and not part of a collection of small wetlands in the landscape that provide this function cumulatively.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☐ History of downstream flood damage to public or private property.
- ☐ Any of the following conditions present downstream of the wetland, but upstream of a major lake or pond, could be impacted by a loss or reduction of the water storage function.
  - ☐ 1. Developed public or private property.
  - ☐ 2. Stream banks susceptible to scouring and erosion.
  - ☐ 3. Important habitat for aquatic life.
- ☐ The wetland is large in size and naturally vegetated.

☐ Any of the following conditions present upstream of the wetland may indicate a large volume of runoff may reach the wetland.

- ☐ 1. A large amount of impervious surface in urbanized areas.
- ☐ 2. Relatively impervious soils.
- ☐ 3. Steep slopes in the adjacent areas.

2. Surface and Ground Water Protection

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Constricted or no outlets.
- ☐ Low water velocity through dense, persistent vegetation.
- ☐ Hydroperiod permanently flooded or saturated.
- ☐ Wetlands in depositional environments with persistent vegetation wider than 20 feet.
- ☐ Wetlands with persistent vegetation comprising a defined delta, island, bar or peninsula.
- ☐ Presence of seeps or springs.
- ☐ Wetland contains a high amount of microtopography that helps slow and filter surface water.
- ☐ Position in the landscape indicates the wetland is a headwaters area.
- ☐ Wetland is adjacent to surface waters.
- ☐ Wetland recharges a drinking water source.
- ☐ Water sampling indicates removal of pollutants or nutrients.
- ☐ Water sampling indicates retention of sediments or organic matter.
- ☐ Fine mineral soils and alkalinity not low.
- ☐ The wetland provides an obvious filter between surface water or ground water and land uses that may contribute point or nonpoint sources of sediments, toxic substances or nutrients to the wetland, such as: steep erodible slopes; row crops; dumps; areas of pesticide, herbicide or fertilizer application; feed lots; parking lots or heavily traveled road; and septic systems.

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

- ☐ Presence of dead forest or shrub areas in sufficient amounts to result in diminished

nutrient uptake.

- ☐ Presence of ditches or channels that confine water and restrict contact of water with vegetation.
- ☐ Wetland is very small in size, not contiguous to a stream, and not part of a collection of small wetlands in the landscape that provide this function cumulatively.
- ☐ Current use in the wetland results in disturbance that compromises this function.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☐ The wetland is adjacent to a well head or source protection area, and provides ground water recharge.
- ☐ The wetland provides flows to Class A surface waters.
- ☐ The wetland contributes to the protection or improvement of water quality of any impaired waters.
- ☐ The wetland is large in size and naturally vegetated.

3. Fish Habitat

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Contains woody vegetation that overhangs the banks of a stream or river and provides any of the following: shading that controls summer water temperature; cover including refuges created by overhanging branches or undercut banks; source of terrestrial insects as fish food; or streambank stability.
- ☐ Provides spawning, nursery, feeding or cover habitat for fish (documented or professionally judged). Common habitat includes deep marsh and shallow marsh associates with lakes and streams, and seasonally flooded wetlands associated with streams and rivers.
- ☐ Documented or professionally judged spawning habitat for northern pike.
- ☐ Provides cold spring discharge that lowers the temperature of receiving waters and creates summer habitat for salmonoid species.
- ☐ The wetland is located along a tributary that does not support fish, but contributes to a larger body of water that does support fish. The tributary supports downstream fish by providing cooler water, and food sources.

4. Wildlife Habitat

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Provides resting, feeding staging or roosting habitat to support waterfowl migration, and feeding habitat for wading birds. Good habitats for these species include open water wetlands.
- ☐ Habitat to support one or more breeding pairs or broods of waterfowl including all species of ducks, geese, and swans. Good habitats for these species include open water habitats adjacent shallow marsh, deep marsh, shrub wetland, forested wetland, or naturally vegetated buffer zone.
- ☐ Provides a nest site, a buffer for a nest site or feeding habitat for wading birds including but not limited to: great blue heron, black-crowned night heron, green-backed heron, cattle egret, or snowy egret. Good habitats for these species include open water or deep marsh adjacent to forested wetlands, or standing dead trees.
- ☐ Supports or has the habitat to support one or more breeding pairs of any migratory bird that requires wetland habitat for breeding, nesting, rearing of young, feeding, staging roosting, or migration, including: Virginia rail, common snipe, marsh wren, American bittern, northern water thrush, northern harrier, spruce grouse, Cerulean warbler, and common loon.
- ☐ Supports winter habitat for white-tailed deer. Good habitats for these species include softwood swamps. Evidence of use includes deer browsing, bark stripping, worn trails, or pellet piles.
- ☐ Provides important feeding habitat for black bear, bobcat, or moose based on an assessment of use. Good habitat for these types of species includes wetlands located in a forested mosaic.
- ☐ Has the habitat to support muskrat, otter or mink. Good habitats for these species include deep marshes, wetlands adjacent to bodies of water including lakes, ponds, rivers and streams.
- ☐ Supports an active beaver dam, one or more lodges, or evidence of use in two or more consecutive years by an adult beaver population.
- ☐ Provides the following habitats that support the reproduction of Uncommon Vermont amphibian species including:
  - ☐ 1. Wood Frog, Jefferson Salamander, Blue-spotted Salamander, or Spotted Salamander. Breeding habitat for these species includes vernal pools and small ponds.
  - ☐ 2. Northern Dusky Salamander and the Spring Salamander. Habitat for these species includes headwater seeps, springs, and streams.
  - ☐ 3. The Four-toed salamander; Fowler's Toad; Western or Boreal Chorus frog, or other amphibians found in Vermont of similar significance.

☐ Supports or has the habitat to support significant populations of Vermont amphibian species including, but not limited to Pickerel Frog, Northern Leopard Frog, Mink Frog, and others found in Vermont of similar significance. Good habitat for these types of species includes large marsh systems with open water components.

☐ Supports or has the habitat to support populations of uncommon Vermont reptile species including: Wood Turtle, Northern Map Turtle, Eastern Musk Turtle, Spotted Turtle, Spiny Softshell, Eastern Ribbonsnake, Northern Watersnake, and others found in Vermont of similar significance.

☐ Supports or has the habitat to support significant populations of Vermont reptile species, including Smooth Greensnake, DeKay's Brownsnake, or other more common wetland-associated species.

☐ Meets four or more of the following conditions indicative of wildlife habitat diversity:

- ☐ 1. Three or more wetland vegetation classes (greater than 1/2 acre) present including but not limited to: open water contiguous to, but not necessarily part of, the wetland, deep marsh, shallow marsh, shrub swamp, forested swamp, fen, or bog;
- ☐ 2. The dominant vegetation class is one of the following types: deep marsh, shallow marsh, shrub swamp or, forested swamp;
- ☐ 3. Located adjacent to a lake, pond, river or stream;
- ☐ 4. Fifty percent or more of surrounding habitat type is one or more of the following: forest, agricultural land, old field or open land;
- ☐ 5. Emergent or woody vegetation occupies 26 to 75 percent of wetland, the rest is open water;
- ☐ 6. One of the following:
  - ☐ i. hydrologically connected to other wetlands of different dominant classes or open water within 1 mile;
  - ☐ ii. hydrologically connected to other wetlands of same dominant class within 1/2 mile;
  - ☐ iii. within 1/4 mile of other wetlands of different dominant classes or open water, but not hydrologically connected;

☐ Wetland or wetland complex is owned in whole or in part by state or federal government and managed for wildlife and habitat conservation; and

☐ Contains evidence that it is used by wetland dependent wildlife species.

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

☐ The wetland is small in size for its type and does not represent fugitive habitat in

developed areas (vernal pools and seeps are generally small in size, so this does not apply).

- ☐ The surrounding land use is densely developed enough to limit use by wildlife species (with the exception of wetlands with open water habitat). Can be negated by evidence of use.
- ☐ The current use in the wetland results in frequent cutting, mowing or other disturbance.
- ☐ The wetland hydrology and character is at a drier end of the scale and does not support wetland dependent species.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☐ The wetland complex is large in size and high in quality.
- ☐ The habitat has the potential to support several species based on the assessment above.
- ☐ Wetland is associated with an important wildlife corridor.
- ☐ The wetland has been identified by ANR-F&W as important habitat.

5. Exemplary Wetland Natural Community

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Wetlands that are identified as high quality examples of Vermont's natural community types recognized by the Natural Heritage Information Project of the Vermont Fish and Wildlife Department, including rare types such as dwarf shrub bogs, rich fens, alpine peatlands, red maple-black gum swamps and the more common types including deep bulrush marshes, cattail marshes, northern white cedar swamps, spruce-fir-tamarack swamps, and red maple-black ash seepage swamps are automatically significant for this function.

The wetland is also likely to be significant if any of the following conditions are met:

- ☐ Is an example of a wetland natural community type that has been identified and mapped by, or meets the ranking and mapping standards of, the Natural Heritage Information Project of the Vermont Fish and Wildlife Department.
- ☐ Contains ecological features that contribute to Vermont's natural heritage, including, but not limited to:
  - ☐ Deep peat accumulation reflecting a long history of wetland formation;
  - ☐ Forested wetlands displaying very old trees and other old growth characteristics;
  - ☐ A wetland natural community that is at the edge of the normal range for that type;

- ☐ A wetland mosaic containing examples of several to many wetland community types; or
- ☐ A large wetland complex with examples of several wetland community types.

6. Rare, Threatened, and Endangered Species Habitat

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Wetlands that contain one or more species on the federal or state threatened or endangered lists, as well as species that are rare in Vermont, are automatically significant for this function.

The wetland is also likely to be significant if any of the following apply:

- ☐ There is creditable documentation that the wetland provides important habitat for any species on the federal or state threatened or endangered species lists;
- ☐ There is creditable documentation that threatened or endangered species have been present in past 10 years;
- ☐ There is creditable documentation that the wetland provides important habitat for any species listed as rare in Vermont (S1 or S2 ranks), state historic (SH rank), or rare to uncommon globally (G1, G2, or G3 ranks) by the Natural Heritage Information Project of the Vermont Fish and Wildlife Department;
- ☐ There is creditable documentation that the wetland provides habitat for multiple uncommon species of plants or animals (S3 rank).

List name of species and ranking:

7. Education and Research in Natural Sciences

☐ Function is present and likely to be significant: Any of the following characteristics indicate the wetland provides this function.

- ☐ Owned by or leased to a public entity dedicated to education or research.
- ☐ History of use for education or research.
- ☐ Has one or more characteristics making it valuable for education or research.

8. Recreational Value and Economic Benefits

☐ Function is present and likely to be significant: Any of the following characteristics indicate the wetland provides this function.

- ☐ Used for, or contributes to, recreational activities.
- ☐ Provides economic benefits.
- ☐ Provides important habitat for fish or wildlife which can be fished, hunted or trapped under applicable state law.
- ☐ Used for harvesting of wild foods.

Comments:

9. Open Space and Aesthetics

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Can be readily observed by the public; and
  - ☐ Possesses special or unique aesthetic qualities; or
  - ☐ Has prominence as a distinct feature in the surrounding landscape;
- ☐ Has been identified as important open space in a municipal, regional or state plan.

10. Erosion Control through Binding and Stabilizing the Soil

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Erosive forces such as wave or current energy are present and any of the following are present as well:
  - ☐ Dense, persistent vegetation along a shoreline or stream bank that reduces an adjacent erosive force.
  - ☐ Good interspersion of persistent emergent vegetation and water along course of water flow.
  - ☐ Studies show that wetlands of similar size, vegetation type, and hydrology are important for erosion control.

What type of erosive forces are present?

- ☐ Lake fetch and waves
- ☐ High current velocities
- ☐ Water level influenced by upstream impoundment

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

- ☐ The stream is artificially channelized and/or lacks vegetation that contributes to controlling the erosive force.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☐ The stream contains high sinuosity.
- ☐ Has been identified through fluvial geomorphic assessment to be important in maintaining the natural condition of the stream or river corridor.

VERMONT WETLAND EVALUATION FORM

Wetland ID#: BR25-W2 Project #: 195601752 - VTrans SW STP

Date: 2022-07-19 Investigator: Stantec (Fenner)

SUMMARY OF FUNCTIONAL EVALUATION:
Each function gets a score of 0= not present; L = Low; P = Present; or H = High.

1. Water Storage for Flood Water and Storm Runoff	P	**6. Rare, Threatened, and Endangered Species Habitat**	0
2. Surface & Ground Water Protection	P	**7. Education and Research in Natural Sciences**	0
3. Fish Habitat	0	**8. Recreational Value and Economic Benefits**	0
4. Wildlife Habitat	L	**9. Open Space and Aesthetics**	0
5. Exemplary Wetland Natural Community	0	**10. Erosion Control through Binding and Stabilizing the Soil**	L

Note:

- ***When to use this form:*** This is a field form to help you compile data needed to evaluate the 10 possible functions and values of a wetland as described in the Vermont Wetland Rules. All information in this form is replicated in the applications for both wetland determinations and wetland permits.
- ***Both a desktop review and field examination*** should be employed to accurately determine surrounding land use, hydrology, hydroperiod, vegetation, position in the landscape, and physical attributes.
- ***The entire wetland or wetland complex*** in question must be evaluated to determine the level of function in all ten (10) categories for accurate classification. A wetland complex can be defined as a series of interconnected wetland types.
- ***The surrounding upland and outflow area*** of the wetland should be examined to determine land use, development, nearby natural resources, and hydrology. The surrounding land use, previous development, and cumulative impacts may play a role in the current function of the wetland. For best results please read all descriptions prior to scoring activity.
- ***Evaluation***: The first portion in each section determines whether the wetland does or does not provide the function. If none of the conditions listed in the first section are met, proceed

to the next section. If any of these conditions are met, determine if the wetland provides this function at a higher or lower level based on the information listed in the subsequent sections.

- ***Presumptions:*** Please note that many wetlands are already presumed to be significant under the Vermont Wetland Rules. A wetland is presumed to be significant if:
    - The wetland is mapped on the VSWI map
    - The wetland is contiguous to a VSWI mapped wetland
    - The wetland meets the presumptions of significance under Section 4.6
    - The wetland has a preliminary determination that it is Class II

1. Water Storage for Flood Water and Storm Runoff

☒ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Constricted outlet or no outlet and an unconstricted inlet.
- ☒ Physical space for floodwater expansion and dense, persistent, emergent vegetation or dense woody vegetation that slows down flood waters or stormwater runoff during peak flows and facilitates water removal by evaporation and transpiration.
- ☐ If a stream is present, its course is sinuous and there is sufficient woody vegetation to intercept surface flows in the portion of the wetland that floods.
- ☐ Physical evidence of seasonal flooding or ponding such as water stained leaves, water marks on trees, drift rows, debris deposits, or standing water.
- ☐ Hydrologic or hydraulic study indicates wetland attenuates flooding.

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level:

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

- ☐ Significant flood storage capacity upstream of the wetland, and the wetland in question provides this function at a negligible level in comparison to upstream storage (unless the upstream storage is temporary such as a beaver impoundment).
- ☐ Wetland is contiguous to a major lake or pond that provides storage benefits independently of the wetland.
- ☐ Wetland's storage capacity is created primarily by recent beaver dams or other temporary structures.
- ☐ Wetland is very small in size, not contiguous to a stream, and not part of a collection of small wetlands in the landscape that provide this function cumulatively.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☐ History of downstream flood damage to public or private property.
- ☐ Any of the following conditions present downstream of the wetland, but upstream of a major lake or pond, could be impacted by a loss or reduction of the water storage function.
  - ☐ 1. Developed public or private property.
  - ☐ 2. Stream banks susceptible to scouring and erosion.
  - ☐ 3. Important habitat for aquatic life.
- ☐ The wetland is large in size and naturally vegetated.

☐ Any of the following conditions present upstream of the wetland may indicate a large volume of runoff may reach the wetland.

- ☐ 1. A large amount of impervious surface in urbanized areas.
- ☐ 2. Relatively impervious soils.
- ☐ 3. Steep slopes in the adjacent areas.

2. Surface and Ground Water Protection

■ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ■ Constricted or no outlets.
- ■ Low water velocity through dense, persistent vegetation.
- ☐ Hydroperiod permanently flooded or saturated.
- ☐ Wetlands in depositional environments with persistent vegetation wider than 20 feet.
- ☐ Wetlands with persistent vegetation comprising a defined delta, island, bar or peninsula.
- ■ Presence of seeps or springs.
- ☐ Wetland contains a high amount of microtopography that helps slow and filter surface water.
- ☐ Position in the landscape indicates the wetland is a headwaters area.
- ☐ Wetland is adjacent to surface waters.
- ☐ Wetland recharges a drinking water source.
- ☐ Water sampling indicates removal of pollutants or nutrients.
- ☐ Water sampling indicates retention of sediments or organic matter.
- ☐ Fine mineral soils and alkalinity not low.
- ■ The wetland provides an obvious filter between surface water or ground water and land uses that may contribute point or nonpoint sources of sediments, toxic substances or nutrients to the wetland, such as: steep erodible slopes; row crops; dumps; areas of pesticide, herbicide or fertilizer application; feed lots; parking lots or heavily traveled road; and septic systems.

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

- ☐ Presence of dead forest or shrub areas in sufficient amounts to result in diminished

nutrient uptake.

- ☐ Presence of ditches or channels that confine water and restrict contact of water with vegetation.
- ☐ Wetland is very small in size, not contiguous to a stream, and not part of a collection of small wetlands in the landscape that provide this function cumulatively.
- ☐ Current use in the wetland results in disturbance that compromises this function.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☐ The wetland is adjacent to a well head or source protection area, and provides ground water recharge.
- ☐ The wetland provides flows to Class A surface waters.
- ☐ The wetland contributes to the protection or improvement of water quality of any impaired waters.
- ☐ The wetland is large in size and naturally vegetated.

3. Fish Habitat

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Contains woody vegetation that overhangs the banks of a stream or river and provides any of the following: shading that controls summer water temperature; cover including refuges created by overhanging branches or undercut banks; source of terrestrial insects as fish food; or streambank stability.
- ☐ Provides spawning, nursery, feeding or cover habitat for fish (documented or professionally judged). Common habitat includes deep marsh and shallow marsh associates with lakes and streams, and seasonally flooded wetlands associated with streams and rivers.
- ☐ Documented or professionally judged spawning habitat for northern pike.
- ☐ Provides cold spring discharge that lowers the temperature of receiving waters and creates summer habitat for salmonoid species.
- ☐ The wetland is located along a tributary that does not support fish, but contributes to a larger body of water that does support fish. The tributary supports downstream fish by providing cooler water, and food sources.

4. Wildlife Habitat

☒ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Provides resting, feeding staging or roosting habitat to support waterfowl migration, and feeding habitat for wading birds. Good habitats for these species include open water wetlands.
- ☐ Habitat to support one or more breeding pairs or broods of waterfowl including all species of ducks, geese, and swans. Good habitats for these species include open water habitats adjacent shallow marsh, deep marsh, shrub wetland, forested wetland, or naturally vegetated buffer zone.
- ☐ Provides a nest site, a buffer for a nest site or feeding habitat for wading birds including but not limited to: great blue heron, black-crowned night heron, green-backed heron, cattle egret, or snowy egret. Good habitats for these species include open water or deep marsh adjacent to forested wetlands, or standing dead trees.
- ☐ Supports or has the habitat to support one or more breeding pairs of any migratory bird that requires wetland habitat for breeding, nesting, rearing of young, feeding, staging roosting, or migration, including: Virginia rail, common snipe, marsh wren, American bittern, northern water thrush, northern harrier, spruce grouse, Cerulean warbler, and common loon.
- ☐ Supports winter habitat for white-tailed deer. Good habitats for these species include softwood swamps. Evidence of use includes deer browsing, bark stripping, worn trails, or pellet piles.
- ☐ Provides important feeding habitat for black bear, bobcat, or moose based on an assessment of use. Good habitat for these types of species includes wetlands located in a forested mosaic.
- ☐ Has the habitat to support muskrat, otter or mink. Good habitats for these species include deep marshes, wetlands adjacent to bodies of water including lakes, ponds, rivers and streams.
- ☐ Supports an active beaver dam, one or more lodges, or evidence of use in two or more consecutive years by an adult beaver population.
- ☐ Provides the following habitats that support the reproduction of Uncommon Vermont amphibian species including:
  - ☐ 1. Wood Frog, Jefferson Salamander, Blue-spotted Salamander, or Spotted Salamander. Breeding habitat for these species includes vernal pools and small ponds.
  - ☐ 2. Northern Dusky Salamander and the Spring Salamander. Habitat for these species includes headwater seeps, springs, and streams.
  - ☐ 3. The Four-toed salamander; Fowler's Toad; Western or Boreal Chorus frog, or other amphibians found in Vermont of similar significance.

☐ Supports or has the habitat to support significant populations of Vermont amphibian species including, but not limited to Pickerel Frog, Northern Leopard Frog, Mink Frog, and others found in Vermont of similar significance. Good habitat for these types of species includes large marsh systems with open water components.

☒ Supports or has the habitat to support populations of uncommon Vermont reptile species including: Wood Turtle, Northern Map Turtle, Eastern Musk Turtle, Spotted Turtle, Spiny Softshell, Eastern Ribbonsnake, Northern Watersnake, and others found in Vermont of similar significance.

☐ Supports or has the habitat to support significant populations of Vermont reptile species, including Smooth Greensnake, DeKay's Brownsnake, or other more common wetland-associated species.

☐ Meets four or more of the following conditions indicative of wildlife habitat diversity:

- ☐ 1. Three or more wetland vegetation classes (greater than 1/2 acre) present including but not limited to: open water contiguous to, but not necessarily part of, the wetland, deep marsh, shallow marsh, shrub swamp, forested swamp, fen, or bog;
- ☐ 2. The dominant vegetation class is one of the following types: deep marsh, shallow marsh, shrub swamp or, forested swamp;
- ☒ 3. Located adjacent to a lake, pond, river or stream;
- ☒ 4. Fifty percent or more of surrounding habitat type is one or more of the following: forest, agricultural land, old field or open land;
- ☐ 5. Emergent or woody vegetation occupies 26 to 75 percent of wetland, the rest is open water;
- ☒ 6. One of the following:
  - ☐ i. hydrologically connected to other wetlands of different dominant classes or open water within 1 mile;
  - ☒ ii. hydrologically connected to other wetlands of same dominant class within 1/2 mile;
  - ☐ iii. within 1/4 mile of other wetlands of different dominant classes or open water, but not hydrologically connected;

☐ Wetland or wetland complex is owned in whole or in part by state or federal government and managed for wildlife and habitat conservation; and

☐ Contains evidence that it is used by wetland dependent wildlife species.

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level.

☒ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

☒ The wetland is small in size for its type and does not represent fugitive habitat in

developed areas (vernal pools and seeps are generally small in size, so this does not apply).

- [x] The surrounding land use is densely developed enough to limit use by wildlife species (with the exception of wetlands with open water habitat). Can be negated by evidence of use.
- [ ] The current use in the wetland results in frequent cutting, mowing or other disturbance.
- [ ] The wetland hydrology and character is at a drier end of the scale and does not support wetland dependent species.

- [ ] Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.
  - [ ] The wetland complex is large in size and high in quality.
  - [ ] The habitat has the potential to support several species based on the assessment above.
  - [ ] Wetland is associated with an important wildlife corridor.
  - [ ] The wetland has been identified by ANR-F&W as important habitat.

5. Exemplary Wetland Natural Community

- [ ] Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.
  - [ ] Wetlands that are identified as high quality examples of Vermont's natural community types recognized by the Natural Heritage Information Project of the Vermont Fish and Wildlife Department, including rare types such as dwarf shrub bogs, rich fens, alpine peatlands, red maple-black gum swamps and the more common types including deep bulrush marshes, cattail marshes, northern white cedar swamps, spruce-fir-tamarack swamps, and red maple-black ash seepage swamps are automatically significant for this function.

  The wetland is also likely to be significant if any of the following conditions are met:

  - [ ] Is an example of a wetland natural community type that has been identified and mapped by, or meets the ranking and mapping standards of, the Natural Heritage Information Project of the Vermont Fish and Wildlife Department.
  - [ ] Contains ecological features that contribute to Vermont's natural heritage, including, but not limited to:
    - [ ] Deep peat accumulation reflecting a long history of wetland formation;
    - [ ] Forested wetlands displaying very old trees and other old growth characteristics;
    - [ ] A wetland natural community that is at the edge of the normal range for that type;

- ☐ A wetland mosaic containing examples of several to many wetland community types; or
- ☐ A large wetland complex with examples of several wetland community types.

6. Rare, Threatened, and Endangered Species Habitat

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Wetlands that contain one or more species on the federal or state threatened or endangered lists, as well as species that are rare in Vermont, are automatically significant for this function.

The wetland is also likely to be significant if any of the following apply:

- ☐ There is creditable documentation that the wetland provides important habitat for any species on the federal or state threatened or endangered species lists;
- ☐ There is creditable documentation that threatened or endangered species have been present in past 10 years;
- ☐ There is creditable documentation that the wetland provides important habitat for any species listed as rare in Vermont (S1 or S2 ranks), state historic (SH rank), or rare to uncommon globally (G1, G2, or G3 ranks) by the Natural Heritage Information Project of the Vermont Fish and Wildlife Department;
- ☐ There is creditable documentation that the wetland provides habitat for multiple uncommon species of plants or animals (S3 rank).

List name of species and ranking:

7. Education and Research in Natural Sciences

☐ Function is present and likely to be significant: Any of the following characteristics indicate the wetland provides this function.

- ☐ Owned by or leased to a public entity dedicated to education or research.
- ☐ History of use for education or research.
- ☐ Has one or more characteristics making it valuable for education or research.

8. Recreational Value and Economic Benefits

☐ Function is present and likely to be significant: Any of the following characteristics indicate the wetland provides this function.

- ☐ Used for, or contributes to, recreational activities.
- ☐ Provides economic benefits.
- ☐ Provides important habitat for fish or wildlife which can be fished, hunted or trapped under applicable state law.
- ☐ Used for harvesting of wild foods.

Comments:

9. Open Space and Aesthetics

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Can be readily observed by the public; and
  - ☐ Possesses special or unique aesthetic qualities; or
  - ☐ Has prominence as a distinct feature in the surrounding landscape;
- ☐ Has been identified as important open space in a municipal, regional or state plan.

10. Erosion Control through Binding and Stabilizing the Soil

■ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ■ Erosive forces such as wave or current energy are present and any of the following are present as well:
  - ☐ Dense, persistent vegetation along a shoreline or stream bank that reduces an adjacent erosive force.
  - ☐ Good interspersion of persistent emergent vegetation and water along course of water flow.
  - ☐ Studies show that wetlands of similar size, vegetation type, and hydrology are important for erosion control.

What type of erosive forces are present?

- ☐ Lake fetch and waves
- ☒ High current velocities
- ☐ Water level influenced by upstream impoundment

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level.

☒ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

- ☒ The stream is artificially channelized and/or lacks vegetation that contributes to controlling the erosive force.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☐ The stream contains high sinuosity.
- ☐ Has been identified through fluvial geomorphic assessment to be important in maintaining the natural condition of the stream or river corridor.

Appendix D HABITAT AND AQUATIC ORGANISM PASSAGE RECORDS REVIEW SUMMARY

Appendix D, Table 1. Records Review of Habitat and Aquatic Organism Passage

Structure ID	Road	Town	County	Rare, Threatened, Endangered (RTE) Species[1]	Bankfull Width : Span Ratio	Habitat Connectivity	Aquatic Organism Passage
					Data source: BR 14 and BR 36 from VT Culvert Inventory[2] BR 9, BR 19, BR 25, BR 28, BR 58A, and BR 61 from Hot 200 Culvert Study[3] (VT Culvert inventory data used when data not available from Hot 200)		
BR 9	Vermont Route 4A	Castleton	Rutland	No EO records of RTE species at crossing location;	1.67	Little or no need for extra provisions for wildlife passage	Natural barrier within 100’ of crossing
BR 14	Vermont Route 4A	Ira	Rutland	No EO records of RTE species at crossing location;	No data available (structure not in Hot 200)	No specific comments on habitat connectivity; multiple assessments between 2012 and 2022 note the poor structural condition of the bridge structure	
BR 19	US Route 7	Sunderland	Bennington	No EO records of RTE species at crossing location;	1.5	Top priority for wildlife passage	Prime fish habitat
BR 25	Vermont Route 11	Londonderry	Bennington	No EO records of RTE species at crossing location;	0.18	Moderate need for wildlife passage	Natural barrier within 100’ of crossing
BR 28	US Route 4	Killington	Rutland	No EO records of RTE species at crossing location;	2.18	Top priority for wildlife passage	Prime fish habitat
BR 36	US Route 4	Bridgewater	Rutland	No EO records of RTE species at crossing location;	No data available (structure not in Hot 200)	No specific comments on habitat connectivity; comments from inspections conducted between 2015 and 2020 note poor condition of culvert, placement of riprap at inlet and outlet, rust scale and staining of culvert meta, and perforations throughout invert. Based on these notes, it can be assumed that habitat conditions in the crossing structure are diminished	
BR 58A	Vermont Route 30	Dorset	Bennington	No EO records of RTE species at crossing location;	No data available (BFW not measurable based on field conditions)	Little or no need for extra provisions for wildlife passage	Natural barrier within 100’ of crossing
BR 61	Vermont Route 30	Rupert	Bennington	No EO records of RTE species at crossing location;	2.17	Little or no need for extra provisions for wildlife passage	Low slope, no outlet drop, hydraulically adequate

[1]Vermont Natural Heritage Inventory: Vermont Agency of Natural Resources, Natural Resources Atlas; https://anrmaps.vermont.gov/websites/anra5/
[2] Hot 200 Culvert Study: Stantec, 2017 (project 195311430 under contract for VTrans)
[3] Vermont Culvert Inventory: Vermont association of Planning & Development Agencies, VTrans; accessible online at https://www.vtculverts.org/

Appendix H: Archeology Memo - Pending

Appendix I: Historic Memo

Kyle Obenauer
Senior Architectural Historian

Vermont Agency of Transportation

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Historic Preservation Resource Identification Memo

To: Julie Ann Held, VTrans Environmental Specialist
Cc: Brennan Gauthier, VTrans Señor Archaeologist

Date: 08/11/2022

Subject: Statewide Southwest STP CULV(91)

Julie Ann,

This resource identification included surveying broad, general areas that could potentially be affected by culvert or small bridge replacement projects at the locations below. Several structures have National Register-eligible properties within a likely project Area of Potential Effect (APE). **Historically significant properties identified have been mapped in Esri FieldMaps.** Once a specific scope and design is developed at each location, further potential impacts and avoidance measures can be identified within a defined project APE to satisfy requirements under Section 106, Section 4(f), and NEPA.

Bridgewater: Br. 36, US Route 4

- No historic properties identified within a likely project APE.
- Although over 50 years of age, Bridge 36 is a common example of its type and does not possess the historic significance necessary for inclusion in the National Register.
- Adjacent single-family house at 1081 US Route 4 does not retain sufficient integrity for inclusion in the National Register (*Figure 3*).

Castleton: Br. 9, VT Route 4A

- **One historic property was identified** within a likely project APE at **968 VT Route 4A** (*Figure 6*). This National Register-eligible house is listed in the Vermont State Register (1103-21; 1980) and likely would not be affected by a future project at Bridge 9; however, Section 4(f) review might be necessary if easements are required from the parcel associated with the building.
- Although over 50 years of age, Bridge 9 is a common example of its type and does not possess the historic significance necessary for inclusion in the National Register.

Dorset: Br. 58A, Vermont Route 30

- A potentially **National-register eligible farmstead** was identified within a likely project **APE at 4299 and 4343 Vermont Route 30** (*Figure 9*). Further research, including better images of the farmhouse, is necessary to make a more definitive determination; however, this complex should be considered historically significant during project design. Section 4(f) review might be necessary if easements are required from the parcel associated with the farm complex.
- Although over 50 years of age, Bridge 58A is a common example of its type and does not possess the historic significance necessary for inclusion in the National Register.

Ira: Br. 14, Vermont Route 30

- No historic properties were identified within a likely project APE.
- Although over 50 years of age, Bridge 14 does not appear to possess the significance necessary for inclusion in the National Register under its type within the Vermont Bridges MPDF.

Killington: Br. 28, Us Route 4

- No historic properties were identified within a likely project APE.
- Although over 50 years of age, Bridge 28 is a common example of its type and does not possess the historic significance necessary for inclusion in the National Register.

Londonderry: Br. 25, Vermont Route 11

- A potentially **National-register eligible farmstead** was identified within a likely project **APE at 825 Vermont Route 11 (Taylor Farm) in Londonderry** (*Figure 16*). Further research, including better images of the farmhouse, is necessary to make a more definitive determination; however, this complex should be considered historically significant during project design. Section 4(f) review might be necessary if easements are required from the parcel associated with the farm complex.
- Although over 50 years of age, Bridge 25 is a common example of its type and does not possess the historic significance necessary for inclusion in the National Register.

Rupert: Br. 61, Vermont Route 30

- Two potentially **National-register eligible buildings** were identified within a likely project **APE at 209 Vermont Route 30 in Dorset and 40 Vermont Route 30 in Rupert** (*Figures 19-20*). Further research is necessary to make a more definitive determination; however, the parcels associated with these two properties should be considered historically significant during project design. Section 4(f) review might be necessary if easements are required from either parcel.
- Although over 50 years of age, Bridge 30 is a common example of its type and does not possess the historic significance necessary for inclusion in the National Register.

Sunderland: Br. 19-7, US Route 7

- Less than 50 years of age, Bridge 19-7 is a common example of its type and does not possess the Exceptional historic significance necessary for inclusion in the National Register. There are no other buildings, structures, or objects within a likely project APE.

Please, let me know if there are any questions.

Images and Illustrations

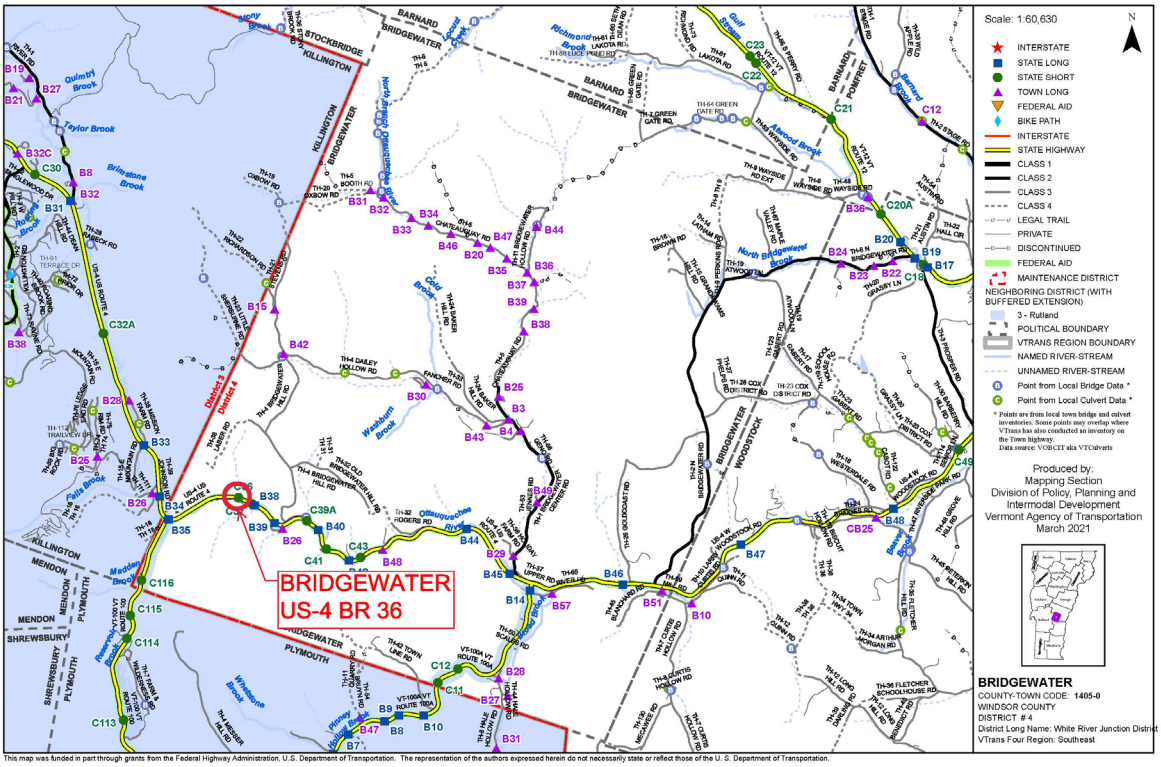


Figure 1. Bridge 36 location in Bridgewater.

Figure 2. Survey area at Bridge 36 in Bridgewater, near 1081 US Route 4.

Figure 3. Vacant, deteriorated house near Bridge 36, at 1081 US Route 4 in Bridgewater. August 2022.

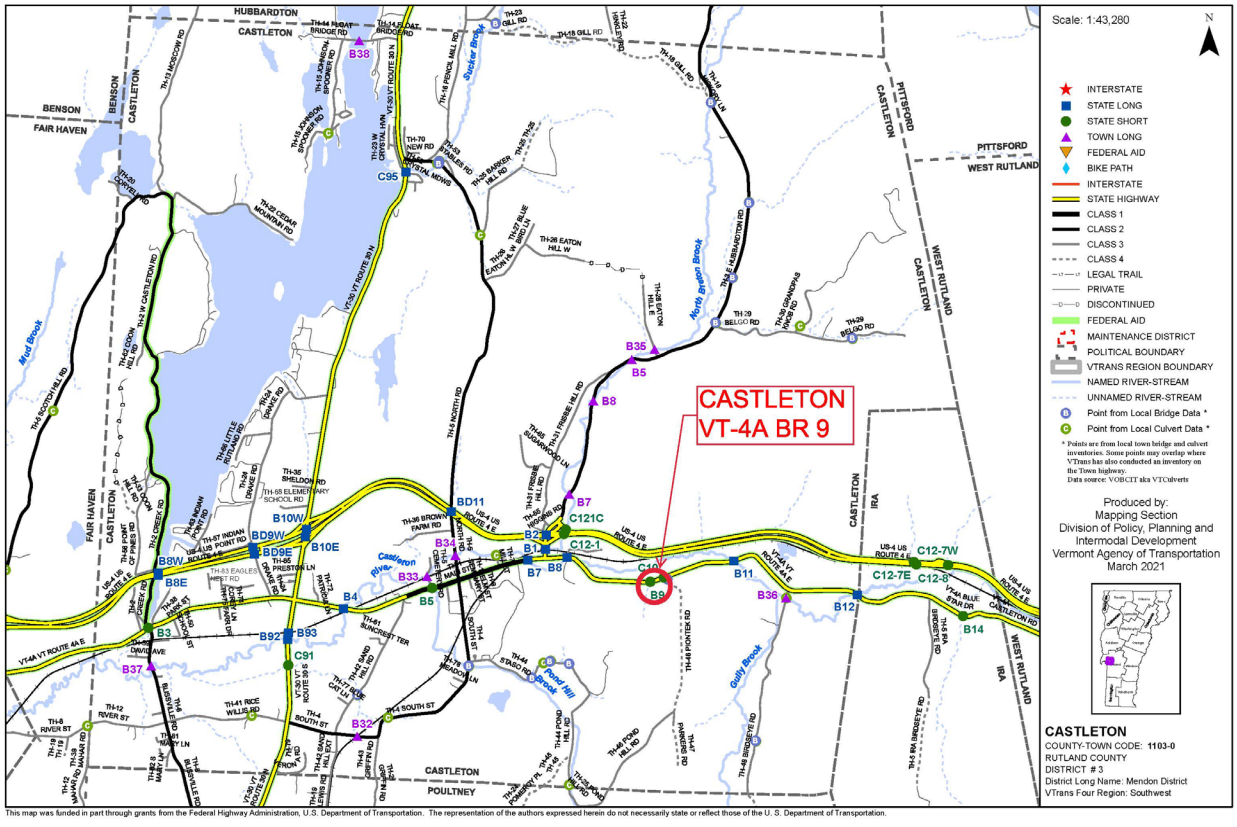


Figure 4. Bridge 9 location in Castleton.

Figure 5. Survey area at Bridge 9 in Castleton, near 968 Vermont Route 4A.

Figure 6. Vermont State Register-listed Onion House at 968 VT Route 4A in Castleton, near Bridge 9. August 2022.

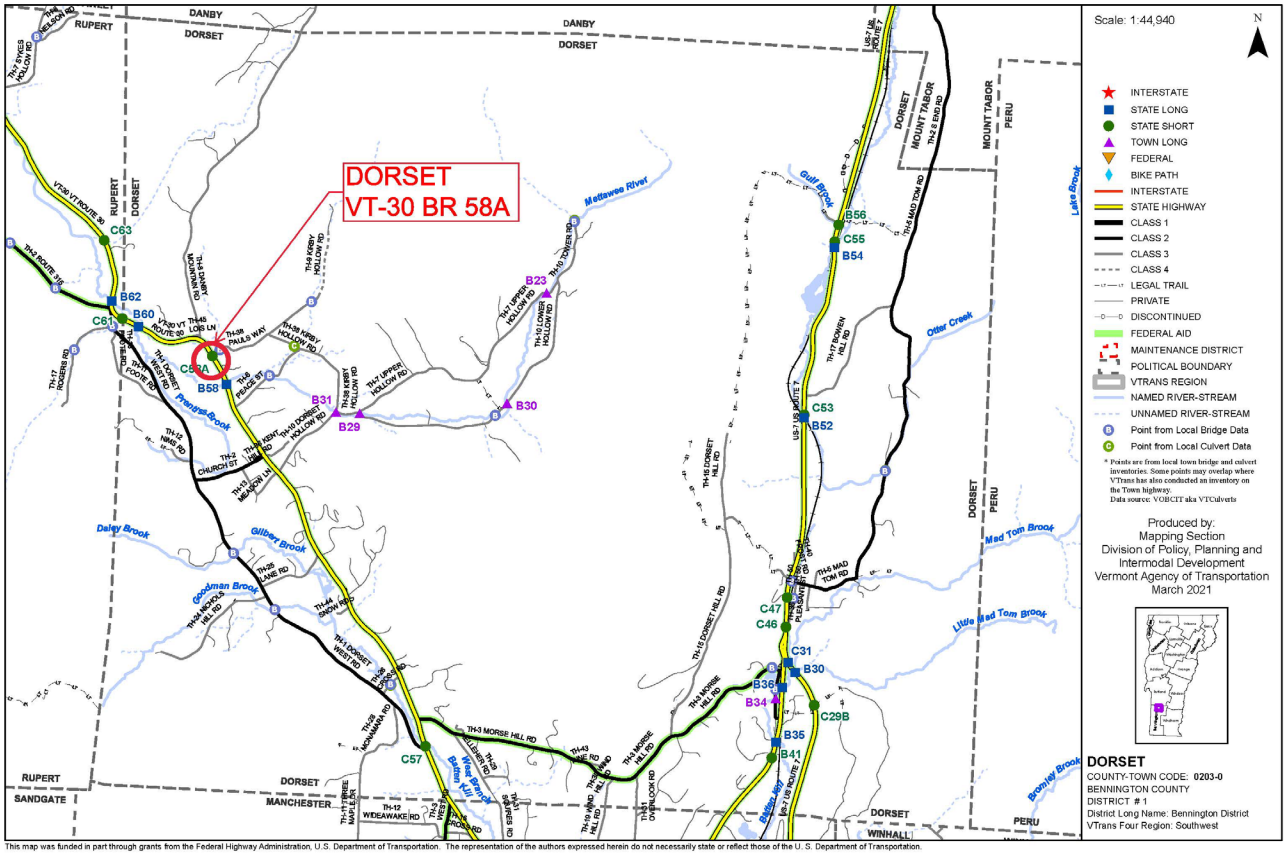


Figure 7. Bridge 58A location in Dorset.

Figure 8. Survey area at Bridge 58A in Dorset, near 4343 Vermont Route 30.

Figure 9. Potentially National Register-eligible farm complex near Br. 58A in Dorset at 4343 Vermont Route 30.

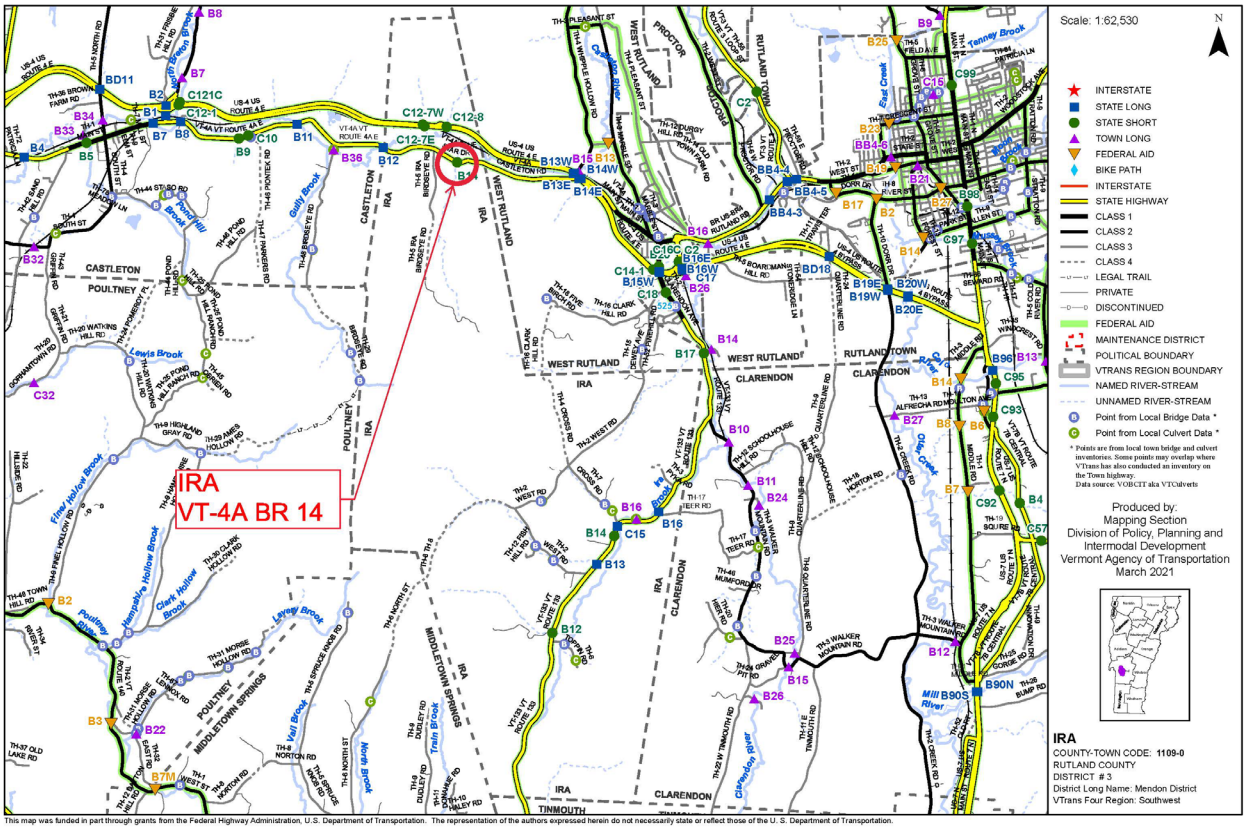


Figure 10. Bridge 14 location in Ira.

Figure 11. *Survey area at Bridge 14 in Ira on Vermont Route 30.*

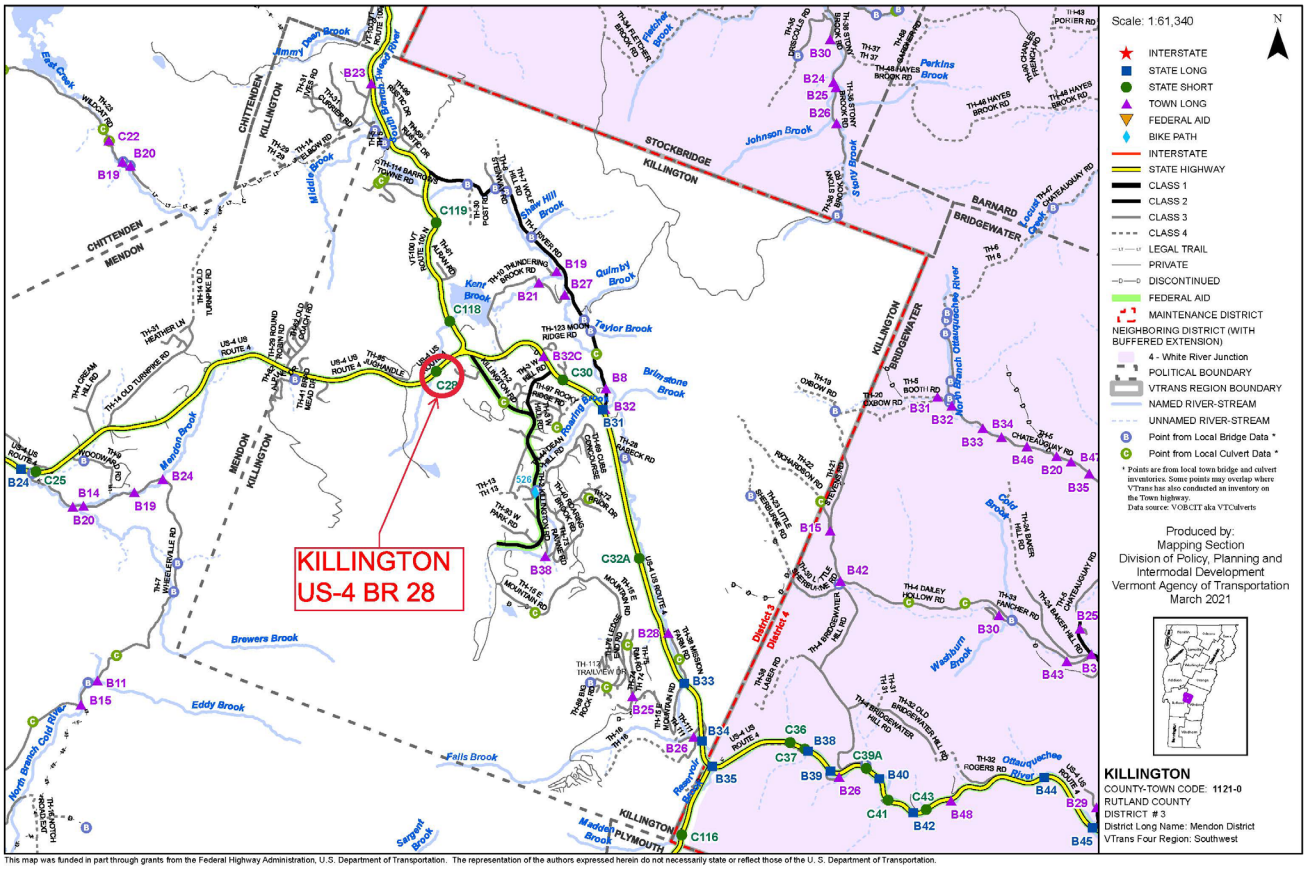


Figure 12. Bridge 28 location in Killington.

Figure 13. Survey area at Bridge 28 in Killington on US Route 4.

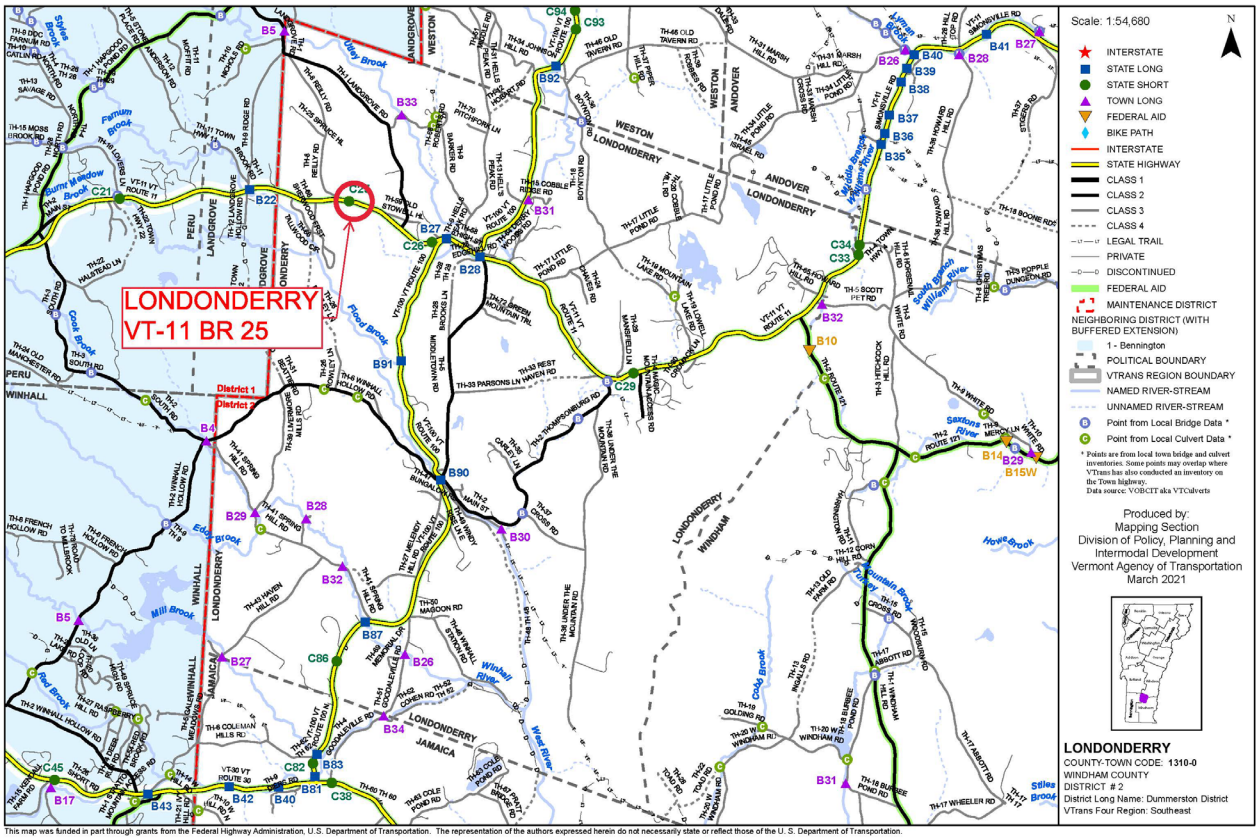


Figure 14. Bridge 25 location in Londonderry on Vermont Route 11.

Figure 15. Survey area at Bridge 25 in Londonderry on Vermont Route 11.

Figure 16. Potentially National Register-eligible farm complex at 825 Vermont Route 11 in Londonderry (Taylor Farm).

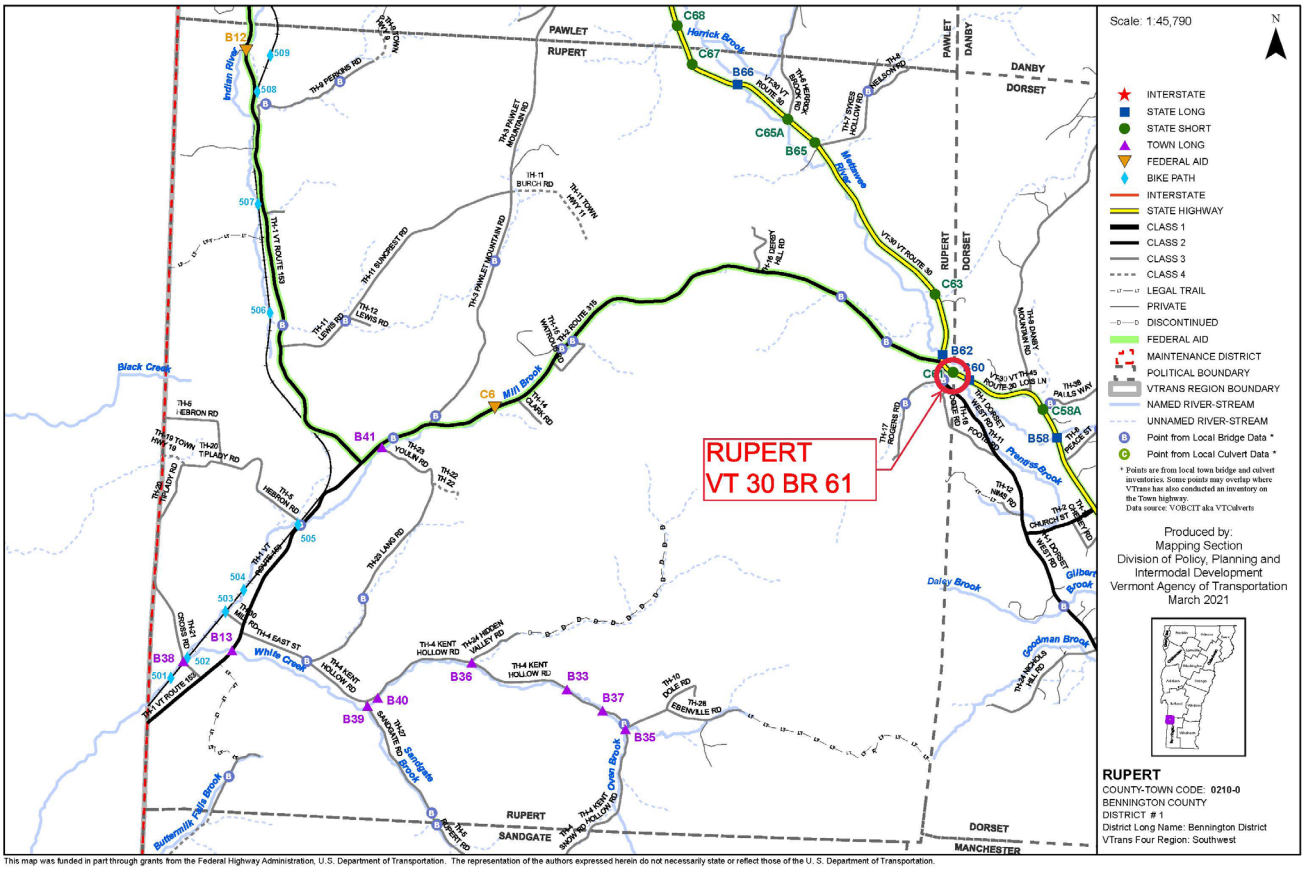


Figure 17. Bridge 61 location in Rupert on Vermont Route 30.

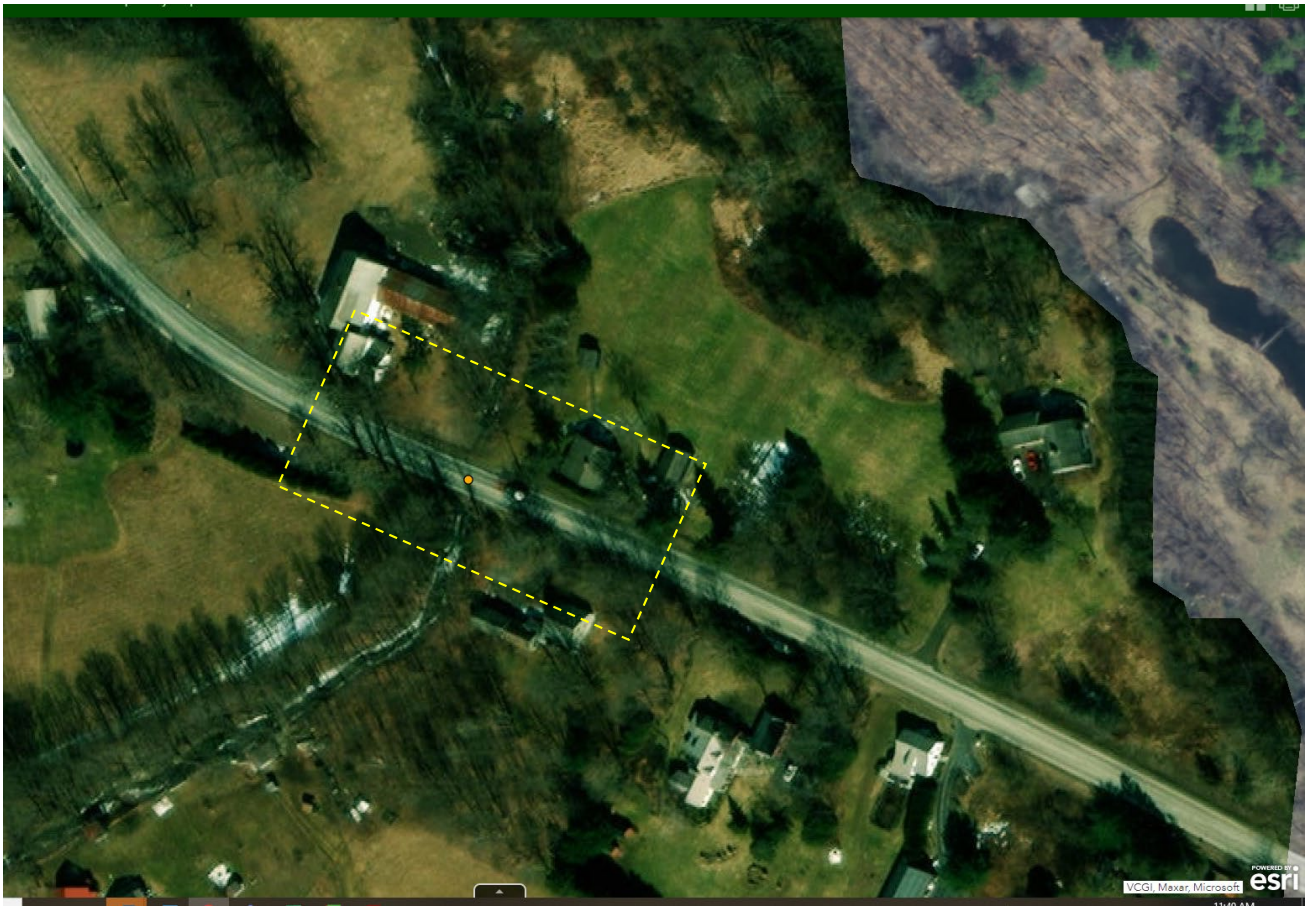


Figure 18. Survey area at Bridge 25 in Londonderry on Vermont Route 11.

Figure 19. *Potentially National Register-eligible single family house at* 209 Vermont Route 30 in Dorset.

Figure 20. Potentially National Register-eligible single-family house and associated barn at 40 Vermont Route 30 in Rupert.

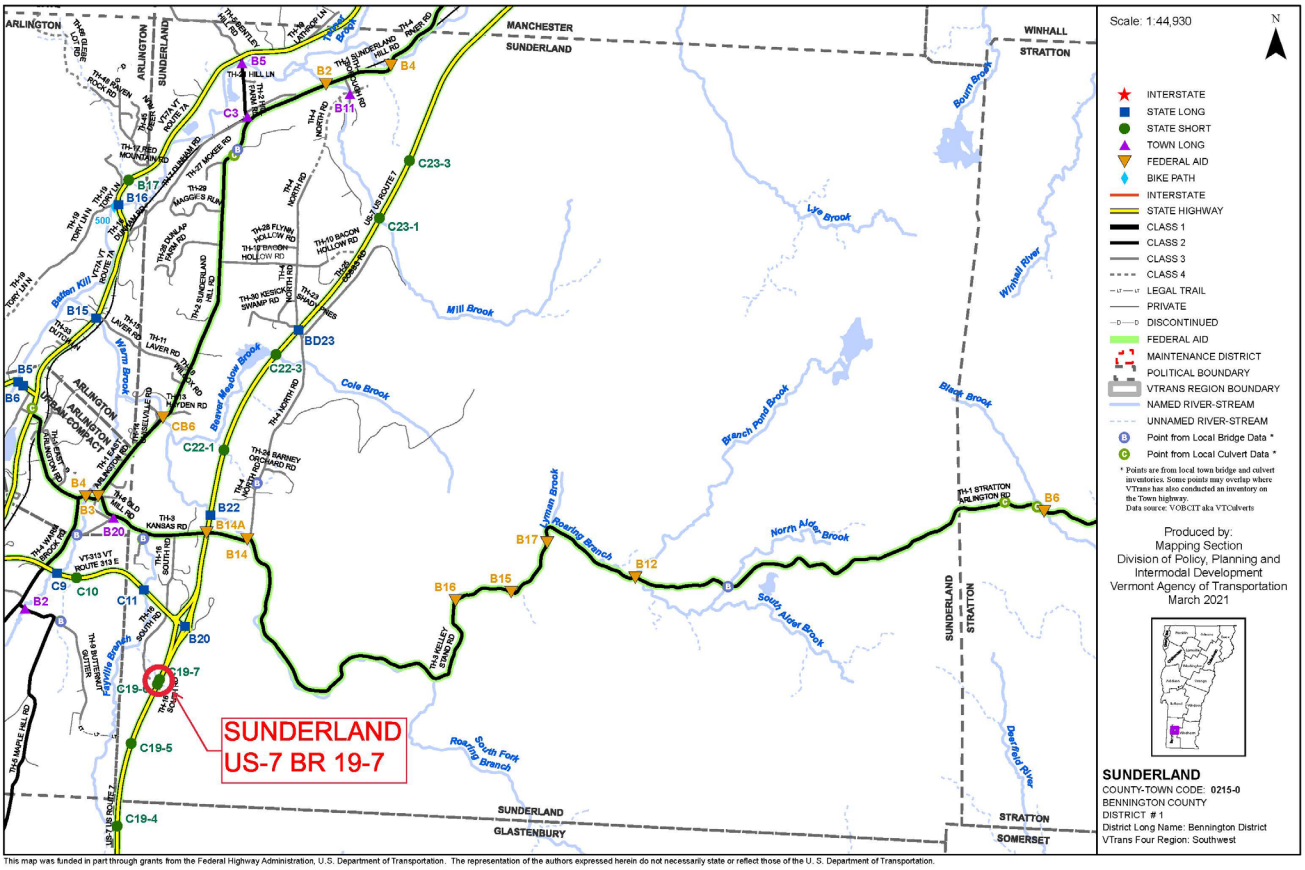


Figure 21. Bridge 19-7 location in Sunderland on US Route 7.

Figure 22. Survey area at Bridge 19-7 in Sunderland on US Route 7.

Appendix J: Local Input - *Pending*

Project Summary

This project, Sunderland STP CULV(91), focuses on Bridge 19-7 on US Route 7 in Sunderland, Vermont. The culvert is deteriorating and is in need of 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 pipe, removal of the existing pipe and replacement with a new culvert placed in the same location, or removal of the existing pipe and replacement in a new 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 culvert 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.

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

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 culvert, one-way traffic, or lane closures and provide contact information (names, address, email addresses, and phone numbers.

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?

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?

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

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 culverts, etc), including those that may be or go into other towns.

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

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

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

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

Pedestrians and Bicyclists

1. What is the current level of bicycle and pedestrian use on the culvert?

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

3. Does the community feel there is a need for a sidewalk or bike lane over the culvert?

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

5. Does the Town have plans to construct either pedestrian or bicycle facilities leading up to the culvert? Please provide any planning documents demonstrating this (scoping study, master plan, corridor study, town or regional plan).

6. 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?

Design Considerations

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

2. Are there any concerns with the width of the existing culvert?

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

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

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

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

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

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

Land Use & Zoning

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

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

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.

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.

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?

Appendix K: Operations Input

Bridge Scoping Project Sunderland STP CULV(91)
Operations Input Questionnaire

The Structures Section has begun the scoping process for Sunderland STP CULV(91), US ROUTE 7, BRIDGE 19-7 OVER UNAMED BROOK. This is a CGMPP constructed in 1979. The Structure Inspection, Inventory, and Appraisal Sheet (attached) rates the culvert as 5 (Fair). 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?

2. What are your comments on the current geometry and alignment of the road overt the culvert (curve, sag, banking, sight distance)?

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

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

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

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.

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.

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

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

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

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?

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.

13. Are there any drainage issues that we should address on this project?

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

15. Is there anything else we should be aware of?

Appendix L: Crash Data

Vermont Agency of Transportation

General Yearly Summaries - Crash Listing: State Highways and All Federal Aid Highway Systems

From 01/01/11 To 12/31/15 General Yearly Summaries Information

VT-7 Br 19-7 is located at MM. 1.1

*	Reporting Agency/ Number	Town	Mile Marker	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
Route: US-7 Continued ...													
	VTVSP0900/12C30 1984	Shaftsbury	1.25	07/10/2012	09:56	Clear	Failure to keep in proper lane, Under the influence of medication/drugs/alcohol	Other - Explain in Narrative	1	0	0		SH
	VTVSP0900/11C30 2440	Shaftsbury	1.3	10/27/2011	22:59	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0	N	SH
	VTVSP0900/15C30 2589	Shaftsbury	1.71	08/18/2015	12:21	Clear	Operating defective equipment, No improper driving	Other - Explain in Narrative	0	0	0	N	SH
	VTVSP0900/15C30 0788	Shaftsbury	2.52	03/14/2015	16:00	Rain	Inattention, Failure to keep in proper lane, No improper driving	Opp Direction Sideswipe	1	0	0	N	SH
	VTVSP0900/15C30 3216	Shaftsbury	2.65	10/11/2015	20:03				0	0	0		SH
	VTVSP0900/15C30 3813	Shaftsbury	2.79	12/07/2015	18:50	Clear	No improper driving	Single Vehicle Crash	0	0	0	S	SH
	VTVSP0900/11C30 3091	Shaftsbury	4.51	12/28/2011	06:59	Rain	Other improper action	Single Vehicle Crash	0	0	0	S	SH
	VTVSP0900/12C30 3765	Glastenbury	0.77	12/16/2012	06:27	Cloudy	Failure to keep in proper lane, Fatigued, asleep	Single Vehicle Crash	0	0	0	S	SH
	VTVSP0900/11C30 1495	Glastenbury	0.8	07/06/2011	10:00	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	S	SH
	VTVSP0900/12C30 1152	Glastenbury	0.96	04/30/2012	08:18	Clear	No improper driving, Failure to keep in proper lane	Same Direction Sideswipe	3	0	0	S	SH
	VTVSP0900/11C30 1967	Sunderland	0.29	08/27/2011	11:04	Cloudy	Fatigued, asleep, Failure to keep in proper lane	Single Vehicle Crash	1	0	0		Ramp/Spur
	VTVSP0900/15C30 1552	Sunderland	0.7	05/27/2015	16:03				0	0	0		SH
	VTVSP0900/12C30 2917	Sunderland	0.74	09/22/2012	08:03	Clear	Fatigued, asleep, Failure to keep in proper lane	Single Vehicle Crash	1	0	0	N	SH
	VTVSP0900/15C30 3472	Sunderland	1.06	11/04/2015	17:13	Clear	No improper driving	Single Vehicle Crash	0	0	0		SH
	VTVSP0900/14C30 2751	Sunderland	1.16	08/15/2014	23:46				0	0	0		SH
	VTVSP0900/15C30 3418	Sunderland	1.56	10/30/2015	09:50				0	0	0		SH
	VTVSP0900/15C30 0932	Sunderland	1.58	03/30/2015	06:05	Snow	No improper driving, Wrong side or wrong way	Opp Direction Sideswipe	0	0	0	N	SH
	VTVSP0900/11C30 0525	Sunderland	1.63	03/09/2011	04:20	Clear	Fatigued, asleep, Failure to keep in proper lane	Single Vehicle Crash	0	0	0	N	SH
	VTVSP0900/13C30 3226	Sunderland	1.93	10/31/2013	06:34	Cloudy	No improper driving	Single Vehicle Crash	0	0	0	S	SH
	VTVSP0900/12C30 1270	Sunderland	2.14	05/11/2012	22:40	Cloudy	No improper driving	Single Vehicle Crash	0	0	0	S	SH
	VTVSP0900/11C30 0371	Sunderland	2.16	02/18/2011	21:52	Clear	No improper driving, Under the influence of medication/drugs/alcohol, Failure to keep in proper lane	Head On	2	0	0		SH
	VTVSP0900/11C30 2035	Sunderland	2.2	09/04/2011	14:40	Clear	No improper driving, Failed to yield right of way	Same Direction Sideswipe	0	0	0	N	SH
	VTVSP0900/14C30 2549	Sunderland	2.39	07/31/2014	09:54	Cloudy	No improper driving	Single Vehicle Crash	0	0	0	S	SH
	VTVSP0900/14C30 0605	Sunderland	3.06	02/21/2014	22:47				0	0	0		SH
	VTVSP0900/15C30 0509	Sunderland	3.33	02/15/2015	12:39				0	0	0		SH
	VTVSP0900/13C30 3421	Sunderland	3.62	11/15/2013	17:30	Cloudy	No improper driving	Single Vehicle Crash	0	0	0	N	SH
	VTVSP0900/14C30 2650	Sunderland	3.62	08/07/2014	15:47				0	0	0		SH
	VTVSP0900/13C30 0053	Sunderland	4.67	01/07/2013	06:26				0	0	0		SH

**Crash occurred prior to the last Highway Improvement Project. This data should not be used in a crash analysis. UNK indicates the Mile Marker is Unknown.*

Vermont Agency of Transportation

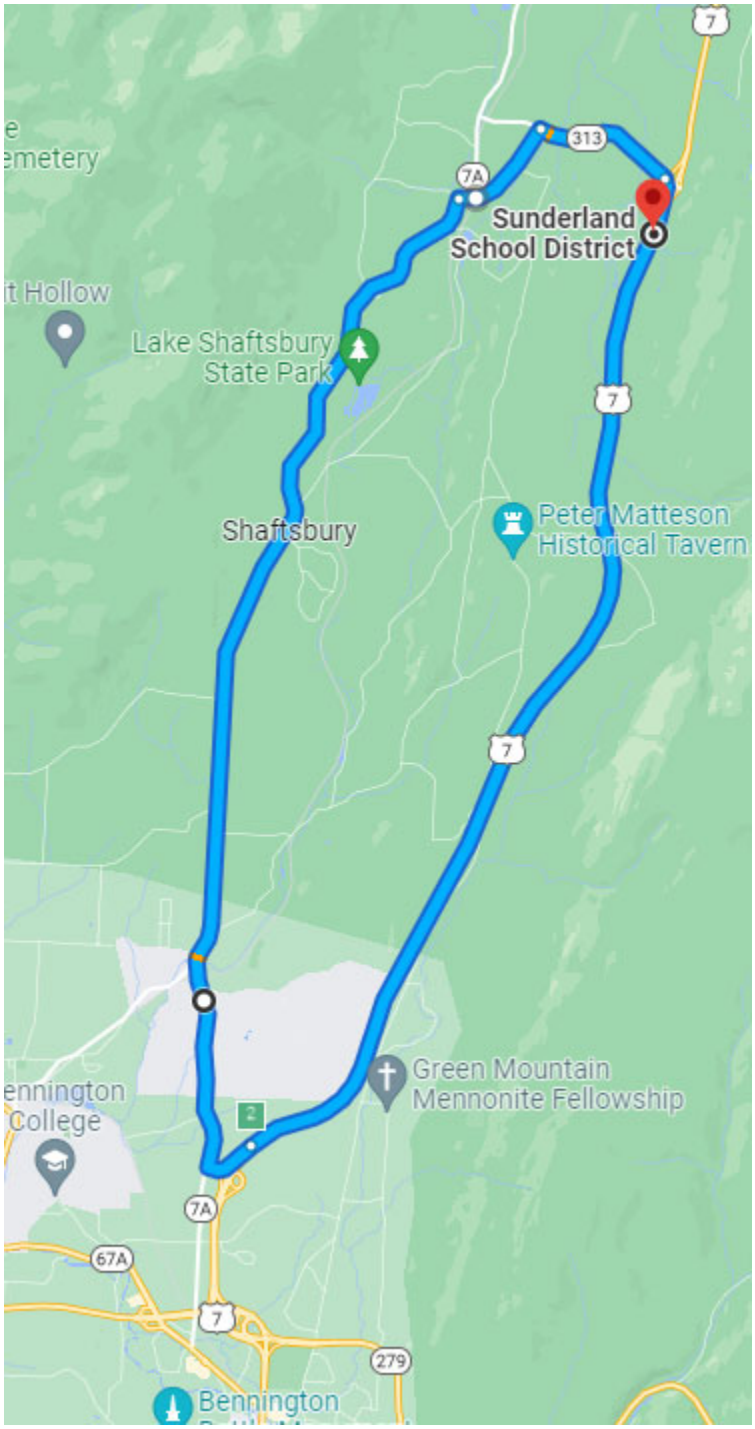
General Yearly Summaries - Crash Listing: State Highways and All Federal Aid Highway Systems

From 01/01/11 To 12/31/15 General Yearly Summaries Information

*	Reporting Agency/ Number	Town	Mile Marker	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
Route: US-7 Continued ...													
	VTVSP0900/12C30 3446	Sunderland	6.18	11/11/2012	08:30	Clear	Failure to keep in proper lane, Distracted	Single Vehicle Crash	3	0	0	S	SH
	VTVSP0900/12C30 1187	Sunderland	6.95	05/04/2012	05:24	Rain	Failure to keep in proper lane, Fatigued, asleep	Single Vehicle Crash	0	1	0	N	SH
	VTDMV0004/12DM V0300	Sunderland	UNK	11/21/2012	07:58	Cloudy	No improper driving	Single Vehicle Crash	0	0	0	N	SH
	VTVSP0900/13C30 1431	Sunderland	UNK	05/31/2013	09:03				0	0	0		SH
	VTVSP0900/13C30 3742	Sunderland	UNK	12/15/2013	05:27				0	0	0		SH
	VTVSP0900/13C30 3807	Sunderland	UNK	12/20/2013	18:56	Rain	No improper driving	Head On	0	0	0	N	SH
	VTVSP0900/14C30 0447	Sunderland	UNK	02/09/2014	17:18				0	0	0		SH
	VTVSP0900/14C30 0496	Sunderland	UNK	02/14/2014	08:26				0	0	0		SH
	VTVSP0900/14C30 0497	Sunderland	UNK	02/14/2014	10:11				0	0	0		SH
	VTVSP0900/14C30 1997	Sunderland	UNK	06/16/2014	18:45		No improper driving	Single Vehicle Crash	0	0	0	N	SH
	VTVSP0900/15C30 0564	Sunderland	UNK	02/20/2015	06:08				0	0	0		SH
	VTVSP0900/15C30 1370	Sunderland	UNK	05/11/2015	21:00				0	0	0		SH
	VTVSP0900/15C30 1889	Sunderland	UNK	06/24/2015	21:25				0	0	0		SH
	VTVSP0900/15C30 1910	Sunderland	UNK	06/26/2015	17:46				0	0	0		SH
	VTVSP0900/15C30 2049	Sunderland	UNK	07/05/2015	15:03				0	0	0		SH
	VTVSP0900/15C30 2092	Sunderland	UNK	07/08/2015	15:34				0	0	0		SH
	VT0020400/15MC0 00356	Manchester	0.01	01/21/2015	08:43	Clear	Followed too closely, Inattention	Rear End	0	0	0	N	Ramp/Spur
	VT0020400/2014M C003495	Manchester	0.36	10/17/2014	15:50	Clear		Rear End	0	0	0	N	Ramp/Spur
	VT0020400/11MC0 0364	Manchester	3.71	03/06/2011	21:19	Sleet, Hail (Freezing Rain or Drizzle)	No improper driving	Single Vehicle Crash	0	0	0		SH
	VT0020400/15MC0 01241	Manchester	3.91	03/22/2015	15:29	Clear	Made an improper turn, Inattention, No improper driving, Not Distracted	Left Turn and Thru, Broadside v<--	4	0	0		SH
	VT0020400/15MC0 03462	Manchester	3.91	09/19/2015	14:40	Clear	Failure to keep in proper lane, No improper driving	Same Direction Sideswipe	1	0	0	S	SH
	VT0020400/12MC0 0076	Manchester	3.98	01/12/2012	11:40	Snow	No improper driving	Single Vehicle Crash	0	0	0		SH
	VT0020400/13MC0 0953	Manchester	4.7	06/12/2013	10:00	Cloudy	Failed to yield right of way, No improper driving		0	0	0	S	SH
	VT0020400/11MC0 0052	Manchester	UNK	01/08/2011	08:41	Snow	No improper driving	Other - Explain in Narrative	0	0	0	N	SH
	VT0020400/11MC0 1308	Manchester	UNK	07/19/2011	09:34	Clear	No improper driving	Right Turn and Thru, Broadside ^<--	0	0	0	N	SH
	VT0020400/11MC0 2025	Manchester	UNK	10/20/2011	18:49	Rain	No improper driving	Other - Explain in Narrative	0	0	0	S	SH
	VT0020400/11MC0 2110	Manchester	UNK	11/04/2011	18:20	Cloudy	No improper driving	Single Vehicle Crash	0	0	0	S	SH
	VT0020400/12MC0 1055	Manchester	UNK	06/02/2012	13:48	Cloudy	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	N	SH
	VT0020400/14MC0 00100	Manchester	UNK	01/12/2014	18:07	Cloudy	No improper driving	Single Vehicle Crash	0	0	0		SH

**Crash occurred prior to the last Highway Improvement Project. This data should not be used in a crash analysis. UNK indicates the Mile Marker is Unknown.*

Appendix M: Detour Map



Regional Detour Route: US Route 7, to VT Route 313, and VT Route 7A, back to US Route 7

Through Route: 9.6 miles
Detour Route: 12.9 miles
Added Distance: 3.3 miles
End-to-End Distance: 22.5 miles

Appendix N: Plans

EXISTING CONDITIONS

SCALE 1" = 20'-0"
20 0 20

N

VT STATE PLANE GRID

US ROUTE 7
TO GLASTONBURY

US ROUTE 7
TO MANCHESTER

53+00 54+00 55+00 56+00 57+00 58+00 59+00

N25°34'26.53"E

BENCHMARK
CHISELED SQUARE
IN CONCRETE
ELEV.=904.78

STA 56+07.00=
CHAN 41+43.70
Δ= 57°49'55" LT

BROOK FLOW

43+00

41+00

40+00

TH-16 (SOUTH ROAD)

WOVEN WIRE FENCE

4x4 CONCRETE BOUNDRY MARKER 4" ABOVE GROUND

WOOD DRIVE

12'-6" x 12'-6" RCB BOX

SIGN D1

SIGN D9-7,D9-8,D9-9 D9-1,D9-3,D9-10 (EXIT 3)

SIGN D9-8b

SIGN VD-701 (BRI9-6 US-7)

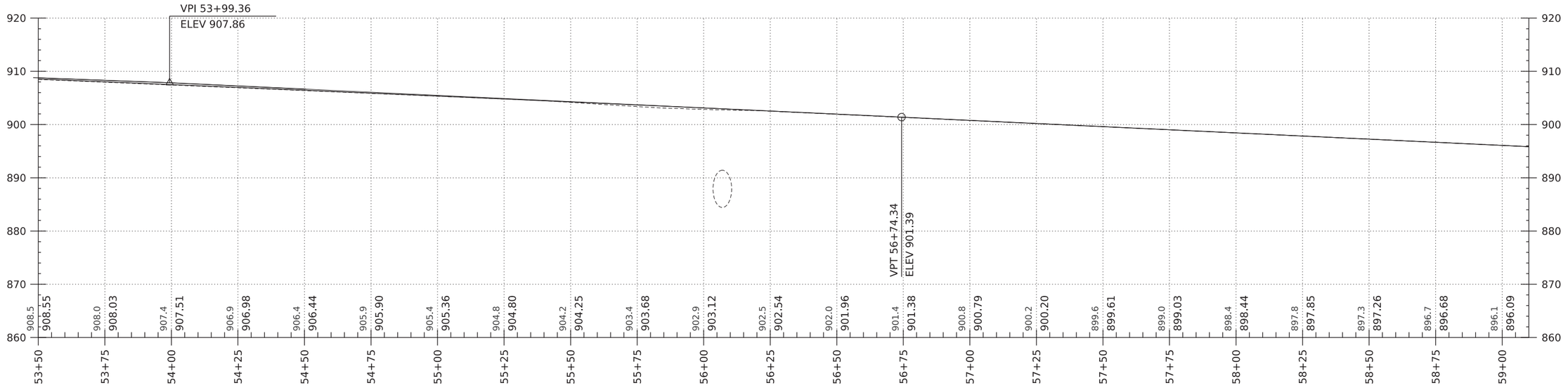
SIGN VD-701 (BRI9-7 US-7)

SIGN M3-3 M1-4 (US-7)

HVCTRL 102
HVCTRL 101
HVCTRL 100
HVCTRL 119
HVCTRL 130
HVCTRL 115
HVCTRL 116
HVCTRL 113
HVCTRL 111

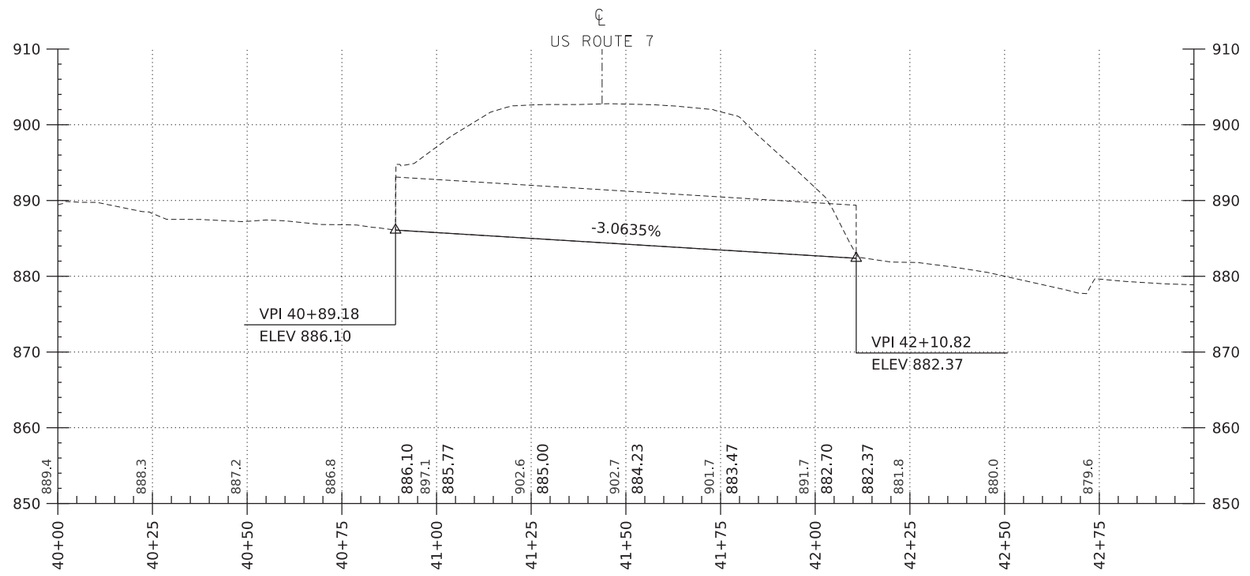
EXISTING BRIDGE INFO
84" CGMPP, 120' LONG
BUILT 1979
10' AVERAGE COVER
38 SQFT WATERWAY AREA

PROJECT NAME:	STATEWIDE - SOUTHWEST
PROJECT NUMBER:	STP CULV(91)
FILE NAME: Sunderland_BDR_Existing Layout.dgn	PLOT DATE: 20-OCT-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYCUT	SHEET 1 OF 22



US ROUTE 7 PROFILE

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



CULVERT 19-7 CHANNEL PROFILE

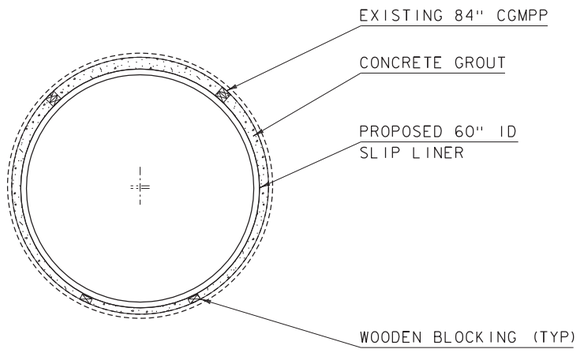
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

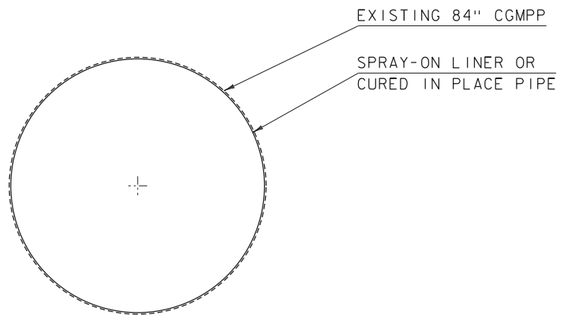
PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

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

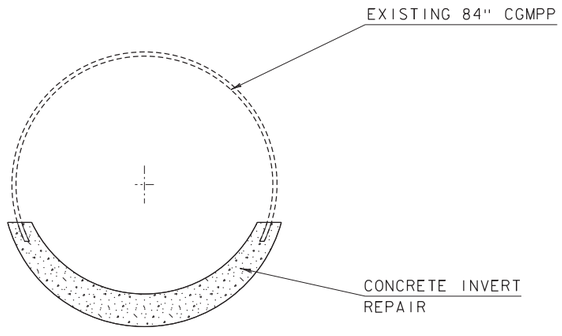
PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 2 OF 22



SLIP LINER REHABILITATION TYPICAL SECTION

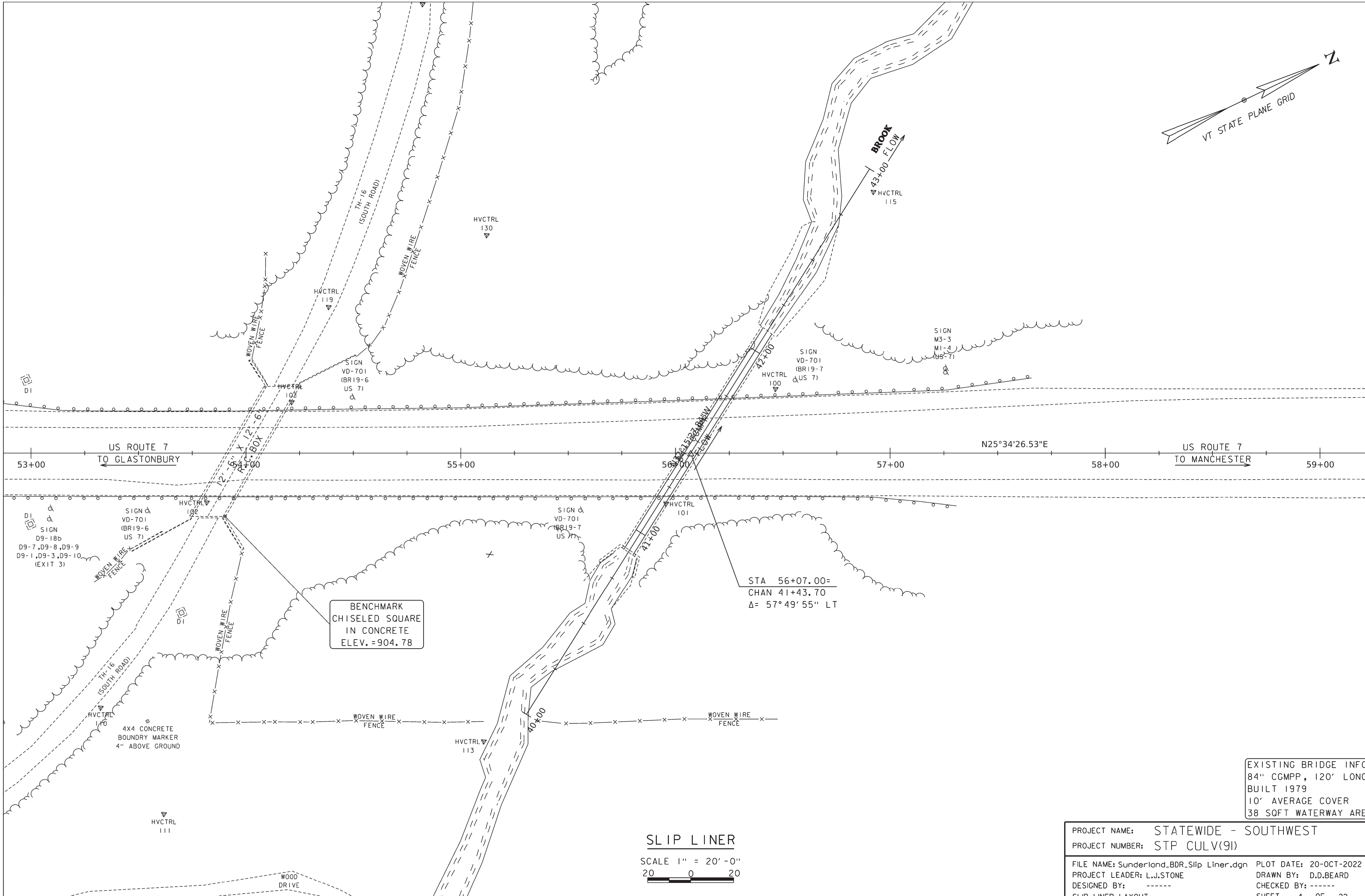


SPRAY LINER REHABILITATION TYPICAL SECTION



INVERT REPAIR TYPICAL SECTION

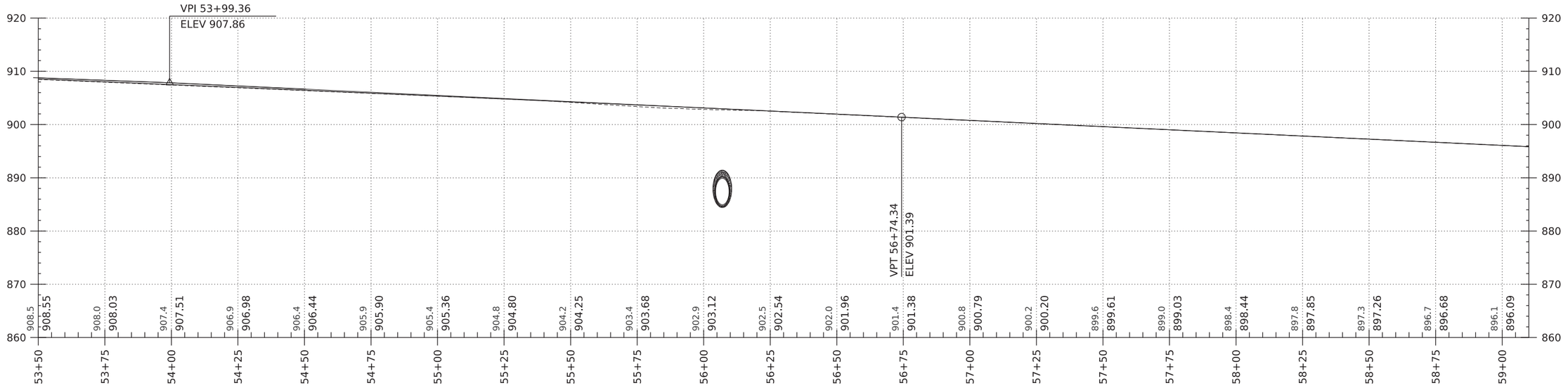
PROJECT NAME:	STATEWIDE - SOUTHWEST
PROJECT NUMBER:	STP CULV(91)
FILE NAME: s22b045_Sunderland_typ.dgn	PLOT DATE: 20-OCT-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ----------	CHECKED BY: ----------
REHABILITATION TYPICAL SECTIONS	SHEET 3 OF 22



EXISTING BRIDGE INFO
84" CGMPP, 120' LONG
BUILT 1979
10' AVERAGE COVER
38 SQFT WATERWAY AREA

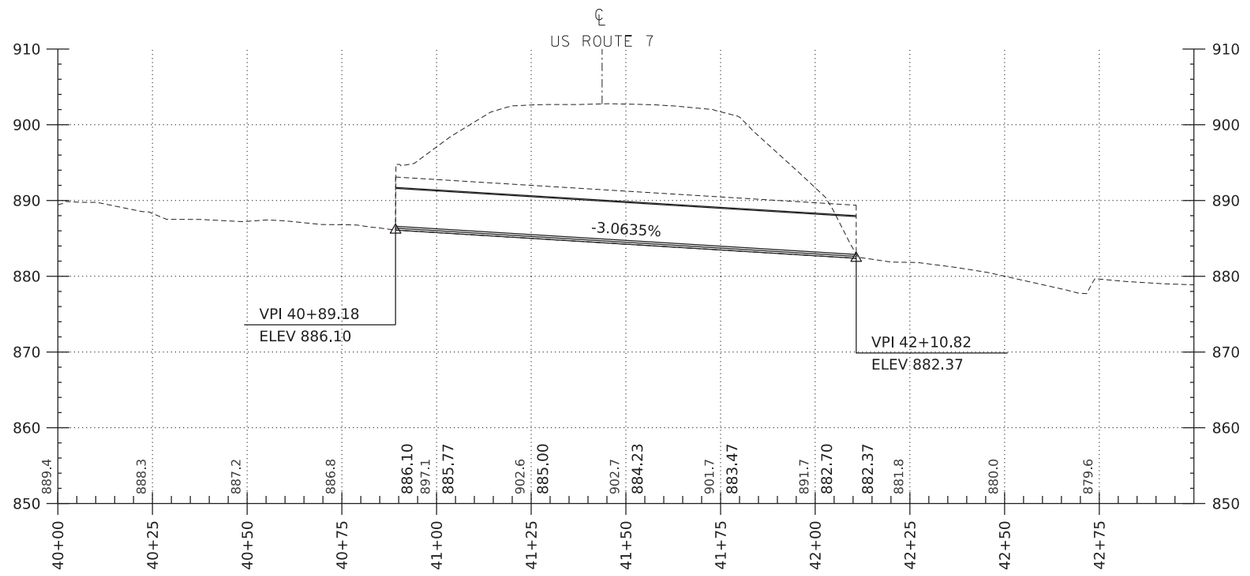
PROJECT NAME:	STATEWIDE - SOUTHWEST
PROJECT NUMBER:	STP CULV(91)

FILE NAME: Sunderland_BDR_Slip Liner.dgn	PLOT DATE: 20-OCT-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SLIP LINER LAYOUT	SHEET 4 OF 22



US ROUTE 7 PROFILE

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



CULVERT 19-7 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: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

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

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 5 OF 22

N

VT STATE PLANE GRID

BROOK FLOW

43+00

HVCTRL 115

HVCTRL 130

TH-16 (SOUTH ROAD)

WOVEN WIRE FENCE

HVCTRL 119

WOVEN WIRE FENCE

SIGN VD-701 (BR19-6 US 7)

HVCTRL 102

D1

SIGN M3-3 M1-4 (US 7)

SIGN VD-701 (BR19-7 US 7)

42+00

HVCTRL 100

12'-6" X 12'-6" RCB BOX

US ROUTE 7 TO GLASTONBURY

53+00 54+00 55+00 56+00 57+00 58+00 59+00

N25°34'26.53"E

US ROUTE 7 TO MANCHESTER

D1

SIGN D9-18b D9-7,D9-8,D9-9 D9-1,D9-3,D9-10 (EXIT 3)

SIGN VD-701 (BR19-6 US 7)

HVCTRL 102

D1

WOVEN WIRE FENCE

BENCHMARK CHISELED SQUARE IN CONCRETE ELEV.=904.78

SIGN VD-701 (BR19-7 US 7)

HVCTRL 101

41+00

STA 56+07.00=
CHAN 41+43.70
Δ= 57°49'55" LT

TH-16 (SOUTH ROAD)

HVCTRL 110

4X4 CONCRETE BOUNDRY MARKER 4" ABOVE GROUND

WOVEN WIRE FENCE

40+00

HVCTRL 113

HVCTRL 111

WOOD DRIVE

SPRAY LINER

SCALE 1" = 20'-0"

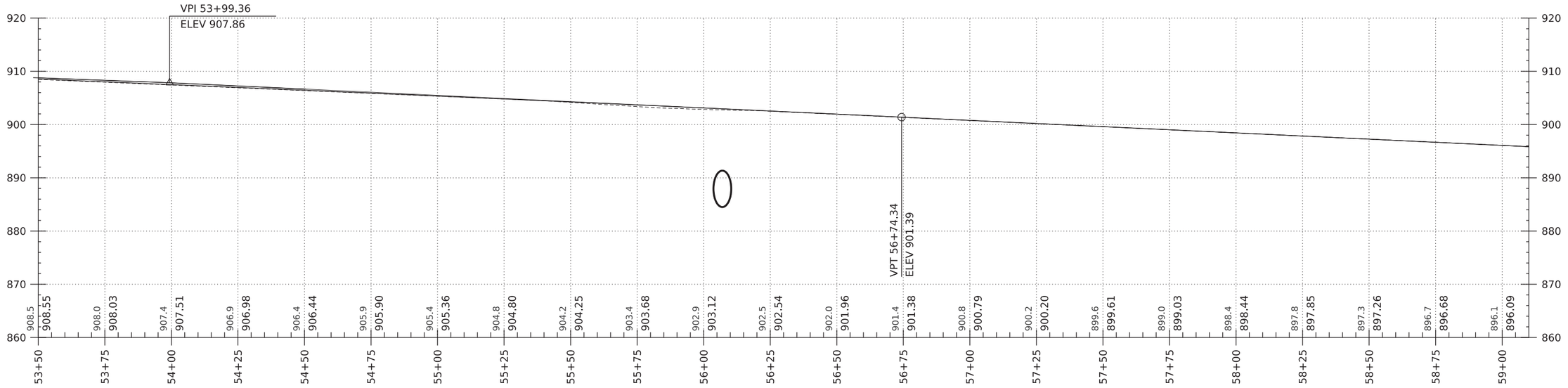
20 0 20

EXISTING BRIDGE INFO
84" CGMPP, 120' LONG
BUILT 1979
10' AVERAGE COVER
38 SQFT WATERWAY AREA

PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

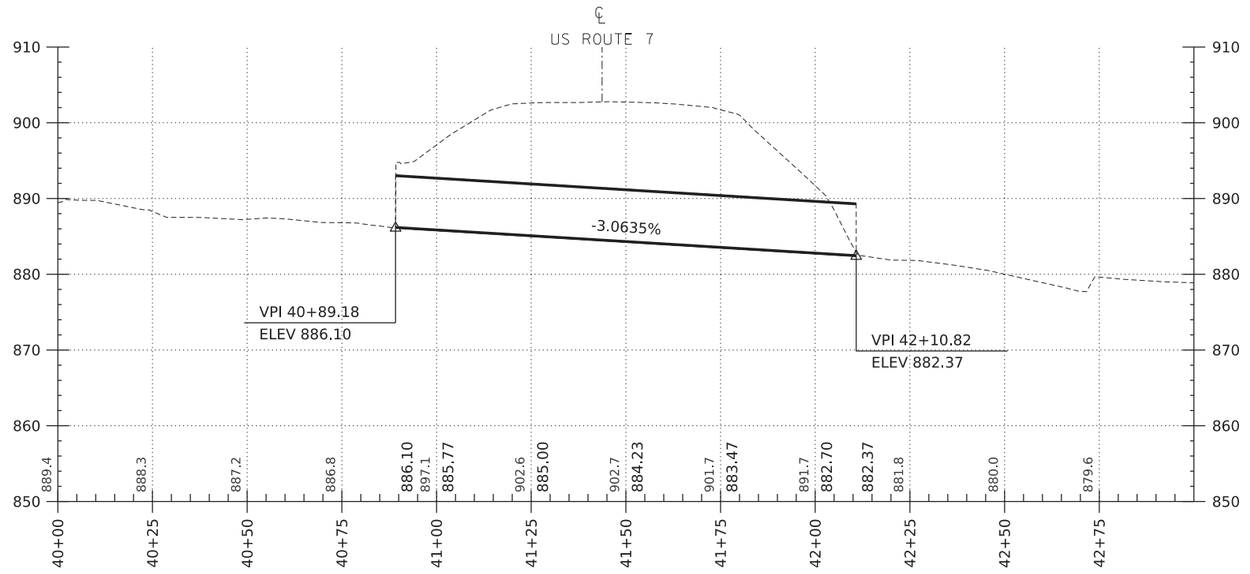
FILE NAME: Sunderland_BDR_Spray Liner.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
SPRAY LINER LAYOUT

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 6 OF 22



US ROUTE 7 PROFILE

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



CULVERT 19-7 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: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

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

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 7 OF 22

N

VT STATE PLANE GRID

BROOK FLOW

43+00

42+00

41+00

40+00

HVCTRL 130

HVCTRL 115

HVCTRL 119

HVCTRL 100

HVCTRL 102

HVCTRL 101

HVCTRL 113

HVCTRL 111

HVCTRL 116

WOVEN WIRE FENCE

TH-16 (SOUTH ROAD)

SIGN VD-701 (BR19-6 US 7)

SIGN VD-701 (BR19-7 US 7)

SIGN M3-3 M1-4 (US-7)

SIGN D9-18b D9-7, D9-8, D9-9 D9-1, D9-3, D9-10 (EXIT 3)

D1

12'-6" X 12'-6" BOX

US ROUTE 7 TO GLASTONBURG

US ROUTE 7 TO MANCHESTER

N25°34'26.53"E

53+00 54+00 55+00 56+00 57+00 58+00 59+00

STA 56+07.00=
CHAN 41+43.70
Δ= 57°49'55" LT

BENCHMARK
CHISELED SQUARE
IN CONCRETE
ELEV.=904.78

4X4 CONCRETE BOUNDRY MARKER 4" ABOVE GROUND

WOOD DRIVE

INVERT REPAIR

SCALE 1" = 20'-0"

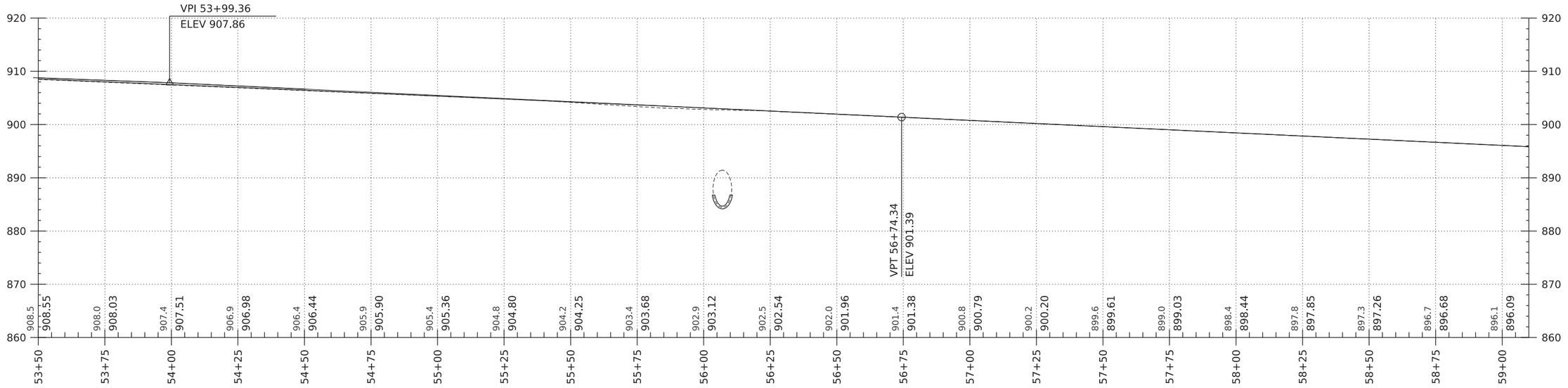
20 0 20

EXISTING BRIDGE INFO
84" CGMPP, 120' LONG
BUILT 1979
10' AVERAGE COVER
38 SQFT WATERWAY AREA

PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

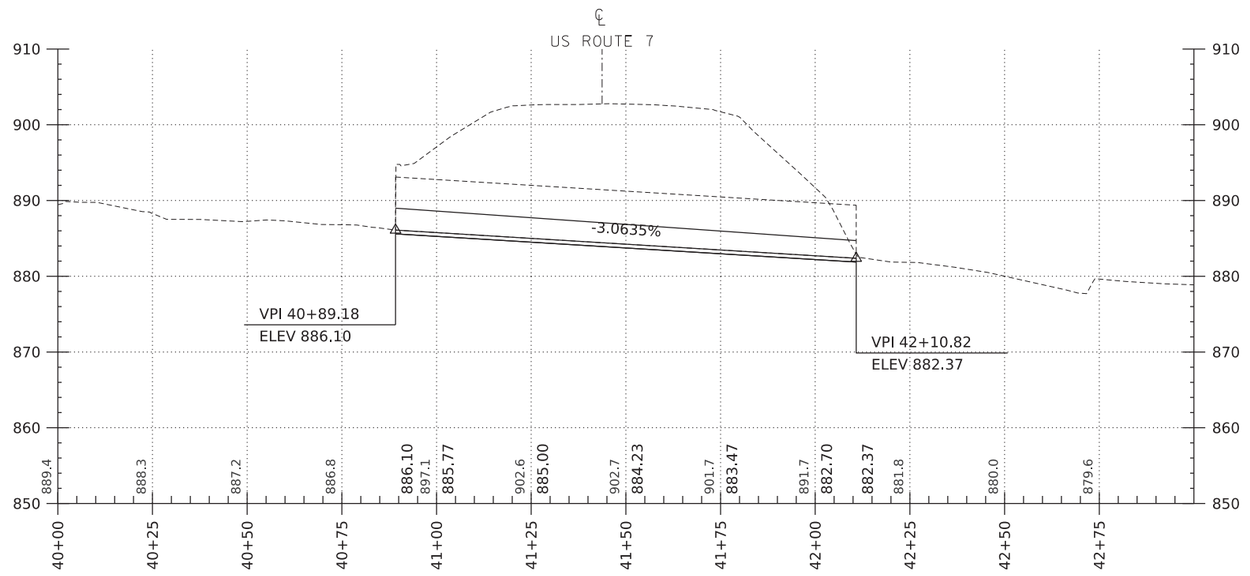
FILE NAME: Sunderland_BDR_Invert Repair.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
INVERT REPAIR LAYOUT

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 8 OF 22



US ROUTE 7 PROFILE

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



CULVERT 19-7 CHANNEL PROFILE

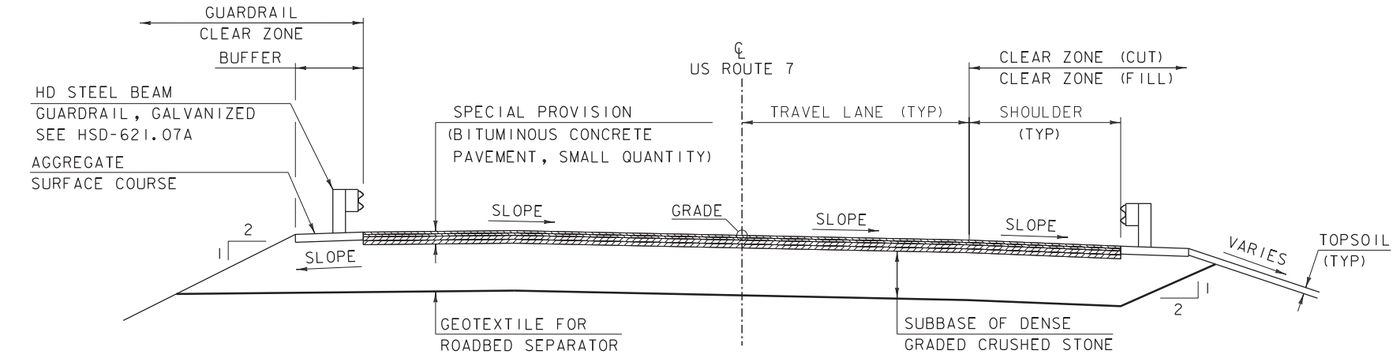
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

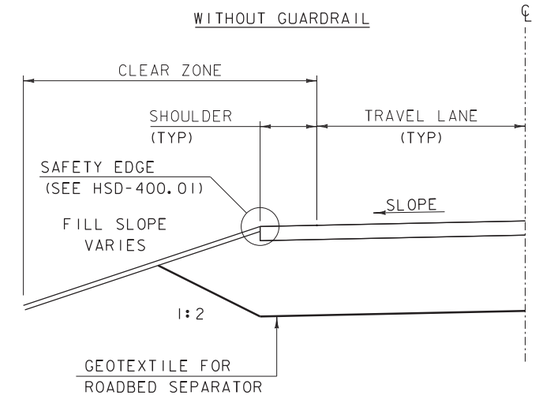
FILE NAME: Sunderland_profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
INVERT REPAIR PROFILE SHEET

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 9 OF 22



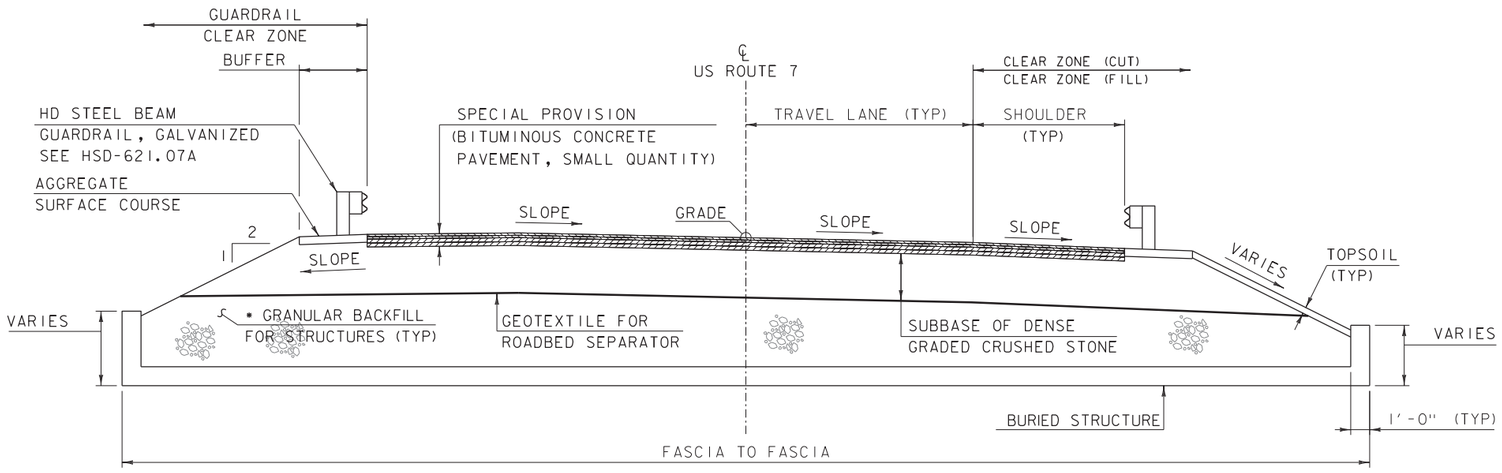
US ROUTE 7 TYPICAL SECTION

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



ROADWAY TYPICAL SECTION

NOT TO SCALE



US ROUTE 7 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	8'-0"	VARIES	8'-0"	VARIES
BUFFER	3'-7"	-0.060	3'-7"	-0.060
FILL SLOPE	---	VARIES	---	VARIES
CLEAR ZONE (CUT)	20'-0"	---	20'-0"	---
CLEAR ZONE (FILL)	26'-0"	---	26'-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

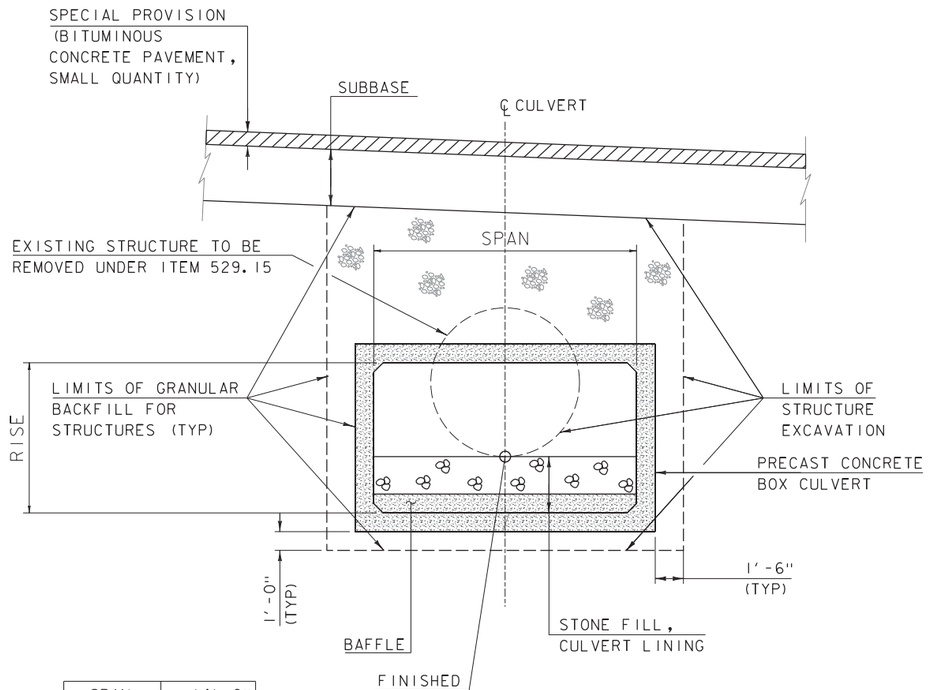
(IF USED ON PROJECT)

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

PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

FILE NAME: s22b045_Sunderland_typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
ROADWAY TYPICAL SECTIONS

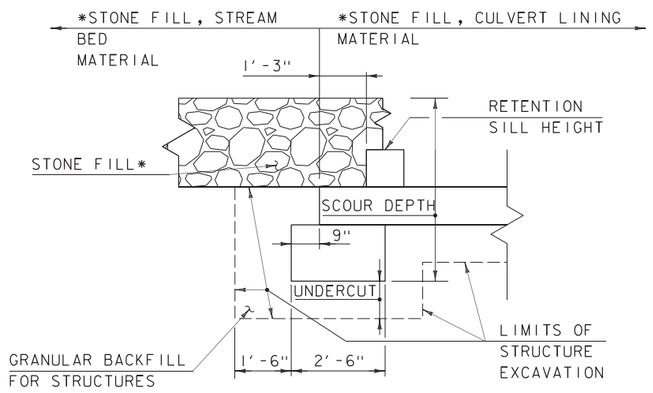
PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------



SPAN	14'-0"
RISE	8'-0"
LENGTH	120'-0"

CULVERT TYPICAL SECTION

NOT TO SCALE



CUTOFF WALL TYPICAL SECTION

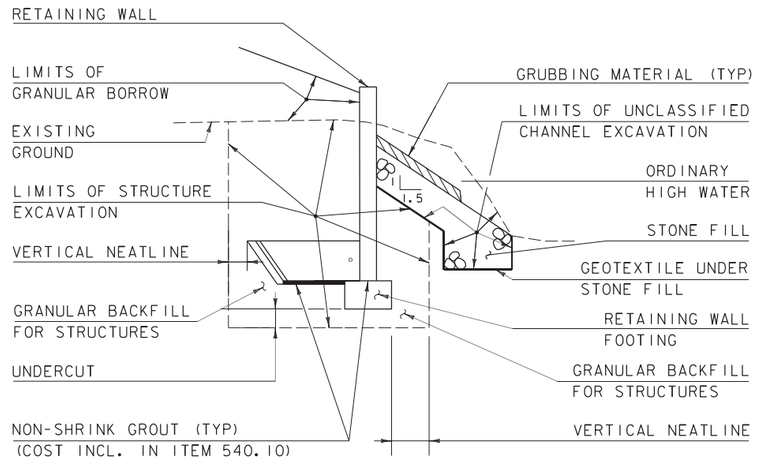
NOTE:

NOT TO SCALE

THE CUTOFF WALL MAY BE OMITTED IF THE DEPTH OF CULVERT LINING MATERIAL PLUS THE THICKNESS TO THE BOTTOM OF THE BOX MEETS OR EXCEEDS THE LISTED SCOUR DEPTH.

CUTOFF WALL - CRITICAL DIMENSIONS

	DIMENSION
SCOUR DEPTH	4'-0"
RETENTION SILL HEIGHT	1'-0"
UNDERCUT	1'-0"

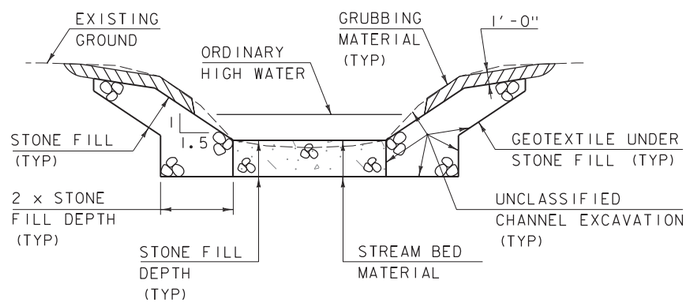


RETAINING WALL EARTHWORK TYPICAL SECTION

NOT TO SCALE

NOTE:

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



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	2'-0"	TYPE II
STONE FILL, CULVERT LINING	2'-0"	E-STONE TYPE II
STONE FILL, STREAM BED MATERIAL	2'-0"	E-STONE TYPE II

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"

PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

FILE NAME: s22b045_Sunderland_typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PRECAST CULVERT TYPICAL SECTIONS

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET II OF 22

N

VT STATE PLANE GRID

BROOK FLOW

43+00

HVCTRL 115

HVCTRL 130

HVCTRL 119

WOVEN WIRE FENCE

TH-16 (SOUTH ROAD)

SIGN VD-701 (BR19-6 US 7)

HVCTRL 102

D1

SIGN VD-701 (BR19-7 US 7)

SIGN M3-3 M1-4 (US 7)

42+00

HVCTRL 100

12'-6" X 12'-6" BOX

N25°34'26.53"E

US ROUTE 7
TO GLASTONBURY

US ROUTE 7
TO MANCHESTER

53+00 54+00 55+00 56+00 57+00 58+00 59+00

SIGN D9-18b D9-7,D9-8,D9-9 D9-1,D9-3,D9-10 (EXIT 3)

HVCTRL 102

HVCTRL 101

41+00

STA 56+07.00=
CHAN 41+43.70
Δ= 57°49'55" LT

BENCHMARK
CHISELED SQUARE
IN CONCRETE
ELEV.=904.78

4X4 CONCRETE
BOUNDRY MARKER
4" ABOVE GROUND

HVCTRL 116

HVCTRL 113

40+00

HVCTRL 111

WOOD DRIVE

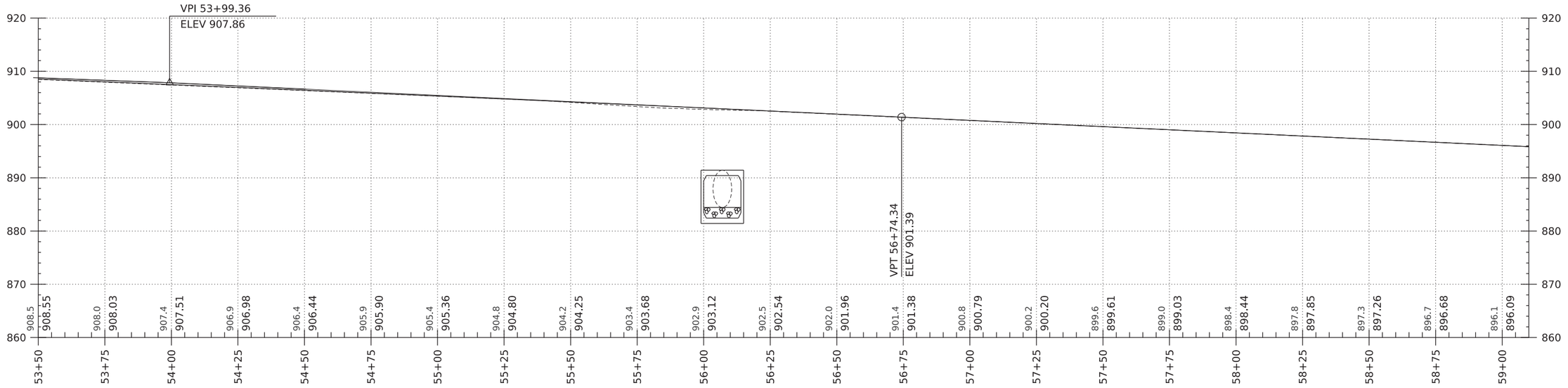
PRECAST BOX

SCALE 1" = 20'-0"

20 0 20

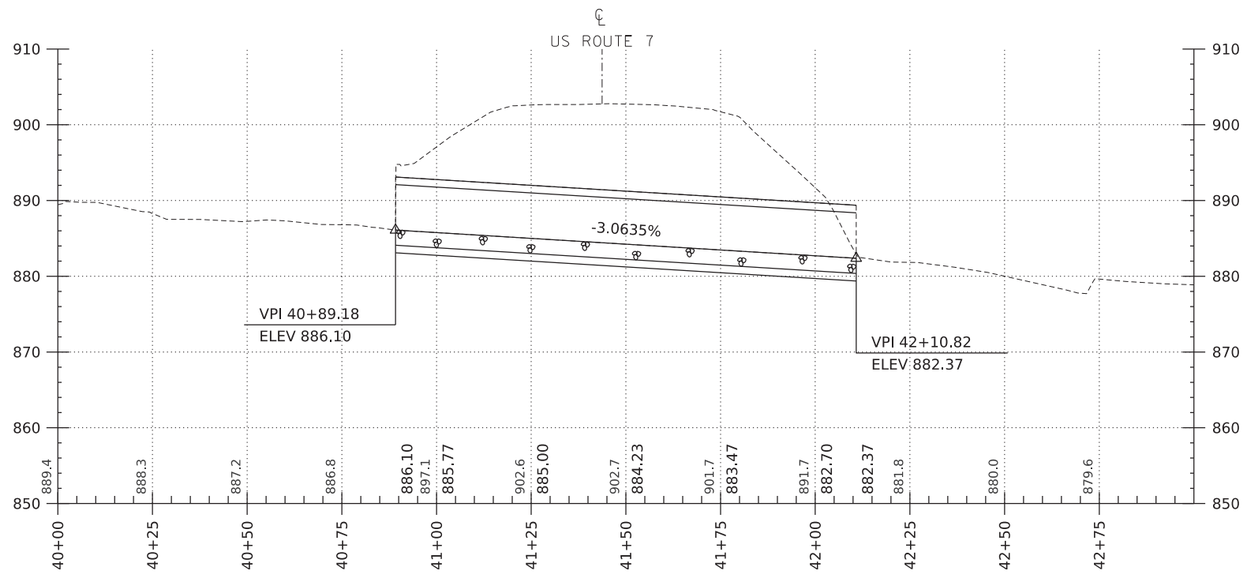
EXISTING BRIDGE INFO
84" CGMPP, 120' LONG
BUILT 1979
10' AVERAGE COVER
38 SQFT WATERWAY AREA

PROJECT NAME:	STATEWIDE - SOUTHWEST
PROJECT NUMBER:	STP CULV(91)
FILE NAME: Sunderland_BDR_Precast Layout.dgn	PLOT DATE: 20-OCT-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PRECAST BOX LAYOUT	SHEET 12 OF 22



US ROUTE 7 PROFILE

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



CULVERT 19-7 CHANNEL PROFILE

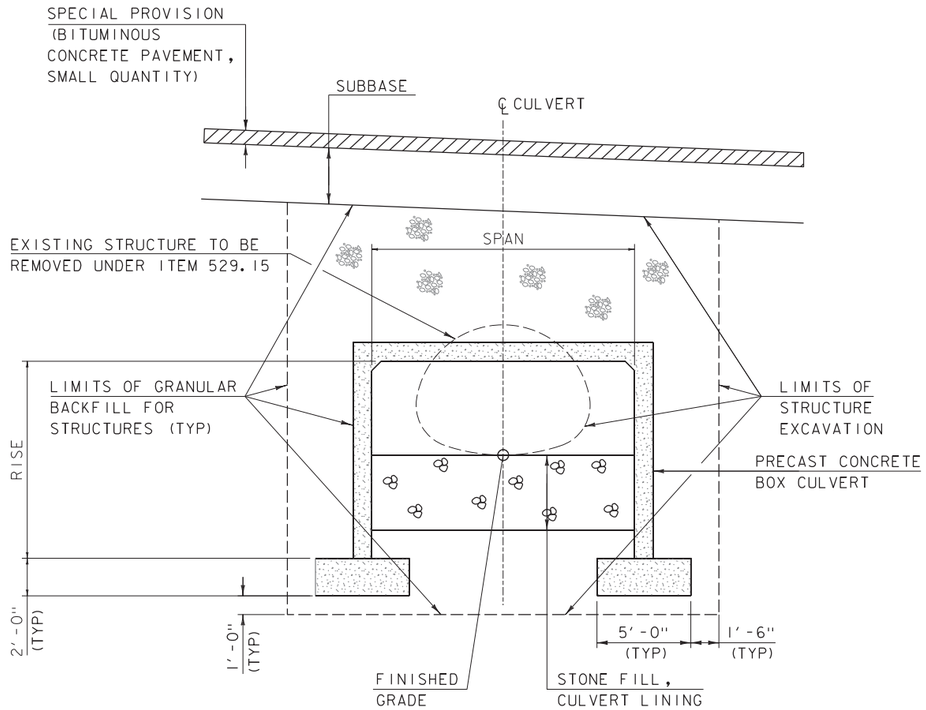
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

FILE NAME: Sunderland_profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
BOX CULVERT PROFILE SHEET

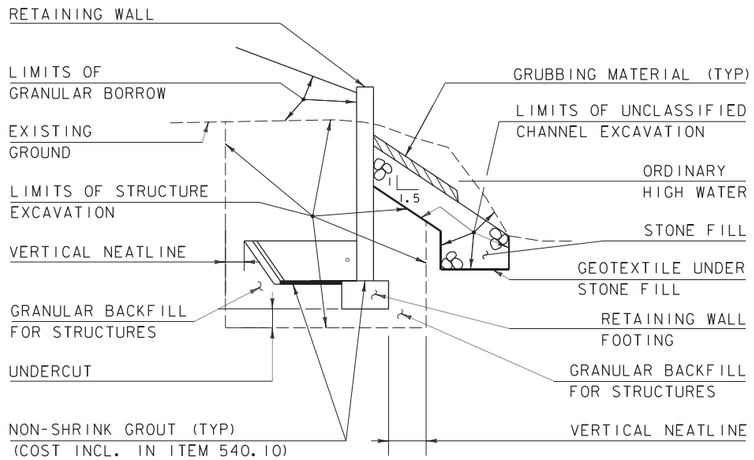
PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 13 OF 22



SPAN	14'-0"
RISE	12'-0"
LENGTH	120'-0"

CULVERT TYPICAL SECTION

NOT TO SCALE



RETAINING WALL EARTHWORK TYPICAL SECTION

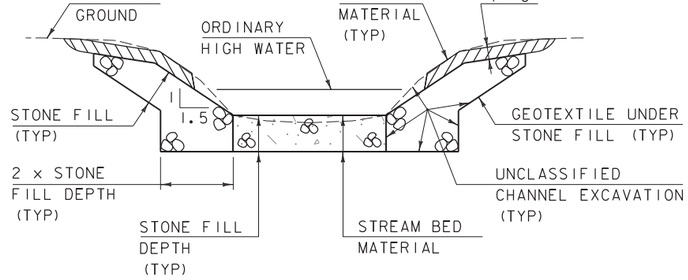
NOT TO SCALE

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	2'-0"	TYPE II
STONE FILL, CULVERT LINING	2'-0"	E-STONE TYPE II
STONE FILL, STREAM BED MATERIAL	2'-0"	E-STONE TYPE II

PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

FILE NAME: s22b045_Sunderland_typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
3-SIDED BOX CULVERT TYPICAL SECTIONS

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 14 OF 22

N

VT STATE PLANE GRID

BROOK FLOW

43+00

HVCTRL 115

HVCTRL 130

HVCTRL 119

WOVEN WIRE FENCE

TH-16 (SOUTH ROAD)

SIGN VD-701 (BR19-6 US 7)

HVCTRL 102

D1

SIGN M3-3 M1-4 (US-7)

SIGN VD-701 (BR19-7 US 7)

42+00

HVCTRL 100

12'-0" X 12'-0" BOX

N25°34'26.53"E

US ROUTE 7
TO GLASTONBURY

US ROUTE 7
TO MANCHESTER

53+00 54+00 55+00 56+00 57+00 58+00 59+00

SIGN D9-18b D9-7,D9-8,D9-9 D9-1,D9-3,D9-10 (EXIT 3)

HVCTRL 102

SIGN VD-701 (BR19-6 US 7)

SIGN VD-701 (BR19-7 US 7)

HVCTRL 101

41+00

STA 56+07.00=
CHAN 41+43.70
Δ= 57°49'55" LT

BENCHMARK
CHISELED SQUARE
IN CONCRETE
ELEV.=904.78

WOVEN WIRE FENCE

TH-16 (SOUTH ROAD)

HVCTRL 116

4X4 CONCRETE
BOUNDRY MARKER
4" ABOVE GROUND

40+00

HVCTRL 113

HVCTRL 111

WOOD DRIVE

3-SIDED BOX

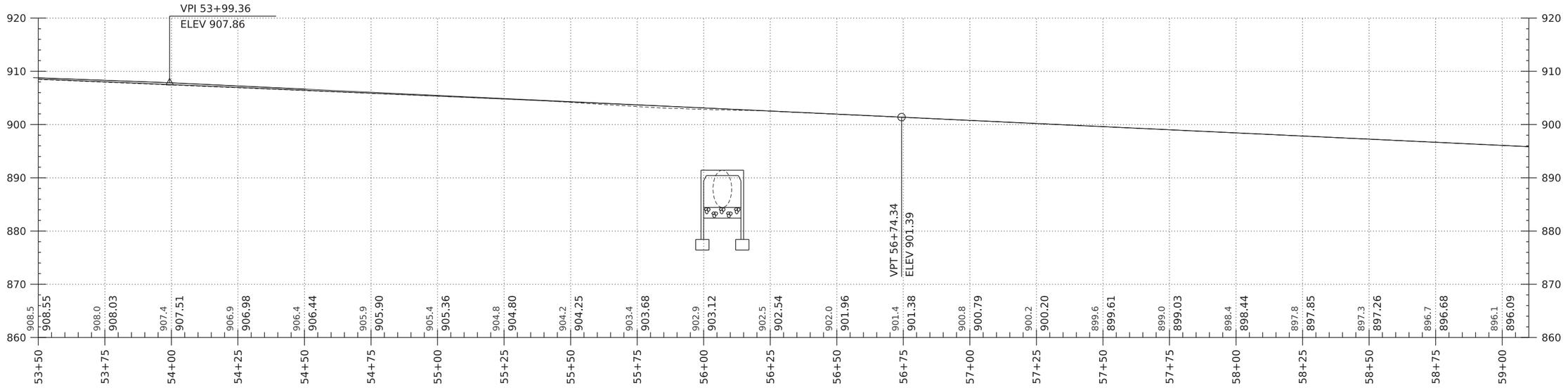
SCALE 1" = 20'-0"

20 0 20

EXISTING BRIDGE INFO
84" CGMPP, 120' LONG
BUILT 1979
10' AVERAGE COVER
38 SQFT WATERWAY AREA

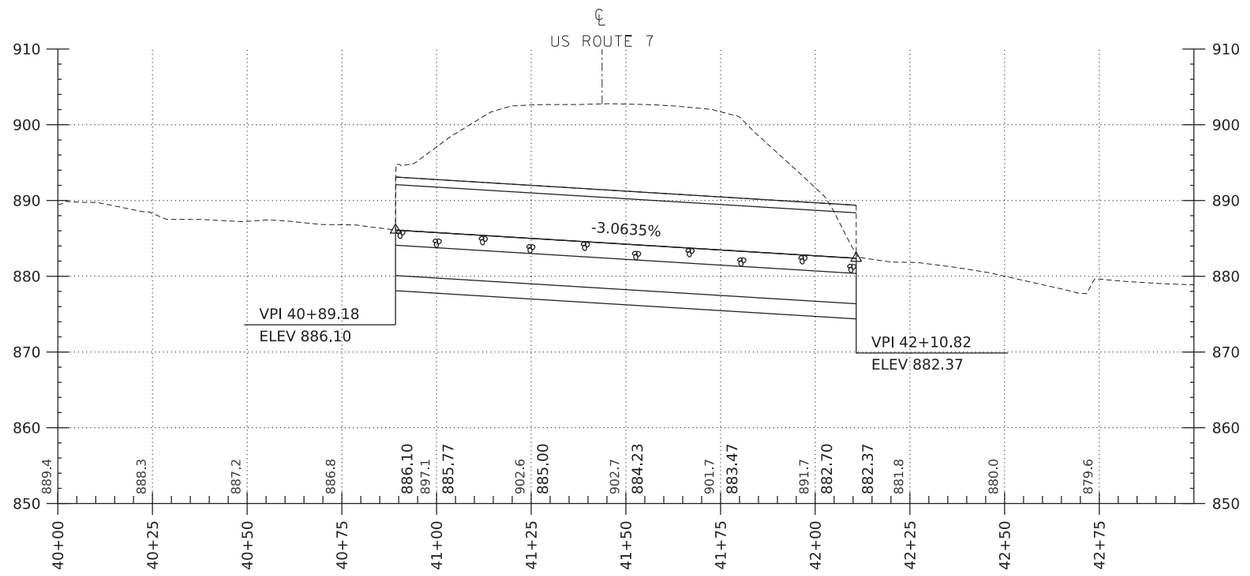
PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

FILE NAME: Sunderland_BDR_3-Sided Box.dgn PLOT DATE: 20-OCT-2022
PROJECT LEADER: L.J.STONE DRAWN BY: D.D.BEARD
DESIGNED BY: ------ CHECKED BY: ------
3-SIDED BOX LAYOUT SHEET 15 OF 22



US ROUTE 7 PROFILE

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



CULVERT 19-7 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: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

FILE NAME: Sunderland_profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
3-SIDED BOX PROFILE SHEET

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------

N

VT STATE PLANE GRID

BROOK FLOW

43+00

HVCTRL 115

HVCTRL 130

HVCTRL 119

TH-16 (SOUTH ROAD)

WOVEN WIRE FENCE

WOVEN WIRE FENCE

SIGN VD-701 (BR19-6 US 7)

HVCTRL 102

SIGN M3-3 M1-4 (US 7)

SIGN VD-701 (BR19-7 US 7)

42+00

HVCTRL 100

D1

US ROUTE 7
TO GLASTONBURY

53+00

54+00

55+00

56+00

57+00

58+00

US ROUTE 7
TO MANCHESTER

59+00

N25°34'26.53"E

12'-6" X 12'-6" BOX

BROOK FLOW

D1

SIGN D9-18b D9-7,D9-8,D9-9 D9-1,D9-3,D9-10 (EXIT 3)

SIGN VD-701 (BR19-6 US 7)

HVCTRL 102

SIGN VD-701 (BR19-7 US 7)

HVCTRL 101

41+00

STA 56+07.00=
CHAN 41+43.70
Δ= 57°49'55" LT

BENCHMARK
CHISELED SQUARE
IN CONCRETE
ELEV.=904.78

WOVEN WIRE FENCE

TH-16 (SOUTH ROAD)

HVCTRL 110

4X4 CONCRETE BOUNDRY MARKER 4" ABOVE GROUND

WOVEN WIRE FENCE

40+00

WOVEN WIRE FENCE

HVCTRL 113

HVCTRL 111

WOOD DRIVE

2 LANE PHASE 1

SCALE 1" = 20'-0"
20 0 20

EXISTING BRIDGE INFO
84" CGMPP, 120' LONG
BUILT 1979
10' AVERAGE COVER
38 SQFT WATERWAY AREA

PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

FILE NAME: Sunderland_BDR_2 Lane_Phase 1.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
2 LANE PHASE 1 LAYOUT

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 17 OF 22

N

VT STATE PLANE GRID

BROOK FLOW

43+00

HVCTRL 115

HVCTRL 130

HVCTRL 119

WOVEN WIRE FENCE

TH-16 (SOUTH ROAD)

SIGN VD-701 (BR19-6 US 7)

HVCTRL 102

D1

12'-6" X 12'-6" RCBOX

SIGN M3-3 M1-4 (US-7)

SIGN VD-701 (BR19-7 US 7)

HVCTRL 100

42+00

CSX

CSX RAILROAD

N25°34'26.53"E

US ROUTE 7
TO GLASTONBURY

US ROUTE 7
TO MANCHESTER

53+00 54+00 55+00 56+00 57+00 58+00 59+00

HVCTRL 102

SIGN D9-18b D9-7,D9-8,D9-9 D9-11,D9-3,D9-10 (EXIT 3)

SIGN VD-701 (BR19-6 US 7)

SIGN VD-701 (BR19-7 US 7)

HVCTRL 101

41+00

STA 56+07.00=
CHAN 41+43.70
Δ= 57°49'55" LT

BENCHMARK
CHISELED SQUARE
IN CONCRETE
ELEV.=904.78

TH-16 (SOUTH ROAD)

HVCTRL 116

4X4 CONCRETE
BOUNDRY MARKER
4" ABOVE GROUND

40+00

HVCTRL 113

HVCTRL 111

WOOD DRIVE

2 LANE PHASE 2

SCALE 1" = 20'-0"
20 0 20

EXISTING BRIDGE INFO
84" CGMPP, 120' LONG
BUILT 1979
10' AVERAGE COVER
38 SQFT WATERWAY AREA

PROJECT NAME: STATEWIDE - SOUTHWEST
PROJECT NUMBER: STP CULV(91)

FILE NAME: Sunderland_BDR_2 Lane_Phase 2.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
2 LANE PHASE 2 LAYOUT

PLOT DATE: 20-OCT-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 18 OF 22

N

VT STATE PLANE GRID

POB 51+05.10

52+00

53+00

US ROUTE 7
TO GLASTONBURY

54+00

55+00

56+00

42+00

41+00

40+00

TH-16
(SOUTH ROAD)

WOVEN WIRE
FENCE

HVCTRL
130

HVCTRL
119

HVCTRL
102

HVCTRL
100

HVCTRL
101

HVCTRL
132

HVCTRL
110

HVCTRL
111

HVCTRL
113

SIGN
VD-701
(BR19-6
US 7)

SIGN
D9-18b
D9-7,D9-8,D9-9
D9-1,D9-3,D9-10
(EXIT 3)

SIGN
VD-701
(BR19-7
US 7)

D1

12'-0" X 12'-0" BOX

BENCHMARK
CHISELED SQUARE
IN CONCRETE
ELEV.=904.78

4X4 CONCRETE
BOUNDRY MARKER
1.4' ABOVE GROUND

4X4 CONCRETE
BOUNDRY MARKER
4" ABOVE GROUND

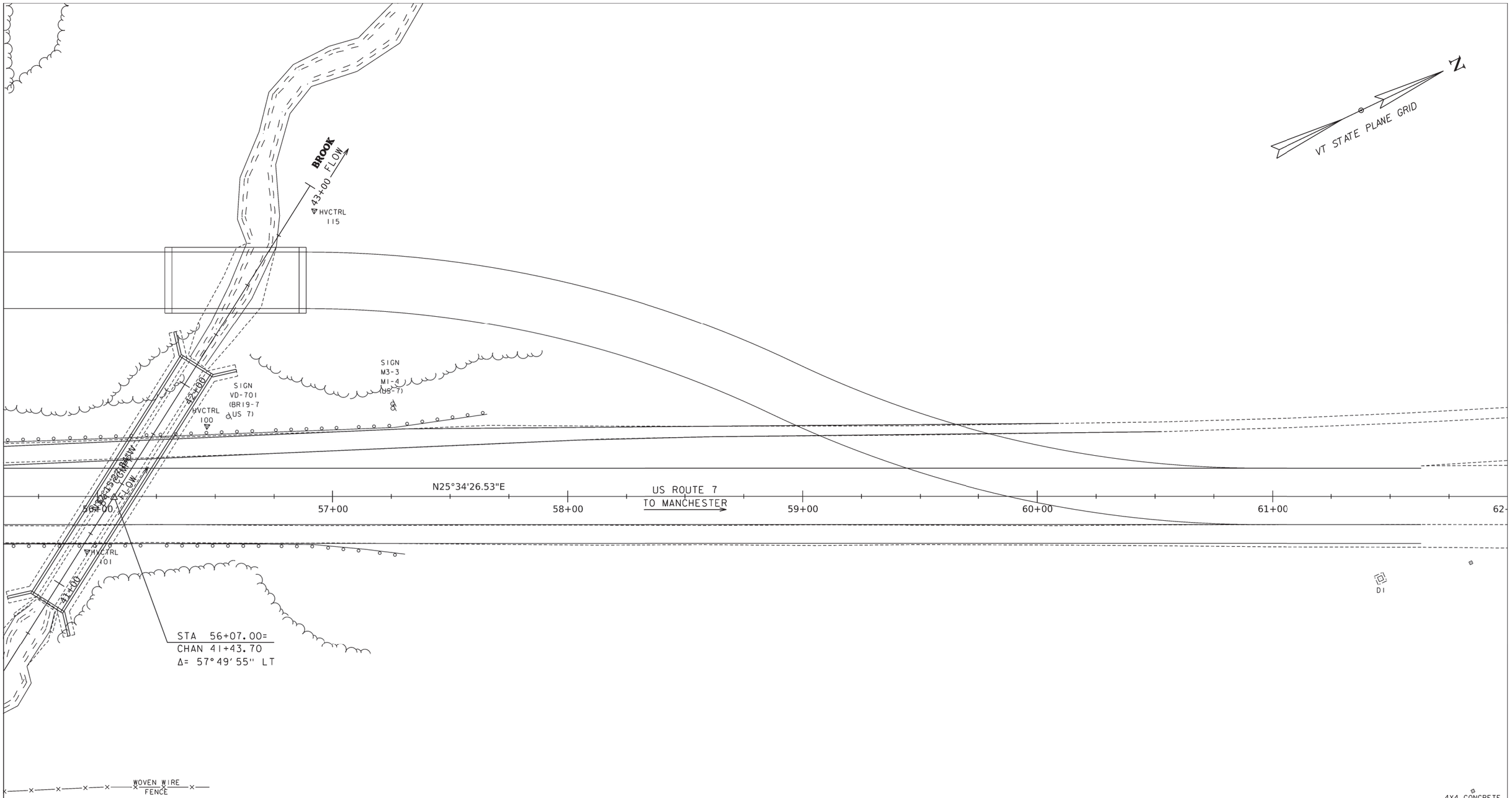
WOOD
DRIVE

STA 5
CHAN 4
Δ= 57°

DOWNSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	STATEWIDE - SOUTHWEST
PROJECT NUMBER:	STP CULV(91)
FILE NAME: Sunderland_BDR_Downstream Temp Bridge.dgn	PLOT DATE: 20-OCT-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
DOWNSTREAM TEMPORARY BRDIGE LAYOUT I	SHEET 19 OF 22



DOWNSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	STATEWIDE - SOUTHWEST
PROJECT NUMBER:	STP CULV(91)
FILE NAME: Sunderland_BDR_Downstream Temp Bridge 220.dgn	PLOT DATE: 20-OCT-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
DOWNSTREAM TEMPORARY BRIDGE LAYOUT 2	SHEET 20 OF 22

N

VT STATE PLANE GRID

POB 51+05.10

52+00

53+00

US ROUTE 7
TO GLASTONBURY

54+00

55+00

40+00

D1

SIGN
D9-18b
D9-7,D9-8,D9-9
D9-1,D9-3,D9-10
(EXIT 3)

SIGN
VD-701
(BR19-6
US 7)

SIGN
VD-701
(BR19-7
US 7)

12'-0" x 12'-6" RC BOX

TH-16
(SOUTH ROAD)

WOVEN WIRE FENCE

HVCTRL
102

HVCTRL
119

HVCTRL
130

HVCTRL
110

HVCTRL
111

HVCTRL
113

4X4 CONCRETE
BOUNDRY MARKER
1.4' ABOVE GROUND

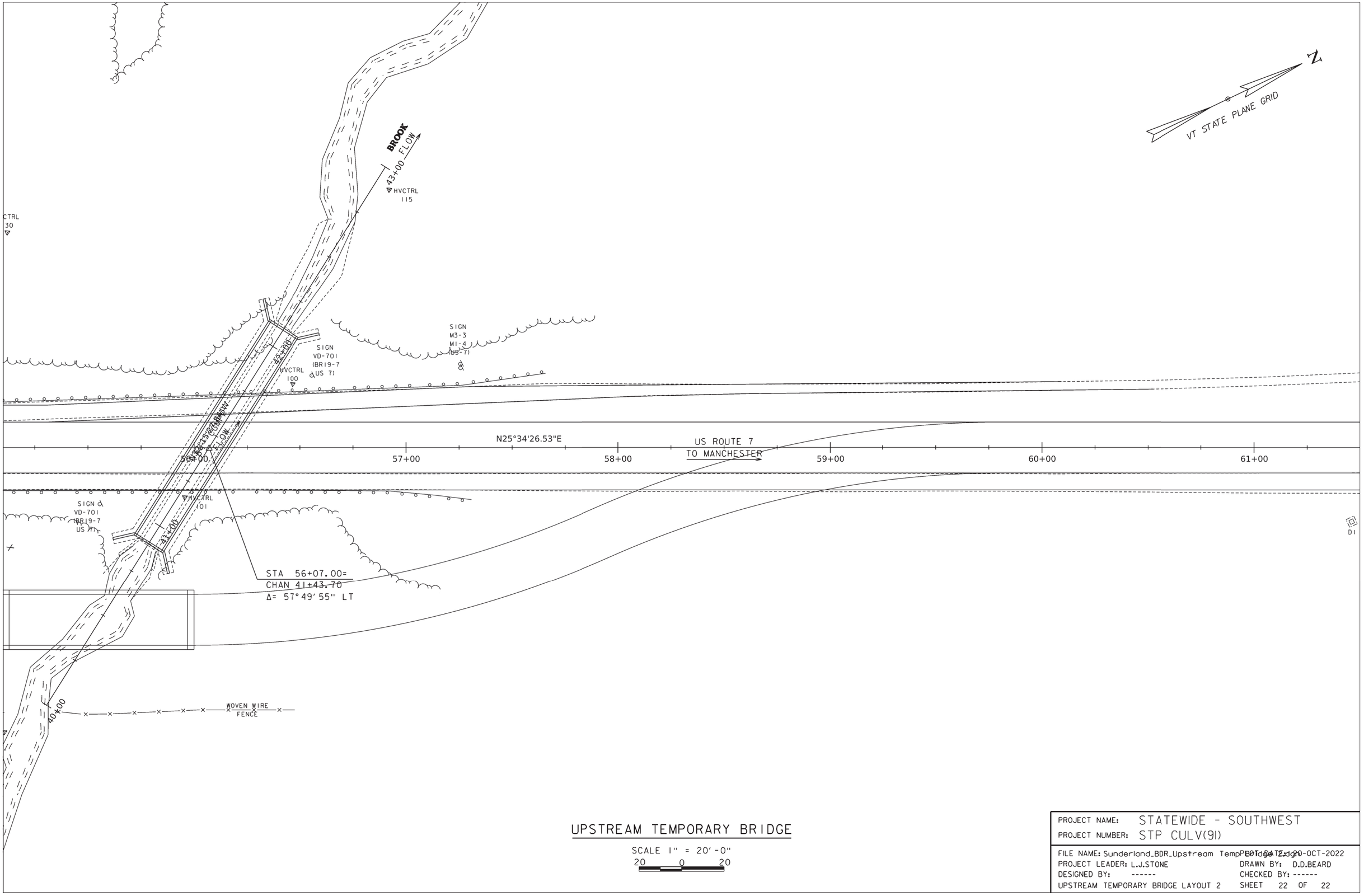
4X4 CONCRETE
BOUNDRY MARKER
4" ABOVE GROUND

WOOD
DRIVE

UPSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	STATEWIDE - SOUTHWEST
PROJECT NUMBER:	STP CULV(91)
FILE NAME: Sunderland_BDR_Upstream_TempBridge_Edge	PLOT DATE: 20-OCT-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
UPSTREAM TEMPORARY BRIDGE LAYOUT 1	SHEET 21 OF 22



UPSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	STATEWIDE - SOUTHWEST
PROJECT NUMBER:	STP CULV(91)
FILE NAME: Sunderland_BDR_Upstream_TempPlan_Detail.dgn	PLOT DATE: 20-OCT-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
UPSTREAM TEMPORARY BRIDGE LAYOUT 2	SHEET 22 OF 22