STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Williston BF 5500(19)

US Route 2, Bridge 23 over unnamed tributary to Winooski River

September 10, 2021

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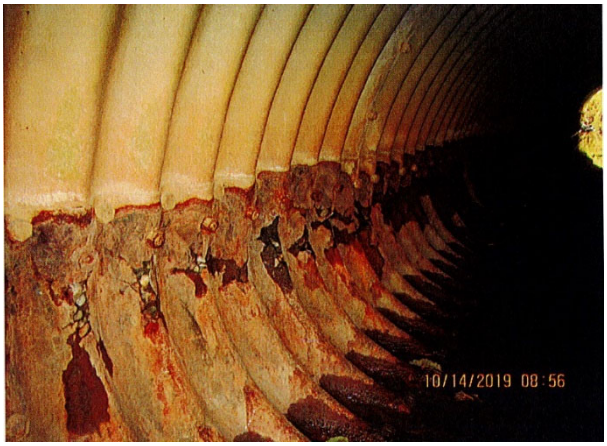
I. Site Information

Bridge 23 is a State-owned bridge located on US Route 2 over an unnamed tributary of the Winooski River. The bridge is approximately 1.1 miles west of the intersection of VT Route 117 and US Route 2. The bridge is at a skew to the roadway and is located on a straight tangent under an average of 3 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	Minor Arterial
Bridge Type	Corrugated Galvanized Metal Plate Pipe Arch (CGMPPA)
Culvert Span	7 feet
Culvert Length	74 feet
Year Built	Unknown
Ownership	State of Vermont

Need

Bridge 23 carries US Route 2 across an unnamed Brook. The following is a list of deficiencies of Bridge 23 and US Route 2 in this location:



1. The culvert is in serious condition. A bridge inspection finding from October 14, 2019, states that the structure is starting to crush along the severe section loss along the barrel walls and settlement in the roadway is progressing.

2. The existing culvert does not meet the minimum hydraulic standard or the calculated bank full width.

3. US Route 2 though the project area is substandard in width for the speed and traffic volumes present.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2025 and 2045.

TRAFFIC DATA	2025	2045
AADT	3300	3600
DHV	410	450
ADTT	220	360
%T	4.4	6.6
%D	57	57

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on an ADT of 3,600, a DHV of 450, and a design speed of 50 mph for a Minor Arterial.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 4.3	11'/3' (28')	11'/5' (32')	Substandard
Bridge Lane and Shoulder Widths	VSS Section 4.7	11'/3' (28')	11'/5' (32')	Substandard
Clear Zone Distance	VSS Table 4.4	Utility poles located within clear zone outside of project limits	20' fill / 12' cut (1:3) 14' cut (1:4)	
Banking	VSS Section 4.12	NC	8% (max)	
Speed		50 mph	50 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	$R = \infty$	$R_{min} = 8{,}150'$ @ e = NC	
Vertical Grade	VSS Table 4.5	<1%	4% (max) for level terrain	
K Values for Vertical Curves	VSS Table 4.1	$K_{sag} = 172$	110 crest / 90 sag	
Vertical Clearance	VSS Section 4.8	No Issues Noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 4.1	>400'	400'	
Bicycle/Pedestrian Criteria	VSS Table 4.7	3' shoulder	5' Shoulder	Substandard
Bridge Railing	Structures Design Manual Section 13	N/A	TL-3	
Hydraulics	VTrans Hydraulics Section	• $HW/D_{(1\% AEP)} = 1.45$ • Clear span: 7 feet	• $HW/D_{(1\% AEP)} < 1.2$ • BFW: 10 feet	Substandard
Structural Capacity	SM, Ch. 3.4.1	Structurally Deficient	Design Live Load: HL-93	Substandard

Inspection Report Summary

Culvert Rating	3 Serious
Channel Rating	3 Serious

01/15/2021 - Special inspection check - dip is increasing in westbound lane. Limited fill over pipe and temporary pipe could be installed until permanent project is underway. ** Highly recommend that this deteriorated pipe be removed this spring. Refer to BIF sent.~ MJ/MK

12/02/2020 – Special Inspection: Pipe is in serious condition and now rated a three with the potential for a localized failure as the corroded walls are rusted thru and ripping longitudinally. There is subsequent pipe distortion occurring reflected in the roadway above where a dip is forming and increasing. Highly probable that the pipe wall will punch inward with infiltration of surrounding fill material, causing a significant dip/sinkhole to develop in the west bond lane. This pipe should be removed now and replaced as it has shallow cover, fairly small and low channel flows rate. ~MJ/MK

09/22/2020 – Structure is in poor condition and should be sleeved or replaced. Moderate settlement in roadway from barrel crushing and piping occurring. Full length transverse perforations along haunches of barrel. Invert has perforations throughout entire invert. ~MAC/JO

10/14/2019 – Structure needs to be replaced. Structure is starting to crush along the severe section loss along the barrel walls and settlement in the roadway is progressing. BIF was sent on crushing of culvert and settlement in roadway. ~SMP/SEP

5/29/2018 – Structure is in poor condition with heavy rust scaling and large holes along walls and invert. Beaver dam downstream damming up water causing sediment to build up in structure. Structure should be replaced before further deterioration or failure occurs. ~SMP/AAL

11/20/2017 - Culvert was unseen due to the water level. Holes in the invert on both ends that can been seen. Beavers have been working on the banks. Should return when the water level is down. ~FRE/MAC

10/28/2016 – Culvert is in very poor condition with the bolt line midway up the culvert sidewalls having heavy deterioration along entire length of culvert. Invert has heavy pitting with large perforation at inlet and outlet with piping occurring. A new culvert is needed or a new sleeve to prevent culvert failure. ~SMP/ABC/JAS

11/19/2015 – Culvert is in poor condition due to the heavy rusting along both haunches and in the invert. Culvert should be considered for replacement soon. ~FRE/TJB

Hydraulics

The existing structure does not meet the current hydraulic standards of the VTrans hydraulic manual. Additionally, the existing structure constricts the channel width, as it does not meet the 10-foot measured bank full width, resulting in an increased potential for debris blockage. This complication is known to cause ponding at the inlet, increase stream velocity and scour at the outlet, and may lead to erosion and failure of channel banks. This structure is within the mapped FEMA flood insurance study floodplain. The VTrans Hydraulics Unit recommends either a precast box with a waterway opening of 10-feet x 5-feet, or a pipe arch with a clear span of 137 inches and a height of 87 inches.

See the Preliminary Hydraulics Report in Appendix D for additional information.

Utilities

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

Municipal Utilities

- The Town of Williston does not have any water or sewer mains anywhere near this area.

Public Utilities

Underground:

- There are underground Utilities in the project area owned by Vermont Gas Systems and Consolidated Communications. There are some abandoned WCVT fiber and copper lines buried on the North side of the road.

Aerial:

- There are aerial utilities in the project area owned by Green Mountain Power, Firstlight Fiber, Comcast, Consolidated Communications, and Waitsfield Champlain Valley Telecom.

Right-Of-Way

The existing Right-of-Way is plotted on the Existing Conditions Layout Sheet. There is a 4-rod Right-of-Way centered on US Route 2. The inlet and outlet of the existing pipe is located outside the State-owned Right-Of-Way, and as such, it is anticipated that Right-Of-Way will be required for all alternatives.

Environmental and Cultural Resources

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

Biological:
Additional information about biological resources can be found in Appendix G.

Wetlands/Floodplains

Existing mapping in the immediate project area indicated presence of class II wetlands from the wetland advisory layer mapping. The wetlands are contiguous to other mapped class II wetlands upstream from the project. During a field visit, two wetlands were identified in the SE and NE quadrants of the project.

An unnamed tributary of the Winooski River which is a perennial stream flows through the project area.

Wetlands and the watercourse within the project area are regulated by the US COE and the ANR. Alternatives must avoid and minimize impacts to these resources to the maximum extent practical.

Rare, Threatened, and Endangered Species

There are no RTE species or significant natural communities present within the vicinity of the project.

The project area is within the range of the northern long-eared bat although no suitable habitat is present within the project area.

Wildlife Habitat

Aquatic organism passage should be incorporated into any design at this location. This would allow passage of small terrestrial mammals that may use the riparian zone as movement from habitat blocks. The stream is a direct tributary to the Winooski River.

Agricultural Soils

Soils mapped in the project area are Limerick (statewide (b)) soils and Hadley very fine sandy loam (prime).

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 23 is not historic and there are no historic or Section 4(f) resources in the project area.

Archeological:

All four quadrants of the project are considered archaeologically sensitive. It is recommended that construction impacts be minimized as much as possible.

The areas of archaeological sensitivity have been plotted on the Existing Conditions Sheet.

Stormwater:

There are no stormwater concerns for this project.

II. Alternatives Discussion

No Action

This alternative is not recommended. The culvert is in serious condition and will continue to deteriorate if no action is taken. Something will have to be done to improve this culvert in the near future. Although the culvert does not appear to be in imminent danger of collapse, it will eventually be posted for lower traffic loads. 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 rated in serious condition with crushing and severe section loss. As a result, the roadway above is seeing material loss and settlement. A rehabilitation is not recommended.

Culvert Replacement – New Buried Structure

This option involves removing the existing corrugated galvanized metal plate pipe arch and replacing it with a new buried structure having a waterway opening of at least 10 feet wide and 5 feet high.

Since there is an average of 3 feet of fill above the existing culvert, there would not have to be an extremely large amount of earthwork, making this a good site for a new precast buried structure using an open cut. Any new structure should have flared wingwalls and headwalls extending down at least four feet, 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 current roadway width is 28-feet. This does not meet the minimum standard of 32-feet. This corridor is a "High Use/Priority" route for bicyclists. Additionally, most of the US Route 2 corridor through Williston meets the minimum standard. Since a new 75+ year structure is being proposed, the roadway geometry should meet the minimum standards through the project limits. Two 11-foot lanes with 5-foot shoulders will be constructed for a 32-foot paved width.

b. Structure Type

The most common structure types for the recommended hydraulic opening are a 4-sided concrete box culvert, or a 3-sided open bottom concrete structure. Due to the limited amount of fill over the existing culvert, a metal pipe is not recommended.

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.

c. Culvert Size, Length and Skew

The existing culvert has a span of 7 feet, which constricts the natural channel width and does not provide adequate hydraulic capacity. Hydraulics has recommended a box with a minimum 10 foot wide and 7-foot-high inside opening, with the invert buried 2 feet, resulting in a 10-foot by 5-foot waterway opening. The 10-foot bank full width should be confirmed by ANR early on in the design process. The culvert will have a skew of 20 degrees to the roadway to match the existing skew of the channel. In order to accommodate a 32-foot-wide roadway with that culvert skew, the proposed barrel length will be approximately 85 feet long.

d. Roadway Alignment

The existing horizontal alignment is straight and meets the minimum standard. Additionally, the vertical alignment meets the minimum standards. As such, both the horizontal and vertical alignment will remain unchanged.

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 provide adequate AOP. The roadway width through the project area would be improved for this option.

Disadvantages: This option has the highest upfront costs. This option would require Right-of-Way acquisition.

III. Maintenance of Traffic

The Vermont Agency of Transportation reviews each new project to determine suitability for the Accelerated Bridge Program, which focuses on expedited delivery of plans and specifications, permitting, and Right-of-Way, as well as accelerated construction of projects in the field. One practice that helps this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges thereby reducing project impacts. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects sooner. 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 also expedites construction schedules. This applies to bridge decks, superstructures, and substructures. Accelerated Bridge Construction also 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 culvert and reroute traffic onto a regional detour. There are several regional and local detour routes available at this site. The shourtest regional detour has an end-to-end distance of 12.0 miles and adds approximately 1.2 miles to travel distance. The available regional detour routes are as follows:

Regional Detour 1: US Route 2, to VT Route 117 and VT Route 2A, back to US Route 2. (16.4 miles end-to-end)

Regional Detour 2: US Route 2, to I-89, and VT Route 2A, back to US Route 2. (12.0 miles end-to-end)

There are several local bypass routes that may see an increase in traffic from local passenger cars. Local bypass routes are not signed detours, but may experience higher traffic volumes if US Route 2 is closed during construction. The most likely local bypass routes are as follows:

1. US Route 2, to VT Route 117, and North Williston Road, back to US Route 2 (10.5 mi end-to-end)

A map of the detour route and possible local bypass route, which could see an increase in traffic, can be found in Appendix M.

Advantages: This option would eliminate the need for a temporary bridge or phased construction, which would significantly decrease cost and time of construction. Additionally, this option would have the least impacts to adjacent properties and environmental and cultural resources.

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

Option 2: Phased Construction

Phased construction is the maintenance of one-way alternating traffic on the existing bridge while building one lane at a time of the proposed structure. This allows the road to be kept open during construction, while having minimal impacts to adjacent property owners. There is an average of 3 feet of fill over the existing culvert. As such, it would not require large amounts of fill to be retained during construction.

Based on the traffic volumes, it is reasonable to close one lane of traffic, and maintain one lane of alternating one-way traffic with a traffic signal.

The phasing for this site could be accomplished in 2 phases. The layout of this phasing sequence can be found in Appendix N. The following is a description of the phases:

- Phase 1: A single lane open to traffic on the downstream side of the road, over the existing culvert. During this phase, a portion of the existing culvert would be removed and

replacement with precast culvert sections would be installed on the upstream side of the road.

- Phase 2: A single lane open to traffic on the upstream side of the road, over the new culvert sections that were placed in Phase 1. During this phase, the remaining portion of the existing culvert would be removed and replaced with precast culvert sections installed on the downstream side of the road. The channel flow would be established in the new culvert at this time.

Advantages: Traffic flow would be maintained through the project corridor during construction. Also, this option would have minimal impacts to adjacent properties, threatened species, surrounding wetlands, and cultural resources.

Disadvantages: Phased construction generally involves higher costs and complexity of construction. Costs are usually higher and construction duration is longer, since many construction activities have to be performed multiple times. Additionally, since cars are traveling near construction activity, there is decreased safety. There would be some delays and disruption to traffic, since the road would be reduced to one-way alternating traffic.

Option 3: Temporary Bridge

From a constructability standpoint, a temporary bridge could be placed on either the upstream or downstream side of the existing culvert. A downstream temporary bridge would have greater impacts to aerial utilities and require a more significant utility relocation. Both an upstream and downstream temporary bridge would have impacts to wetlands and archaeological resources and would require additional rights from adjacent property owners.

A one-way temporary bridge with traffic signals would be required based on the daily traffic volumes and sight distance. See the Temporary Bridge Layout Sheets in Appendix N.

Advantages: Traffic flow can be maintained through the project corridor during construction.

Disadvantages: This option would require additional Right-of-Way acquisition for placement of the temporary bridge. This option would have adverse impacts to adjacent properties, threatened species, and other environmental and cultural resources. 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.

IV. Alternatives Summary

Based on the existing site conditions, bridge condition, and recommendations from hydraulics, there are several viable alternatives:

Alternative 1a: New Precast Box Culvert with Traffic Maintained on Offsite Detour
Alternative 1b: New Precast Box Culvert with Traffic Maintained with Phased Construction
Alternative 1c: New Precast Box Culvert with Traffic Maintained on a Temporary Bridge

V. Cost Matrix[1]

Williston BF5500(19)		Do Nothing	Alt 1a	Alt 1b	Alt 1c
			10' x 7' Precast Reinforced Concrete Box		
			Offsite Detour	Phased Construction	Temporary Bridge
COST	Bridge Cost	$0	354,400	407,500	354,400
	Removal of Structure	$0	64,800	74,500	64,800
	Roadway	$0	208,400	299,600	208,400
	Maintenance of Traffic	$0	89,300	196,600	94,100
	Construction Costs	$0	716,900	978,200	721,700
	Construction Engineering + Contingencies	$0	215,070	293,460	216,510
	Accelerated Premium	$0	28,700	0	0
	Total Construction Costs w CEC	**$0**	960,670	1,271,660	938,210
	Preliminary Engineering[2]	**$0**	251,000	342,400	402,600
	Right of Way	**$0**	10,000	10,000	40,000
	Total Project Costs	$0	1,221,670	1,624,060	1,380,810
	Annualized Costs	$0	16,300	21,700	18,500
SCHEDULING	Project Development Duration[3]	NA	3 years	3 years	4 years
	Construction Duration	NA	3 months	8 months	8 months
	Closure Duration (If Applicable)	NA	1 week	N/A	N/A
ENGINEERING	Typical Section - Roadway (feet)	28'	32'	32'	32'
	Typical Section - Bridge (feet)	3-11-11-3	5-11-11-5	5-11-11-5	5-11-11-5
	Geometric Design Criteria	Substandard Width	Meets Minimum Standards	Meets Minimum Standards	Meets Minimum Standards
	Traffic Safety	No Change	Improved	Improved	Improved
	Alignment Change	No	No	No	No
	Bicycle Access	No Change	Improved	Improved	Improved
	Hydraulic Performance	Substandard	Meets Standard	Meets Standard	Meets Standard
	Pedestrian Access	No Change	Improved	Improved	Improved
	Utility	No Change	Aerial Relocation	Aerial Relocation	Aerial Relocation
OTHER	ROW Acquisition	No	Yes	Yes	Yes
	Road Closure	No	Yes	No	No
	Design Life	<10 years	75 years	75 years	75 years

[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.

VI. Conclusion

Alternative 1a is recommended; to replace the existing culvert with a precast box culvert while maintaining traffic on an offsite detour.

Structure:
The existing culvert is in serious condition and needs replacement. Due to the minimal amount of fill over the culvert, a concrete box is recommended. The current culvert does not meet the minimum hydraulic standard for capacity or bank full width. As such, a culvert replacement with a larger structure is recommended.

The new culvert will be a 10-foot x 7-foot precast concrete box culvert, in order to meet the VTrans Hydraulic Section's recommendation. Additional structure recommendations from the hydraulics report are as follows:

> *"The box invert should be buried 2 feet. This will result in a clear height of 5 feet above streambed, providing 50 square feet of waterway area. Bed retention sills should be added in the bottom of the structure. Sills should be 12 inches high at the edges of the box and 6 inches high in the center, creating a V-shape across the full width of the box. Sills should be spaced no more than 8 feet apart throughout the structure with one sill placed at both the inlet and the outlet. The structure should be filled level to the streambed with E-Stone, Type II, allowing flow to be kept above the surface, providing the conditions necessary for aquatic organism passage."*

The new culvert should have headwalls that extend four feet below the channel bottom at the inlet and the outlet to prevent undermining. This structure will have no roadway overtopping below the Q_{50} storm event.

The existing roadway width does not meet the minimum standard. This corridor is a "High Use/Priority" route for bicyclists. Additionally, most of the US Route 2 corridor through Williston meets the minimum standard. As such, it is recommended that the new culvert be lengthened to provide the minimum standard roadway width through the project. Two 11-foot lanes with 5-foot shoulders will be constructed for a 32-foot paved width.

Traffic Control:
The recommended method of traffic control is to close the culvert for one week and maintain traffic on an offsite detour. The available regional detours for this project location would add approximately 1.5 to 5.5 miles to the through route and have an end-to-end distance of 12.0 to 16.4 miles. There is a local bypass route which may be used by local traffic. This route adds 4.3 miles to the through route and has an end-to-end distance of 10.5 miles. The option to close the road is the least expensive and the safest option. Based on the serious condition of this culvert, and the need to accelerate project delivery, it seems reasonable to close the road since the benefits outweigh the temporary inconvenience. By closing the road, there will be less impacts to Right-of-Way and environmental resources, and the project can be delivered sooner.

VII. Appendices

- Appendix A: Site Pictures
- Appendix B: Town Map
- Appendix C: Bridge Inspection Report
- Appendix D: Hydraulics Memo
- Appendix E: Preliminary Geotechnical Information
- Appendix F: Resource ID Completion Memo
- Appendix G: Natural Resources Memo
- Appendix H: Archeology/Historic Memo
- Appendix I: Stormwater Memo
- Appendix J: Local Input – No Response Received
- Appendix K: VTrans Operations Input
- Appendix L: Crash Data
- Appendix M: Detour and Local Bypass Maps
- Appendix N: Plans

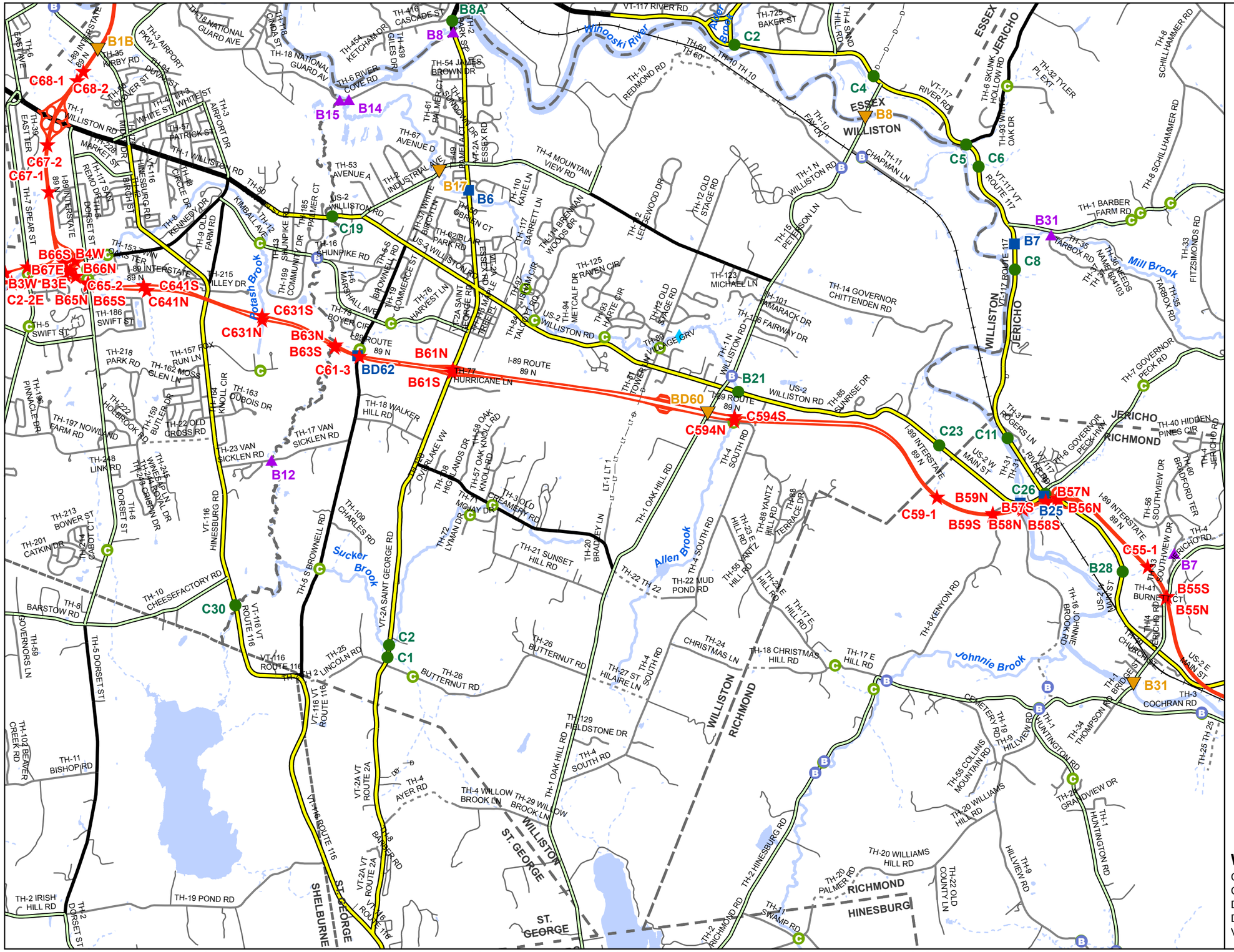
Appendix A: Site Pictures

Looking west over Culvert 23

Looking East over Culvert 23

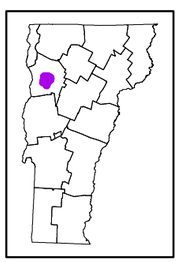
Culvert Barrel

Appendix B: Town Map



* 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
May 2017



WILLISTON

COUNTY-TOWN CODE: **0417-0**
CHITTENDEN COUNTY
DISTRICT # 5
District Long Name: Colchester District
VTrans Four Region: Northwest

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 : WILLISTON **Bridge No.:** 0023 **District:** 5

Located on: US2 **over** BROOK **approximately** 1.1 MI W JCT VT 117 **Maintained By:** STATE-OWNED

CONDITION

Deck Rating: N NOT APPLICABLE

Superstructure Rating: N NOT APPLICABLE

Substructure Rating: N NOT APPLICABLE

Channel Rating: 3 SERIOUS

Culvert Rating: 3 SERIOUS

Federal Str. Number: 300284002304171

AGE and SERVICE

Year Built: 1917 **Year Reconstructed:** 1969

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): 02

ADT: 3200 **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): 28

Skew: 10

Bridge Median: 0 NO MEDIAN

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 05 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: CGMPPA

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): 74

Average Cover Over Culvert (ft): 03

Waterway Area Through Culvert (sq.ft.): 28

Wingwall/Headwall Rating: 5 FAIR CONDITION

APPRAISAL

Appr. Rdwy. Alignment: 8 EQUAL TO DESIRABLE CRITERIA

INSPECTION

Inspection Date: 092020 **Inspection Frequency (months):** 12

INSPECTION SUMMARY and NEEDS

Appendix D: Hydraulics Memo

VERMONT

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

Agency of Transportation

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TO: Laura Stone, Structures, Scoping Project Manager

CC: Nick Wark, Hydraulics Engineer

FROM: Keith Friedland, Hydraulics Technician

DATE: September 8, 2021

SUBJECT: Williston BF 5500(19), pin# 21B031
Williston US-2, over unnamed tributary to Winooski River
Site location: Br23, mm 5.75
Coordinates: 44.430485, -73.030741

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

VTrans Hydraulics Unit visited this site on 6/11/2021, field measurements of bankfull width varied from 8 to 11 feet at a bankfull depth of 3 to 5 feet upstream and downstream of the structure. We attempted to confirm the minimum BFW with ANR but have not been successful to date. We recommend verifying the structure span with ANR prior to developing preliminary plans. If you would like Hydraulics to continue to work on this, please let us know.

Design Storm Flow is 2% AEP (Q50). *This structure is within the mapped FEMA flood insurance study floodplain.*

Model results

- Existing Structure:
    - Corrugated metal plate pipe with a clear span of 6.8 feet and a clear height of 5.5 feet, providing a waterway opening of 29 square feet. Our calculations, field observations and measurements indicate the existing structure does not meet current standards of the VTrans Hydraulic Manual nor does the existing structure meet state stream equilibrium standards for bankfull width (span length). The existing structure constricts the channel width, resulting in an increased potential for debris blockage. This complication is known to cause ponding at the inlet, increase stream velocity and scour at the outlet, and may lead to erosion and failure of channel banks. This structure results in a headwater depth of 6.9 feet at 2% AEP and 8.0 feet at 1% AEP.
- Proposed Structures
    - A concrete box with an inside opening span of 10 feet and minimum height of 7 feet. The box invert should be buried 2 feet. This will result in a clear height of 5 feet above streambed, providing 50 square feet of waterway area. Bed retention sills should be added in the bottom of the structure. Sills should be 12 inches high at the edges of the box and 6 inches high in the center, creating a V-shape across the full width of the box. Sills should be spaced no more than 8 feet apart throughout the structure with one sill placed at both the inlet and the outlet. The structure should be filled level to the streambed with E-Stone, Type II, allowing flow to be kept above the surface, providing the conditions necessary for aquatic organism passage. This structure results in a headwater depth of 4.4 feet at 2% AEP and 5.3 feet at 1% AEP.

- A pipe arch with a clear span of 137 inches and height of 87 inches. The invert should be buried 2 feet. This will result in a clear height of 5.3 feet above streambed, providing 48.6 square feet of waterway area. Bed retention sills need to be added and filled as described for the box above. This structure results in a headwater depth of 4.2 feet at 2% AEP and 5.3 feet at 1% AEP.

Stone Fill, Type II should be used to protect any disturbed channel banks or roadway slopes at the structure's inlet and outlet, up to a height of at least one-foot above the top of the opening. The stone fill should not constrict the channel or structure opening.

It is always desirable for a new structure to have flared wingwalls, matched into the channel banks at the inlet and outlet, to smoothly transition flow and protect the structure and roadway approaches from erosion. It is also recommended that full height concrete headwalls be constructed at the inlet and outlet. Any closed bottom structure should also be equipped with cutoff walls, extending to a depth equal to the culvert rise, up to 4 feet, or to ledge, to serve as undermining prevention.

The proposed structures meet the requirements of the VTrans Hydraulics Manual. 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.

Appendix E: Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

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

AJA

From: August Arles, Geotechnical Engineer

Date: July 16th, 2021

Subject: Williston BF 5500(19) Preliminary Geotechnical Information

1.0 INTRODUCTION

As requested, we have completed our preliminary geotechnical investigation for Bridge No. 23 on US Route 2 over an unnamed brook as part of the Williston BF 5500(19) project. Bridge No. 23 is a 7-foot diameter steel pipe culvert, located approximately 1.1 miles east of the intersection of US Route 2 and VT Route 117. 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 surficial and bedrock geologic maps. The subject 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 postglacial fluvial deposits consisting of alluvium (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 phyllite of the Fairfield Pond Formation (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. The three closest logs of wells TAG 36281, TAG 21630, and TAG 51297 were located approximately 315 feet (ft), 1,045 ft, and 1,353 ft from the project site, respectively, and did not report hitting bedrock to a depth of 22 ft, 32 ft and 305 ft bgs, respectively.

2.3 Hazardous Materials and Underground Storage Tanks

The ANR Atlas also maintains a database of all known hazardous waste sites and underground storage tanks. According to their published data there are no sites located within a 0.5-mile radius of the project, and the location of the project is not on the Hazardous Site List. No impact from other hazardous waste sites is anticipated.

2.4 Record Plans

A review of historical record plans was also a part of this investigation; however, no record plans were available for this project.

3.0 FIELD INVESTIGATION

A field investigation was conducted on July 6th, 2021. Two standard penetration borings were advanced near the inlet and outlet of the existing structure to evaluate the subsurface profile and aid in design and construction of a replacement structure. During drilling operations, split spoon samples and standard penetration tests (SPT) were taken continuously until 20 feet (ft) below ground surface (bgs). Shelby tube samples were taken from a depth of 17 ft to 19 ft bgs in B-101 and 20 ft to 22 ft bgs in B-102. B-101 ended at 21 ft bgs, and B-102 ended at 22 ft bgs. No bedrock was encountered in either of the borings.

4.0 SOIL PROFILE

The field investigation indicates that the soil strata of the project site generally consist of loose to medium dense granular soils consisting primarily of sand and sandy gravel to a depth of 15 ft and soft silty clay from 15 ft to the end of each boring.

5.0 RECOMMENDATIONS

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

- Reinforced concrete box culvert with new wingwalls and headwalls with spread footings founded on soil
- Precast or steel arch with spread footings founded on soil

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.

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 7/12/21.

Reviewed by: Stephen Madden, Geotechnical Engineer SPM

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

Appendix F: Resource ID Completion Memo

OFFICE MEMORANDUM

AOT - PDB - ENVIRONMENTAL SECTION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Laura Stone, Project Manager
FROM: Julie Ann Held, Environmental Specialist *Drafted by Solomon Lew, Environmental Specialist Technical Apprentice*
DATE: August 3, 2021
Project: Williston BF 5500(19)

ENVIRONMENTAL RESOURCES:

Archaeological Resources:	X		See Archaeological Resource ID Memo
Historic Resources:		X	See Historic Resource ID Memo
Wetlands:	X		See Natural Resource ID Memo
Aquatic Organism Passage:	X		See Natural Resource ID Memo: Aquatic organism passage should be incorporated into any design at this location.
Agricultural Soils:	X		See Natural Resource ID Memo
Wildlife Habitat:	X		See Natural Resource ID Memo
Endangered Species:	X		See Natural Resource ID Memo
Stormwater Considerations:		X	See Stormwater Resource ID Memo- See Drainage Considerations
6(f) Properties:		X	
Hazardous Waste:		X	
Urban Background Area:		X	
Wild Scenic Rivers:		X	
Act 250 Permits:		X	
FEMA Floodplains:	X		This area is mapped within a type AE FEMA Floodplain, a FHARC permit may be required depending on the scope of work.
Flood Hazard Area:	X		This area is mapped within a type AE FEMA Floodplain, a FHARC permit may be required depending on the scope of work.
River Corridor:	X		This project is located over an unnamed tributary of the Winooski River, depending on the scope of work River Management Consultation may be required.
US Coast Guard:		X	
Lakes and Ponds:		X	
Other:		X	

cc:
Project File

Appendix G: Natural Resources Memo

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

Agency of Transportation

To: Julie Ann Held, VTrans Environmental Specialist

From: Glenn Gingras, VTrans Environmental Biologist

Date: 7/13/2021

Subject: Williston BF 5500(19)- Natural Resource ID

I have completed my natural resource identification for the above referenced project. My evaluation has included wetlands, wildlife habitat, agricultural soils, and rare, threatened, and endangered species. I have reviewed existing mapped information and I performed a field visit on 5/20/2021.

Wetlands/Watercourses

Existing mapping in the immediate project area indicated presence of class II wetlands from the wetland advisory layer mapping. The wetlands are contiguous to other mapped class II wetlands upstream from the project. During the field review I completed a wetland delineation in accordance with USCOE wetland delineation methodologies. Two wetlands were identified in the SE and NE quadrants of the project.

Figure 1 Wetland A US 2 in background

Wetland A (SE Quad) (figure 1) is a Palustrine emergent wetland dominated by sedges, sensitive fern and reed canary grass. The wetland has mapped hydric soils and field conditions consisted of dark, loamy soils that met the "depleted matrix" criteria. Several hydrology indicators were observed during the field visit. Wetland A continues on the north side of the culvert adjacent to the stream.

Wetland B (NE Quad) is a small palustrine emergent wetland in a field adjacent to the road. This wetland is likely less than 0.5 acres in size. The wetland is dominated by reed canary grass. The soils met the criteria for a depleted matrix and several hydrology indicators were observed.

An unnamed tributary of the Winooski River which is a perennial stream flows through the project area.

Wetlands and the watercourse within the project area are regulated by the US COE and the ANR. Alternatives must avoid and minimize impacts to these resources to the maximum extent practical. A natural resource *dgn* was created and should be referenced for wetland boundaries.

Figure 2 US 2 BR 23 and adjacent wetlands

Wildlife Habitat

Aquatic organism passage should be incorporated into any design at this location. The stream is a direct tributary to the Winooski River.

The current structure (figure 2) is likely to provide aquatic organism passage under most conditions. Bank lines are not present within the structure. If constructed in accordance with AOP guidelines they would likely be achieved. This would allow passage of small terrestrial mammals that may use the riparian zone as movement from habitat blocks.

Rare, Threatened and Endangered Species (RTE)
I have queried the ANR Natural Resource database and no RTE species or significant natural communities are present within the vicinity of the project. The project area is within the range of the northern long-eared bat although no suitable habitat is present within the project area.

Agricultural Soils:
Soils mapped in the project area are Limerick (statewide (b)) soils and Hadley very fine sandy loam (prime).

Invasive Species
No class A or B noxious weeds were found in the project area.

Williston BF5500(19) Overview of Natural Resources

Williston BF 5500 (19)

Appendix H: Archeology/Historic Memo

Archaeological Resource Assessment
Williston Culvert No. 23, U.S. Route 2
BF-5500(19)

Town of Williston, Chittenden County, Vermont

Prepared for:

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

Prepared by:

WSP USA Inc.
433 River Street, 7th Floor
Troy, New York 12180

July 16, 2021

Archaeological Resource Assessment
Williston Culvert No. 23, U.S. Route 2
BF-5500(19)

Town of Williston, Chittenden County, Vermont

Prepared for:

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

Prepared by:

Jessica Vavrasek and Marlis Muschal

WSP USA Inc.
433 River Street, 7th Floor
Troy, New York 12180

July 16, 2021

Abstract

On behalf of the Vermont Agency of Transportation (VTrans), WSP USA Inc. (WSP) of Troy, New York, completed an archaeological resource assessment (ARA) for the proposed improvements to Williston Culvert No. 23, U.S. Route 2, Chittenden County. The scope for the project has yet to be defined; WSP therefore conducted this survey and resource assessment to consider the potential effects of site access, culvert installation and other potential project activities associated with improvements at the site of the Culvert. The archaeological area of potential effect (APE) extends 30.5 meters (100 feet) from either end of the culvert to include all four quadrants of the culvert approaches.

The goal of the ARA was to survey the entire APE to determine if any archaeologically sensitive areas are present. The ARA consisted of background research as well as field inspection, which was conducted on April 8, 2021. The ARA determined the project APE's sensitivity for archaeological resources based on the potential for intact subsurface soils, the APE's relationship to nearby known archaeological sites and historic structures, and other criteria, including soils, topography, and proximity to water. WSP used the Vermont Division for Historic Preservation's *Environmental Predictive Model for Locating Precontact Archaeological Sites* and the Vermont Online Resource Center to inform its assessment.

Background research determined that 14 precontact archaeological sites have been previously recorded within 1.6 kilometers (1 mile) of the APE. No previously recorded historic sites are located within 1.6 kilometers (1 mile) of the APE. No precontact or historic sites were identified during the ARA. Given the density of precontact sites around the APE and their location on landforms similar to those in the APE, the area in and around the APE should be considered potentially sensitive for precontact archaeological resources.

It is WSP's opinion that any future development carried out in the APE may have impacts on potential archaeological resources, and that additional archaeological investigation of the APE may be necessary if a staging area or a temporary bridge is planned during the culvert restoration. In addition, should project activities be expanded and the APE changed, further investigation may be warranted in those areas.

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I. Introduction

A. Project Description

On behalf of the Vermont Agency of Transportation (VTrans), WSP USA Inc. (WSP) of Troy, New York, completed an archaeological resource assessment (ARA) for the proposed improvements to Williston Bridge No. 23, U.S. Route 2, Chittenden County (Figure 1). The scope for the project has yet to be defined; WSP therefore conducted this survey and resource assessment to consider the potential effect of site access, approach work, staging, bridge installation, and other potential project activities associated with improvements at the site of the bridge.

The archaeological area of potential effect (APE) extends 30.5 meters (100 feet) from either end of the bridge to include all four quadrants of the bridge approaches (Figure 2).

B. Scope of Services

The goal of the ARA was to survey the entire APE to determine if any archaeological sensitive areas are present. This will allow VTrans maximum flexibility in avoiding sites that are eligible for the National Register of Historic Places (NRHP). For the ARA, WSP conducted background research and a field inspection, and evaluated the location using the Vermont Department of Historic Preservation (VDHP) *Environmental Predictive Model for Locating Precontact Archaeological Sites* (VDHP 2015) (see Appendix A), the Vermont Online Resource Center (ORC) map tool (VDHP 2021), historical maps, and local histories (see Chapter IV.A).

All cultural resource services were performed using the professional guidelines and standards in *Procedures for the Protection of Historic and Cultural Properties* (36 CFR 800) and *Procedures for Determining Site Eligibility for the National Register of Historic Places* (36 CFR 60 and 63). This investigation also conformed to the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 *Federal Register* 44716) (United States Department of the Interior 1983), and *Guidelines for Conducting Archaeology in Vermont* (VDHP 2002). The cultural resource specialists who performed this work satisfy the Secretary of the Interior's Professional Qualifications standards as specified in 36 CFR 66.3(6)(2).

This report has been organized into six chapters. After the introduction in Chapter I, Chapter II describes the environmental setting of the APE. Chapter III discusses the cultural context for the APE, briefly outlining the 11,000-year history of the region and summarizing previous archaeological investigations in the vicinity. Chapter IV presents the methods and results of the ARA, and Chapter V contains the conclusions. Chapter VI lists the references cited. Appendix A provides the Environmental Predictive Model Checklists.

This investigation was conducted under the direction and supervision of WSP Senior Vice President Hope Luhman, PhD (Register of Professional Archaeologists [RPA 10505]). WSP Historic Preservation Manager Camilla McDonald served as the project manager. Archaeologist Jessica Vavrasek, PhD (RPA 989768) conducted the field inspection. Dr. Vavrasek completed the background research and wrote the report with assistance from Archaeologist Marlis Muschal (RPA 34344474). Principal Draftsperson Jacqueline L. Horsford prepared the graphics. Principal Editor Anne Moiseev supervised the editing and production of the report.

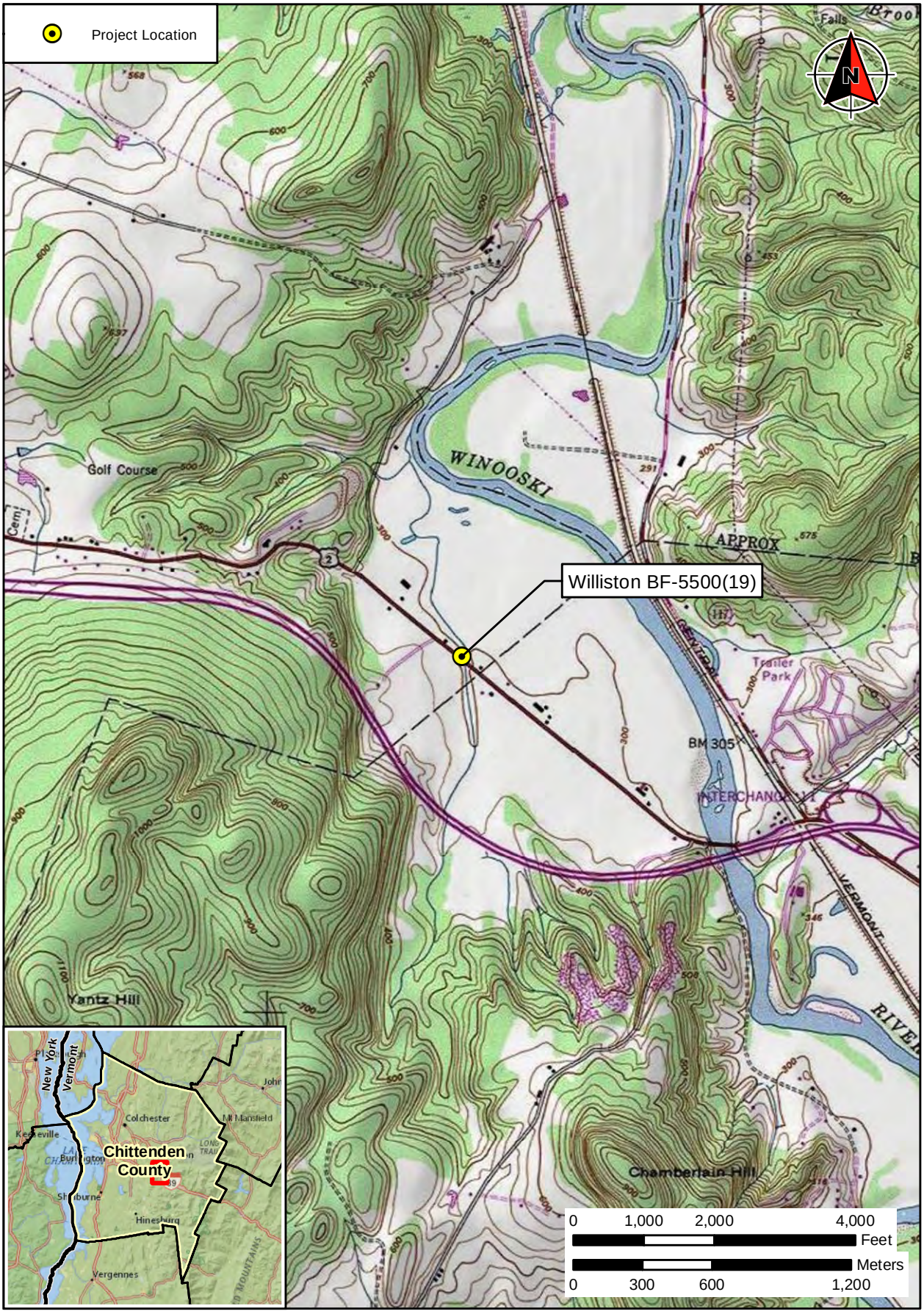

FIGURE 1: Location of Project BF 5500(19) (ESRI USA Topo Maps 2019)

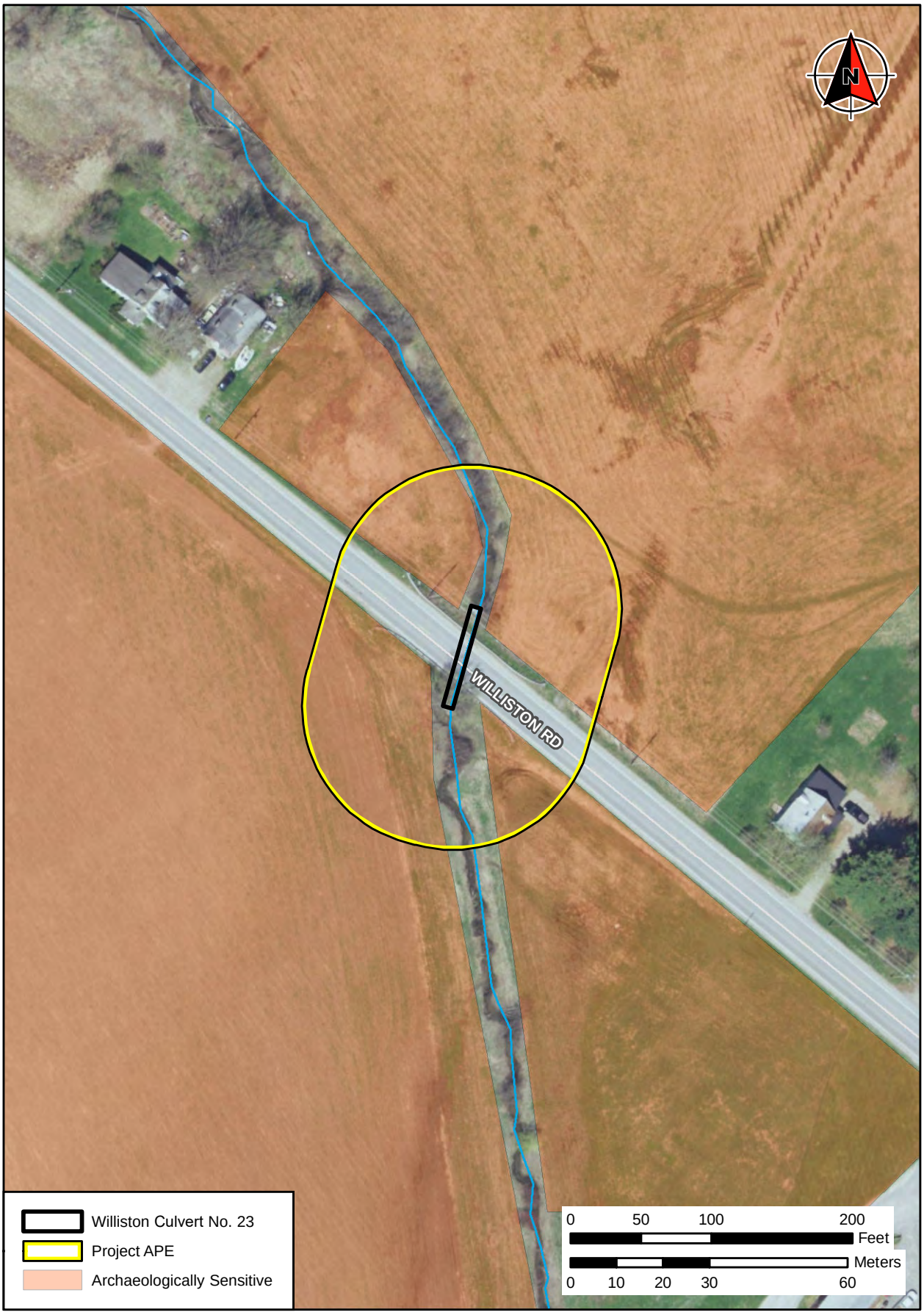

FIGURE 2: Project Area of Potential Effect (APE) (VCGI 2018)

II. Environmental Setting

A. General Setting

The APE is located where U.S. Route 2 crosses an unnamed brook. The APE is in the Green Mountains physiographic region, which runs north-south through Vermont. The northern part of the Green Mountain physiographic region is characterized as an assortment of mountain peaks with deeply incised valleys carved by both the Winooski and Lamoille rivers. The mountains are 400 million years old. The glaciated terrain once reached elevations of as much as 2,438 meters (8,000 feet) in excess of the state's current highest elevation of 1,339 meters (4,393 feet) (Mount Mansfield). The landscape is not well suited for agriculture, and farmland is more often used as pasture. The area also receives a high degree of precipitation, partly because of its location relative to Lake Champlain (Vermont Fish & Wildlife Department 2018).

The dominant water source in the region is Lake Champlain. The major rivers of western Vermont drain the region, including Otter Creek and the Winooski, Lamoille, and Missisquoi rivers. The APE is in the Winooski River watershed (United States Geological Survey [USGS] 2018). Limestones, dolomites, and shales are found throughout the region, with sedimentary rocks in several places metamorphosed to quartzites, marbles, and slates. Rocks of Lower Cambrian and Lower Ordovician age lie throughout the Lowlands, which are part of a trough, or downfold, located between the Champlain and Hinesburg Thrusts (Ratcliffe et al. 2011).

The landscape in the APE includes a combination of agricultural land, residential lawns, and roadside modifications, including drainage ditches and built-up road berms.

B. Soils in the APE

The APE contains one general soil type. Limerick series soils are formed in loamy alluvium on floodplains, and are very deep and poorly drained (United States Department of Agriculture-Natural Resources Conservation Service [USDA-NRCS] 2020) (Figure 3; Table 1).

TABLE 1: SOILS IN PROJECT APE

SERIES NAME	SOIL HORIZON	DEPTH	COLOR	TEXTURE, INCLUSIONS	SLOPE	DRAINAGE	LANDFORM
Limerick silt loam (Le)	Ap	0-20 cm (0-8 in)	Dk Gr Brn	Si Lo	Le (0-3%)	Poorly Drained	Floodplains
	BCg1	20-50 cm (8-20 in)	Ol Gr	Si Lo			
	BCg2	50-91 cm (20-36 in)	Ol Gr	Si Lo			
	BCg3	91-137 cm (36-54 in)	Dk Gr	Si Lo			
	Cg	137-165 cm (54-65 in)	Dk Grn Gr	Si Lo			

KEY: Shade: Lt – Light, Dk – Dark, V – Very, St – Strong
Color: Brn – Brown, Blk – Black, Gry – Gray, GBrn – Grayish Brown, StrBrn – Strong Brown, RBrn – Reddish Brown, YBrn – Yellowish Brown, OlBrn – Olive Brown, Wh – White, Ol – Olive, PlBrn-Pale Brown, Brn Yl-Brownish Yellow, YRd-Yellowish Red
Soils: Cl – Clay, Lo – Loam, Si – Silt, Sa – Sand
Other: / - Mottled, Grl – Gravel, Cbs – Cobbles, Pbs – Pebbles, Rts – Roots, C – Coarse, Ch - Channery, F – Fine, V-Very, E- Extremely, Dec OM – Decomposed organic matter, S- Stratified
USDA-NRCS 2020

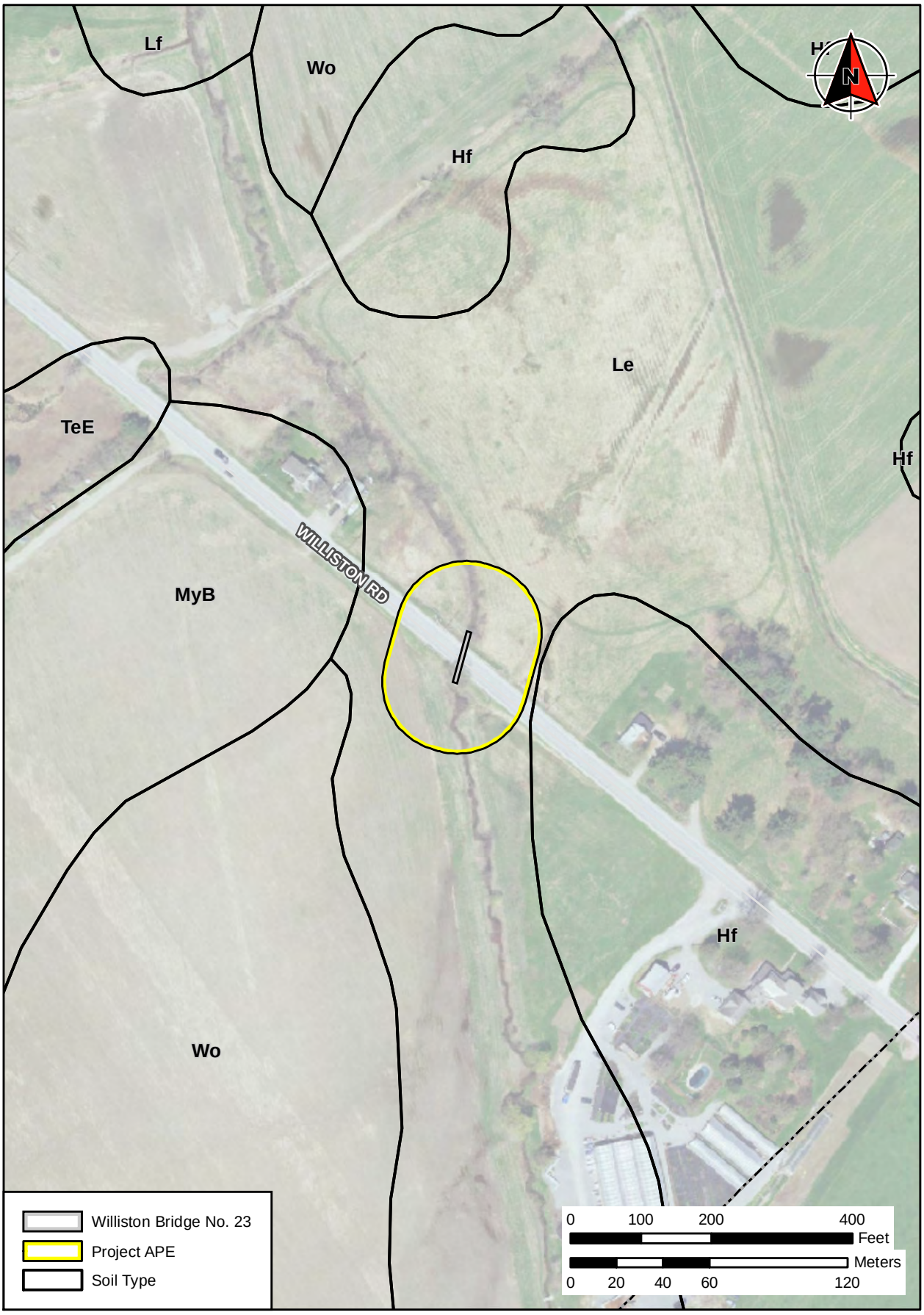

FIGURE 3: Soils in Project APE (USDA-NRCS 2019; VCGI 2018)

C. Environmental History of Vermont

Paleoecologists have constructed the environmental history of Vermont from a variety of sources, including pollen cores, sedimentation histories, and faunal collections. The ruggedness of Vermont and the pronounced differences in elevation across its landscape have resulted in regional contrasts in vegetation, creating a "patchy" landscape. Today it is possible to find tundra at a few thousand feet on the highest peaks of the Green Mountains in contrast to the deciduous and coniferous vegetation in lowlands to the east and west (Thomas 1991).

Before 13,500 years before present (BP), most of present-day Vermont was covered with glacial ice. Within a thousand years the glaciers had moved north of the St. Lawrence lowland, and in their wake grew a landscape of moss, lichens, and stunted shrubs. A frigid arctic climate prevailed, leaving the ground frozen for most of year. By about 12,000 BP most of Vermont was within an herb-to-spruce zone, with higher elevations following suit about 500 to 1,000 years later. Fauna during that period likely included wooly mammoth, mastodon, moose, elk, caribou, and musk ox, as well as smaller arctic animals such as ptarmigan, arctic shrews, and lemmings. By 11,000 BP a subarctic climate dominated the region. Before the end of the eleventh millennium BP, the Champlain Sea had drained. This sea once covered an area about twice the size of present-day Vermont and may have provided Vermont's earliest human settlers with many resources.

With the close of the Pleistocene, an open park-like woodland of largely spruce, fir, and birch moved into Vermont's lowlands, and into the mountains by the following millennium. Evidence exists of larch and alder in wet lowlands and beech, oak, ash, and maple in the better drained bottomland and low hills of the Champlain and Connecticut valleys. These changes led to growth in the populations of many animals that today live in Vermont, including moose, beaver, lynx, porcupine, snowshoe rabbit, spruce grouse, mice, voles, and other animals that likely came in from the south.

Pollen cores indicate a sharp increase by 9000 BP in the amount of white pine, hemlock, oak, poplar, elm, ash, sweet gale, and ferns throughout Vermont. Pine pollen takes up 50 percent of pollen diagrams for that period. The presence of pine-dominated forests indicates a warming trend, and thin alluvial beds on floodplains from the period suggest low precipitation (Thomas and Dillon 1983). Pollen cores illustrate a drop in the rates of various pine pollen and a rise in the amount of oak, beech, birch, sugar maple, elm, and ash pollen within a thousand years, indicating the beginning of a Temperate Oak Forest (Thomas 1991:2-4).

Different strands of evidence from the Upper Midwest and the Northeast reveal that between 7500 and 5300 BP, precipitation was higher than today, and the climate was fairly warm. Evidence of rapid sedimentation and increased channel migration along the Missisquoi River between 6500 and 5400 BP indicates a higher level of rainfall. Other evidence of a wetter environment includes high rates of hemlock and beech pollen deposition, as well as beech, cedar, maple, and hemlock logs found along the Missisquoi floodplain and dating to that time period (Brakenridge 1988; COHMAP Members 1988; Thomas and Dillon 1983).

After 6500 BP the mixed deciduous-coniferous forest in the lowlands of eastern and western Vermont provided good habitat for deer, bear, wolf, raccoon, otter, fox, gray squirrel, wild turkey, and passenger pigeon. In the higher, mountainous elevations of central Vermont, spruce-fir-northern hardwood forests were home to moose, elk, and possibly small herds of woodland caribou (Thomas 1991:2-10).

After 5000 BP hemlock steeply declined and oak and hickory increased (Whitehead and Bentley 1963), possibly indicating the onset of drier conditions. Other evidence of drier conditions includes the entrenchment and infrequent river flooding in the upper Midwest (Thompson and Bettis 1982), a lack of substantial alluvial deposits along floodplains of the Missisquoi River (Brakenridge 1988; Thomas and Dillon 1983), and an apparent drop in the water table of Shelburne Pond in the Champlain Lowlands of Vermont (Carr et al. 1977). The climate was probably between 2 and 4 degrees centigrade warmer than

today (Dincauze 1989). Chestnut appeared after about 2000 BP. Oak continues to dominate in Vermont's forests today.

Temperatures likely became cooler after about 2800 BP, and precipitation increased until about AD 270. These changes led to greater quantities of spruce and fir at higher elevations and a general increase in pine in the lowlands (Bernabo and Webb 1977; Whitehead and Bentley 1963). Warmer temperatures then returned during the first millennium AD, with a rise in precipitation after about AD 750 (Swain 1978). After AD 1050 drought conditions and higher temperatures prevailed. Evidence of lower water tables, a decrease in stream flow and frequency, and the duration of flooding demonstrate that the period between AD 1000 and 1200 may have been the warmest in Vermont in over 2,000 years. After AD 1550 cooler and moister conditions came with the beginning of the so-called "Little Ice Age" (Thomas 1991:2-9), extending into the mid-nineteenth century.

III. Cultural Context

A. Precontact Background

1. Paleoindian Period (11,000 to 10,000 BP)

The earliest known archaeological remains in Vermont date to the Paleoindian period. These sites were created by small groups of hunter-gatherers who colonized the recently deglaciated sections of the state and the surrounding region sometime before the eleventh millennium BP. Data on the specific nature of Paleoindian adaptations in Vermont remains limited. Although sites of this time period have been found in the state (Loring 1980; Ritchie 1953), none have been subject to excavation. Nevertheless, some aspects of Paleoindian adaptations can be inferred by reference to investigated Paleoindian sites in the neighboring areas of New York State, New England, and the Canadian Maritimes (e.g., Deller and Ellis 1992; Ellis and Deller 2000; Ellis and Lothrop 1989; Lothrop 1989; Meltzer 1984; Stork 1997, 2004).

Assemblages from these sites indicate three consistent attributes of Paleoindian technology that were probably also true for groups in Vermont. First, in addition to fluted points, the stone technologies of these groups consisted of a flake-based toolkit with general categories of wide- and narrow-bit unifacial tools, unifacial gravers, utilized flakes, bipolar artifacts, and large bifaces. Second, people during the Paleoindian period in the Northeast probably preferred bedrock lithic sources as opposed to secondary cobble, and lithic procurement strategy may have been driven, in part, by the design requirements of their transported stone toolkits. Finally, locations of raw material sources for Paleoindian stone toolkits are often many kilometers distant from the sites where these tools are recovered. These distances indicate that people in the Northeast traveled far to collect stone for toolmaking, either during their seasonal movements or as part of trips made specifically to gather new supplies of lithic materials (Seeman 1994).

Disagreement exists over whether people at the end of the Pleistocene in the Northeast were specialists following herds of caribou, or generalists living off a diverse environment, collecting and hunting a wide range of resources (Dincauze and Curran 1983; Pelletier and Robinson 2005). More than likely, the reality varied over time and across space, and was a question not of specialist versus generalist but rather of degree and scale (Thomas 1991:3-7). As specialists, people likely gathered in larger, multifamily settlements at key times of year along strategic intercept points to hunt caribou. These larger aggregations then split up into smaller groups and moved widely across the landscape. As generalists, the people of the Paleoindian period may have moved in small family-sized groups, mapping their movements to the availability of resources.

Archaeologists know of substantial Paleoindian sites south of the present APE in the Connecticut River valley, including the Whipple Site just off the Ashuelot River in New Hampshire (Curran 1984), the DEDIC Site on the Connecticut River in Deerfield, Massachusetts (Chilton et al. 2005), and the Turner's Falls Site on the Connecticut River in Turner's Falls, Massachusetts (Binzen 2005). In northwestern Vermont Loring (1980) documented the recovery of fluted points on and below Champlain Sea beach deposits from adjacent interior lowlands and from higher-elevation settings in the western foothills of the Green Mountains. Several sites in northwestern Vermont with evidence of Paleoindian occupations have been found in the Champlain Basin (Robinson et al. 2017).

2. Archaic Period (10,000 to 3000 BP)

Archaeologists call the period beginning 10,000 years ago following the end of the Pleistocene and the beginning of the Holocene, the Archaic period. They further subdivide the Archaic into at least three

subperiods, the Early (10,000 to 7500 BP), Middle (7500 to 6000 BP), and Late Archaic (6000 to 3000 BP). These subperiods are largely demarcated by changes in projectile point styles.

Earlier archaeologists generalized the environment of the early Holocene (Early and Middle Archaic) in the Northeast as closed woodlands dominated by conifers (Dincauze and Mulholland 1977; Fitting 1968; Ritchie 1980). Since a low carrying capacity characterizes such an environment, they hypothesized that there was a low population until about 6,000 years ago, which resulted in low site density for the period. More recently, archaeologists have questioned this understanding. Nicholas (1991a, 1991b, 1998) cites evidence that the landscape in the early Holocene was far more diverse, supporting a broader resource base than that characterized by a closed conifer forest environment. According to Nicholas's "glacial lake basin mosaic model" (Nicholas 1991a, 1991b, 1998), people took advantage of a highly productive ecosystem that contained a complex system of lakes, ponds, and wetlands. Robinson and Petersen (1993) cite the problems encountered with trying to attach changing demographics to known frequencies of temporally diagnostic projectile points. Since earlier archaeologists did not find many sites with temporally diagnostic points in early Holocene contexts, they assumed that the region was fairly uninhabited. Robinson and Petersen (1993), however, write that the lithic technology recovered from known early Holocene components is typically very expedient, resulting in the production of few temporally diagnostic formal artifacts such as projectile points. Rather, assemblages from these sites consist mostly of flake assemblages, and therefore many of the components dating to this time period have likely gone unrecognized. Furthermore, it is possible that many sites from the Early and Middle Archaic now lie deep beneath river floodplains (Thomas 1991:5-1).

In southern Vermont the transition to the Early Archaic was contemporaneous with the continued warming trend in the early Holocene and the replacement of spruce and fir by pine as the dominant tree species (Carr et al. 1977) (see Chapter II.C). The combination of environmental and technological changes during the transition to the Early Archaic may indicate an increase in the importance of plant foods and shifts in the exploitation of certain terrestrial fauna, such as the hunting of deer rather than caribou. As opposed to Paleoindian use of high-quality cherts brought long distances before discard, evidence from early Holocene sites indicates a switch to the use of local chert, quartzite, and quartz during the Early Archaic. The change is likely the result of people living in far more restricted areas than their Paleoindian ancestors as well as a lack of widespread external contacts (Thomas 1991:5-6). Archaeologists have long thought that people remained within these territories, spending portions of the year in larger base camps and then moving to smaller, more task-specific camps in the surrounding area (Snow 1980:171).

The number of known sites and diagnostic artifact types and projectile points dating to the Late Archaic (6000 to 3000 BP) is far greater throughout the Northeast and Vermont than for any of the preceding periods. There is also evidence of the development of mortuary ceremonialism. Archaeologists have traditionally characterized the Late Archaic in the Northeast and Vermont into three basic traditions based on these numerous changing artifact types. The Laurentian tradition is thought to date to between about 5600 and 4400 BP and is known from sites in western Vermont as well as elsewhere throughout the Northeast, including New York, southern Ontario, southern Quebec, and northern New England. The Narrow Point tradition follows the Laurentian and dates roughly between 4400 and 3600 BP. Archaeologists have found artifacts associated with this tradition up and down the East Coast from as far south as North Carolina and as far north as the Upper St. Lawrence River. The Susquehanna tradition is later, dating to between about 3800 and 1800 BP. Traits associated with this tradition are thought to have moved north from the Southeastern Piedmont to as far north as Maine and the Upper St. Lawrence.

These traditions differ from each other based largely on changing artifact traits; however, Dean Snow (1980) and others (e.g., Braun and Braun 1994) geographically split the Northeast during the Late Archaic into three very general sections. They base these divisions on broad generalizations about adaptations to major regional environments. The Maritime Archaic lay in the coastal regions of northern New England

and the Canadian Maritimes and is defined as an adaptation based on the resources of the ocean. The Lake Forest Archaic stretched from the Eastern Great Lakes across northern New England. Snow (1980) believes the people of the Lake Forest Archaic lived around the many lakes and rivers found in the region. The Mast Forest Archaic ran from the coastal plains of southern New England into the oak forests of the interior. Here people are thought to have made use of the abundant nut-bearing deciduous trees in the region. Although these models are useful in a very general sense, they are also problematic because they are so general and mask much of the potential for variation across the Northeast.

Our understanding of the lives people led in the Northeast is largely shaped by where the vast majority of archaeologists have worked along the great rivers of the region, including the Connecticut, the Hudson, and the Merrimack. Thousands of years ago people migrated to these rivers each spring to take advantage of the abundant annual migrations of anadromous fish. Each spring around April these fish swam far up the rivers and their tributaries to spawn until stopped by falls. They created a plentiful food resource for people at the leanest time of year when the winter stocks were empty. These large groups likely stayed together throughout much of the warm-weather months, splintering off periodically to hunt, gather different food, and collect other needed resources. There is ample archaeological evidence along the floodplains of large rivers in much of the Northeast of these large gatherings at so-called "base camps." With the onset of the cold weather, people are thought to have splintered into smaller groups, likely extended families, and moved inland away from the rivers. This pattern of small groups of hunter-gatherers aggregating during the spring and then splintering in the fall has been defined as the "central-based wandering pattern" (Ritchie and Funk 1973:340).

There is ample archaeological evidence along the floodplains of large rivers in much of the Northeast of large gatherings at so-called "base camps." These large groups likely stayed together throughout much of the warm-weather months, splintering off periodically to hunt, gather different food, and collect other needed resources. With the onset of the cold weather, people are thought to have splintered into smaller groups, likely extended families, and moved inland away from the rivers. This pattern of small groups of hunter-gatherers aggregating during the spring and then splintering in the fall has been defined as the "central-based wandering pattern" (Ritchie and Funk 1973:340).

The problem with applying these interpretations to northern Vermont is the lack of anadromous fish coming up the Connecticut River beyond Bellows Falls. Ohl (1994:55) comments on the lack of known sites dating to the Middle Archaic north of the falls, although sites dating to this period are known south of the falls up the West River and Ashuelot River in New Hampshire. Site VT-WD-0003 lies just south of the confluence of the West and Connecticut rivers and may have been the location of a large, warm-weather group aggregation. Elsewhere in northern Vermont, however, since the major impetus for large gatherings appears to have been absent north of Bellows Falls, the lives people lived in this region were likely very different from elsewhere in the Northeast.

3. Woodland Period (3000 BP to AD 1600)

The Woodland period is marked by the introduction of ceramic technology about 3,000 years ago. This new technology allowed the production of containers that could withstand cooking with direct heat. This new capability likely affected nutrition and therefore population dynamics. Ceramics also enhanced the capability to store food, which by offsetting seasonal changes in the availability of different foods made it possible for people to become more sedentary. Despite the possibilities presented by this new technology, there is little evidence of any profound changes in life across Vermont. In addition, the elaborate ceremonialism represented by the rich grave-good assemblages found at Early Woodland (3000 to 2000 BP) and Middle Woodland (2000 to 1000 BP) sites, such as Swanton, Boucher, East Creek, and Bennett (Loring 1985; Thomas 1991:9-9), indicate continuity with the burial ceremonialism of the Late Archaic.

There is little archaeological evidence of the Early Woodland in northern Vermont, and much of what we know about the Early to Middle Woodland comes from sites located in the Connecticut River valley. Two notable sites are the Canaan Site (VT-ES-2) in Canaan, Vermont, and the Skitchewaug Site (VT-WN-41) in southeastern Vermont (Bolian and Gengras 1994; Heckenberger et al. 1992). Middle Woodland sites in western Vermont, such as the Winooski (Power et al. 1980) and McNeil Generating Station sites (Thomas 1980), illustrate the use of areas along the lower reaches of rivers flowing into Lake Champlain. These sites indicate the presence of large gatherings of people who fished, harvested nuts, and hunted.

At Middle Woodland sites like Winooski and McNeil, lithic artifacts are mostly made of non-local cherts. By the Late Woodland (AD 1000 to 1600), however, people were using local cherts, perhaps suggesting changes in and an end to the long-distance trade and political relationships that had existed during the Middle and perhaps Early Woodland periods (Haviland and Power 1982:132-133; Thomas 1991:9-9). The ceramics at Winooski are "related to ceramics from the Lake Forest Middle Woodland 'cultural complex' of the Great Lakes-St. Lawrence drainage" (Petersen and Power 1983:142), whereas later ceramic assemblages "seem more clearly related to other local assemblages within the Lake Champlain drainage basin" (Petersen and Power 1983:143). Ceramics recovered from the Canaan and Skitchewaug sites are consistent with contemporaneous types found elsewhere in Vermont.

Throughout the Northeast the Late Woodland period is associated with the introduction of horticulture, particularly the importation of domesticated maize; however, it is more than likely that maize did not appear in New England until after about AD 1300 (Chilton 2006), several centuries after the Iroquois to the west had adopted it. In New York maize became a key component in the development of large permanent villages. Although maize was adopted throughout New England, there is little evidence of the development of large sedentary villages based on maize horticulture (c.f., Petersen and Cowie 2002). Rather, archaeological evidence indicates that people remained mobile hunter-gatherers who only used maize as a dietary supplement. These people therefore become what Elizabeth Chilton (2002) has called mobile farmers because although they planted, they did not become sedentary farmers like the Iroquois.

4. Contact Period (ca. AD 1600 to 1750)

At the time of European contact in the seventeenth century, the descendants of Late Woodland groups inhabiting the Connecticut Valley of Vermont included the Western Abenaki. By that time sedentary village life was a major aspect of their adaptation. The Western Abenaki were organized into several major bands or organizations, each occupying its own village site. Subsistence strategies alternated between the village setting, where crops were grown and surplus foodstuffs stored, and periodic dispersion into smaller groups that traveled to other locations, primarily to hunt (Haviland and Power 1982).

The coming of Europeans to New England in the seventeenth century brought immense and catastrophic changes to the Native peoples of the region—changes that we are only beginning to understand today. The Native inhabitants of Vermont, the Abenaki, experienced severe population loss to European diseases. Their traditional lifeways were forever changed by Europeans who took their lands, refugee populations of American Indians who moved in from elsewhere in New England, and involvement in European wars and European demand for trade goods, such as beaver pelts. The Abenaki, who call their homeland Ndakinna, meaning "our land," received tribal recognition from the State of Vermont in 2006. They are still seeking federal recognition and are referred to as the St. Francis/Sokoki Band of the Abenaki Nation of Missisquoi (Abenaki Nation 2010). Today, the St. Francis/Sokoki Band of the Abenaki Nation of Missisquoi live in northwestern Vermont (Abenaki Nation 2010).

B. Historical Overview

1. Historic Context for Northern Vermont

The first Euro-Americans to venture into the region that would become Vermont were trappers and hunters in the eighteenth century. Access to much of this area was impeded by mountains, and colonization was slow because the political situation was unsettled. Recurring hostilities between the British and French authorities initially inhibited settlers from making Vermont their home; however, even before the final surrender of the French to the British at Quebec in 1760, applications for land grants were being made by many parties.

The colony of Connecticut made the first land grants within what is now Vermont in the early eighteenth century, after Massachusetts, which had erroneously granted its own citizens 436 square kilometers (172 square miles) within the borders of Connecticut, transferred these land grants (the "equivalent lands") to Connecticut. Connecticut immediately sold these lands to people from both Connecticut and Massachusetts, who in turn sold the land to prospective settlers at a profit. After the final resolution of the Massachusetts-New Hampshire territorial disputes in 1740, these lands became New Hampshire territory. Nevertheless, most of the region's settlers continued to come from Connecticut and Massachusetts (Tosi 1948:48-49). European settlement was slow in all parts of today's Vermont until 1761, when Benning Wentworth, governor of New Hampshire, claimed the lands for New Hampshire and began establishing illegal land grants. These territories became the State of Vermont in 1791.

Prior to 1830, subsistence farming was the dominant economic activity. The earliest economic activity outside the household was the sale of potash and lumber obtained from land clearing. Potash, owing to its high market value and use in the production of glass, became the only inspected product in Vermont at that time (Elliott 1977:18). Small manufacturers, including gristmills and sawmills, sprang up throughout the region to process locally grown materials. Distilleries (using rye and corn) and starch factories (using potatoes) also developed. Taverns and general stores opened to cater to the local populace in nearly every town. By 1830 the region's agricultural economy was concentrated on the cultivation of potatoes and grains, some of which was shipped to Eastern and Southern markets. Wheat was initially an important crop, so much so that it was used as money by the earliest settlers. As transportation increased to wider markets, farmers focused more on a smaller number of specialized products.

Apple growing became an important part of the Vermont economy. John McIntosh, born in 1776, eventually began selling his apple seedlings to settlers, and the McIntosh apple became the dominant apple in Vermont because of its acclimation to cool nights and warm, sunny days. In 1899 Vermont boasted 1,675,131 apple trees and produced 1,176,822 bushels of apples. Commercial apple production in Vermont continued into the twentieth century but declined owing to the lack of modernized facilities. The introduction of the automobile boosted apple production again; in 1955 Vermont produced over 1,100,000 bushels, and in the 1980s roughly 79 commercial growers on 3,500 bearing acres of land produced roughly 1.25 million bushels annually (VDHP 1990).

By the late eighteenth century some industry had begun to develop in Vermont. Lumbering in the oak forests brought much-needed money into the state and also cleared land for farming (Stratton 1980:250). Large fallen trees were ideal for making masts for ships and were usually shipped to Quebec. Production of hats was also an early trade, which used local wool and beaver hides from trappers. Other early businesses included blacksmithing, brick making, and dyeing.

The developing livestock industry rapidly took over in Vermont as both cattle and horses thrived on the local grasslands and climate (Bearse 1968; Tosi 1948:58-59; VDHP 1990). During the early nineteenth century the Spanish Merino sheep, an outstanding wool producer easily adapted to rugged terrain and

climate, arrived in Vermont. The self-sufficiency of the Vermont farmers diminished considerably as many turned to sheep farming for an alternative source of income almost to the complete exclusion of other agricultural products. The improved machinery and larger wool mills that were introduced around 1830 permitted Vermont farmers to produce more wool, and 33 wool factories were built in Vermont during that period. In addition to wool, raw cotton was imported into Vermont mills for processing (Meeks 1986; Tosi 1948:62).

Although some textile production occurred in fulling and cleansing mills, and later also carding mills, the production of textiles remained a household activity until about 1820. After about 1820 factories took over the production of textiles, and the number of fulling and carding mills increased by 200 percent (from 136 to 273) and 275 percent (from 87 to 234), respectively. By 1830 the home manufacture of textiles was almost non-existent. Since a typical textile mill required the labor of about nine or so workers, the mills typically sprang up where the workers lived. In many cases the wool factories were an outgrowth of earlier textile mills as the mills became suppliers for developing wool factories (Meeks 1986; Steponaitis 1975:43-50).

The breeding of wool sheep reached its peak in Vermont in the early 1840s, but by the end of the decade, the industry had begun to decline, partly the result of lower protective tariffs on imported wool and partly the result of competition from the West with its larger pastures, less costly grain, and better transportation following the opening of the Ohio and Pennsylvania canal systems (Tosi 1948:59-60; VDHP 1989b). The number of wool factories in Vermont decreased from 97 in the mid-1840s to 89 a decade later. In addition, the number of textile concerns in Vermont began to drop as the industry consolidated into fewer, larger firms using more efficient machinery and located along more traveled transportation routes. The number of mills fell from a peak of over 400 in the 1820s to only 75 in the early 1850s. The sheep industry revived briefly in the 1860s and immediately afterward, as the Civil War prompted a greater demand and higher prices for wool products because of the low availability of Southern cotton as well as the imposition of higher tariffs (Steponaitis 1975:60-67).

With the initial decline of the sheep and wool industry in the late 1840s, many farmers returned to breeding cattle, although not before mutton sheep slowly infiltrated many farms formerly devoted to wool-bearing sheep (VDHP 1989a:2). Dairy farming in Vermont and elsewhere in New England had been introduced by the 1840s (Barron 1980; Russell 1982). Dairying proved to be a protection against the fluctuating price of wool and allowed farmers to take advantage of expanding urban markets to the south. The introduction of dairy breeds to replace beef cattle was a slow and intermittent process. Barron (1980) believes that one reason farmers in Vermont were slow to switch from wool to dairy was problems with labor. The young of Vermont were moving out West and to the big cities, depopulating the countryside during the second half of the nineteenth century (discussed further below). Because sheep farming was far less labor-intensive, it remained a more efficient use of resources during this period even as prices for wool dropped. Dairy farming, on the other hand, was becoming more labor-intensive, and Barron (1980:333) estimates that because of technological changes, the labor demand for cows grew by 68 percent per cow between 1850 and 1910. As a result, since the available pool of labor was declining after the mid-nineteenth century, farmers were hesitant to make the switch from wool to dairy even though the wool market was unstable. It was not until the market for wool completely collapsed at the end of the century that the switch from sheep to cows became complete.

Up until the 1850s, only private dairying took place. As the industry became more widespread, cheese factories, and later creameries, were built to service entire dairying communities. The three staple crops for the mid-nineteenth century Vermont farmer became wool, butter, and maple sugar, and dairy farming dominated the agriculture of eastern Vermont after the Civil War (Bremer 1929:587; Tosi 1948:63). Butter and cheese were manufactured in centrally located factories, although up until 1900 almost 40 percent of manufactured dairy products were produced privately in the home for sale to a private clientele. The number

of dairy cows in some Vermont counties reached a peak in 1900. By the close of the nineteenth century, however, the Vermont dairy farmer faced direct competition from the dairy industries of Ohio and Wisconsin, for whom the transport of perishable goods did not pose as great an obstacle after development of the railroads connected these states with the East. Dairying declined slowly until 1920, then rose sharply until 1930 (Tosi 1948:62-64). By the end of the twentieth century, however, the need for expensive equipment had put many small hill-country farmers out of business (VDHP 1989a).

The wool industry in Vermont changed in the late nineteenth century with the emergence of large town-based manufacturing firms (those employing more than 100 employees) in places such as Bennington, Winooski, Rutland, Johnson, and Fair Haven. Vermont still enjoyed prominence in the manufacture of wool and knit goods during the 1880s; however, the state's industry declined steadily through the first half of the twentieth century despite a brief rise during the World War II years (Steponaitis 1975:118; VDHP 1991:10-11). Mills gradually closed after the end of the nineteenth century as they became unable to compete with mills and factories in the South (Barron 1980:326).

The population decline during the second half of the nineteenth century produced one of the greatest historical effects on the landscape. As the United States expanded, new opportunities arose and young people moved to the West. Many of the Vermont's rural youth left for jobs in the growing big cities, although Barron (1980) describes contemporary writing of abandoned farms as "hyperbole," writing that agriculture in New England did not collapse after the Civil War but only experienced stagnation. He points out that throughout Vermont two-thirds of male household heads remained farmers/farm laborers throughout the second half of the nineteenth century, 90 percent of farms were family-owned, and two-thirds of the land remained agricultural land. In short, the number, size, and location of farms throughout Vermont remained stable. In addition, the output of wool, butter, and maple sugar from these farms remained constant into the late 1890s. The number of tradesmen also remained constant, although a number of mills and factories were replaced because they could not compete with those in the South (Barron 1980:326). Vermont farmers may have been able to survive the slow attrition of labor throughout the second half of the nineteenth century, but the lack of available labor ultimately prevented them from adapting to more economically advantageous forms of farming.

2. Historic Context for Chittenden County

a. County Formation

The French, the first Europeans to settle in the Champlain Valley, came to present-day Vermont in the seventeenth century. It was not until the end of the French and Indian War (1756-1763), almost 150 years later, that people of English descent began to settle along the western reaches of the Winooski River in present-day Burlington, South Burlington, Williston, and Essex under grants issued by the English governor of New Hampshire. The first proprietors met to establish a new township in 1774, when the Onion River Land Company was formed in Connecticut with members including Ethan Allen, Ira Allen, Remember Baker, and Tom Chittenden. Many of these early settlers left the Winooski Valley with the outbreak of the American Revolution, fearing an attack from the British, and moved south (Rann 1886).

Tom Chittenden settled with his family along the banks of the Winooski in Williston and went on to become the first Governor of the New Republic of Vermont in 1778, serving until his death in 1797. Others also soon settled along the Winooski, taking advantage of the fertile farmland and building farms along the river, near the Winooski Falls (Hemenway 1867; Rann 1886; Swift 1996). Ira Allen began milling grain and sawing lumber in 1772 at the falls, and he and Remember Baker built Fort Frederick nearby for protection from the Abenaki. The small community that developed around the falls, the mills, and the fort became known as Allen's Settlement.

Since the earliest settlers placed their first farms on the arable land they found along the Winooski River and its tributaries, these lowland areas have the oldest place names. The more upland and mountainous sections of the valley were settled later and have more descriptive names (Swift 1996:159). Apparently, the name Winooski has its roots in the Abenaki words for "the wild onion place"; *Winooskitook* means "the wild onion river." The French took the name and spelled it Ouinoustick and Ouinouski. It is possible that the Allens and other early settlers of English descent changed the name to the Onion River (subsequently forming the Onion River Company to settle the land) to remove any trace of French or Abenaki claims to what is today Williston, Burlington, and South Burlington (Swift 1996:159).

b. Town of Williston

Settlement in Williston began in the early 1770s. Thomas Chittenden, Vermont's first governor, was one of the earliest settlers in the town, settling on what is now TH-14, Governor Chittenden's Road. The town was created in 1795 by taking 5,000 acres from the Town of Richmond. The Winooksi Turnpike, now U.S. Route 2, was completed in 1805 from Burlington to Montpelier, serving as the principal east-west road through Williston. Williston Center, which was established in the center of the town along the turnpike, was the town's only village until 1846, when North Williston was established. Williston Center had several taverns and inns to accommodate travelers on the turnpike and those traveling on numerous stagecoach lines that ran through the village (Wright 1913:46-47). The Central Vermont Railroad was completed to Burlington with a depot at North Williston by December 1849 (Beers 1869; Hayden et al. 1916:140).

As with many towns in Vermont, milling was the first major industry established, during the early to mid-nineteenth century, including sawmills, gristmills, and wool mills on the Winooski River, Allen Brook, and Muddy Brook (Wright 1913:56). As the population grew and land was cleared, the fertile valleys of the Winooski River, Muddy Brook, Allens Brook, and Sucker Brook supported growth of diverse agricultural products, including wool, corn, grains, hay, potatoes, and dairy products such as milk and cheese. Sugar maple trees were also plentiful and supported an early maple syrup industry; 5,000 pounds of syrup were produced in 1860 (Meiners 2010). Sheep raising continued until 1860, when dairying began to take over as the principal agricultural pursuit in the region. The arrival of the railroad bolstered the dairy industry, and many creameries and cheese factories were established in North Williston (Wright 1913:55-57).

The Winooski Turnpike from French Hill to the Richmond town line was well settled with farms, residences, and one school, School No. 7, by 1869. Most of the residences and farms were in the densely forested French Hill area. Only four farmsteads were located between School No. 7 and the town line (Beers 1869) (Figure 4).

Construction of Interstate 89 in 1964 and commercial development such as the IBM facility spurred residential development in the north part of the town. The south part of Williston maintains a rural character, with numerous farms still extant. According to the 2018 census, the town is home to 9,870 residents (United States Census Bureau 2018).

C. Historical Map Review

The earliest map of Chittenden County dates to 1857 (Walling 1857) (Figure 5). The map shows dispersed settlement with private properties located along local roads, and the Vermont Central Railroad runs north-south east of the APE along the Winooski River. The number of settlements had increased by 1869, but no properties or structures were located in or adjacent to the APE (see Figure 4) (Beers 1869).

Topographic maps from 1906 through 1943 show a road with a similar alignment to U.S. Route 2, as well as a structure near the APE; however, the location of the road crossing over the unnamed drainage differs from the present-day location of the APE. In addition, the orientation of the drainage (northeast-southwest)

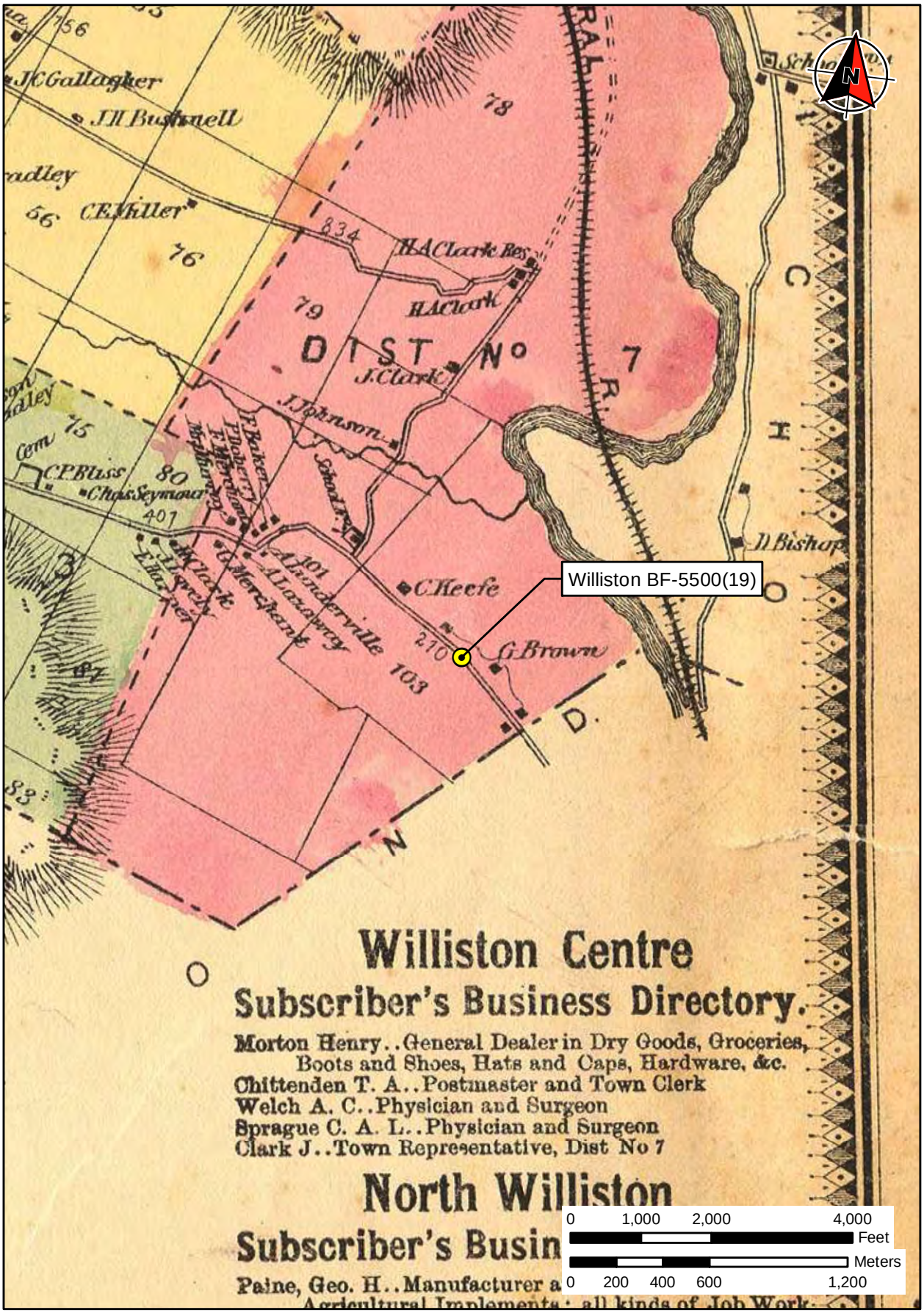

FIGURE 4: Map of Williston, 1869 (Beers 1869)

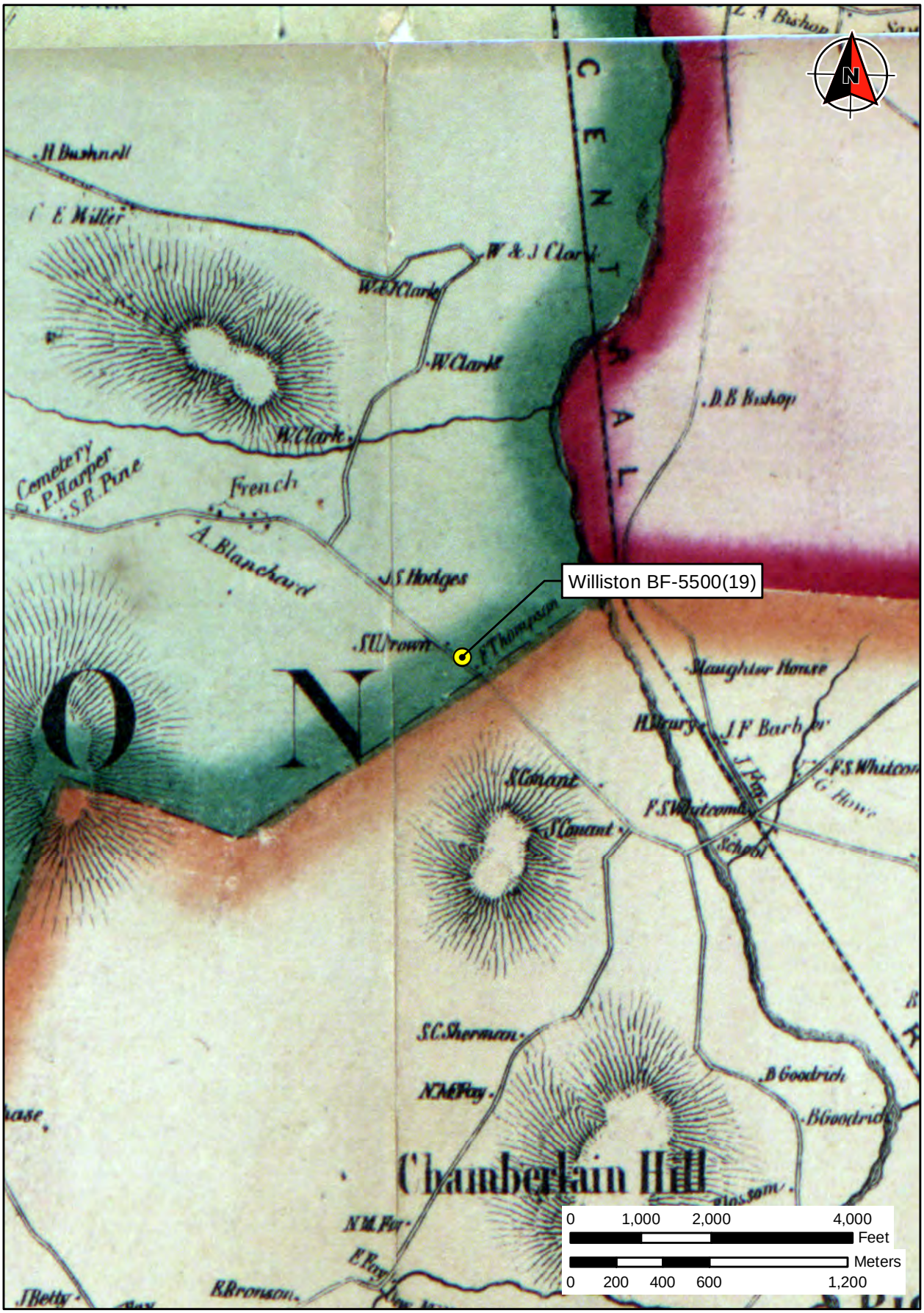

FIGURE 5: Project APE in 1857 (Walling 1857)

differs from the present-day alignment of the drainage (northwest-southeast) (Nationwide Environmental Title Research [NETR] 2021). It is unclear whether the discrepancy reflects an inaccuracy in early twentieth-century mapping of the area or if the drainage and road crossing have changed.

A 1944 topographic map shows more structures in the APE vicinity. The unnamed drainage is not shown, and U.S. Route 2 was established by this time. The unnamed drainage is shown with its present-day alignment on a 1953 topographic map, and the U.S. Route 2 road crossing appears to align with the APE. No structures are shown within the immediate vicinity of the APE on topographic maps from 1953 to 1987 (NETR 2021).

D. Previous Cultural Resource Management Projects and Known Sites

1. Previous Cultural Resource Management Studies in Vicinity of APE

WSP's background research included examination of the VDHP's ORC files to identify known sites and the results of previously conducted cultural resource management surveys in the vicinity. No cultural resource surveys have been conducted within 1.6 kilometers (1 mile) of the APE.

2. Precontact Archaeological Sites in Vicinity of APE

Fourteen precontact archaeological sites have been previously recorded within 1.6 kilometers (1 mile) of the APE (Table 2). Most of these are open-air sites with no temporally diagnostic archaeological materials (VDHP 2021).

TABLE 2: KNOWN ARCHAEOLOGICAL SITES WITHIN 1.6-KILOMETERS (1 MILE) OF APE

SITE No.	LOCATION	PERIOD(S)	RESULTS
VT-CH-0115	Terrace above unnamed drainage, north of Pine Ln	Precontact, Late Archaic	Habitation site with Onondaga and St. Albans chert
VT-CH-0344	Terrace above unnamed tributary of Winooski River	Precontact, unknown	Open-air site
VT-CH-0346	Terrace above unnamed drainage, northwest of Pine Ln	Precontact, unknown	Open-air site
VT-CH-0347	Westward sloping terrace overlooking Williston Rd/U.S. Route 2 to the south	Precontact, unknown	Open-air site
VT-CH-0348	Terrace north of Williston Rd/U.S. Route 2	Precontact, unknown	Open-air site
VT-OR-0349	Terrace on Pine Ridge, above unnamed tributary of Winooski River	Precontact, unknown	Open-air site
VT-CH-0350	Terrace above unnamed tributary of Winooski River	Precontact, unknown	Open-air site
VT-CH-0351	High terrace overlooking a stream, northwest of Winooski River	Precontact, unknown	Open-air site
VT-CH-0352	Terrace above Governor Chittenden Rd	Precontact, unknown	Open-air site
VT-CH-0639	Northeast of W Main St, west of Winooski River	Precontact, unknown	>20 flakes, 2 features
VT-CH-0669	Terrace south of Bradley Bow Rd	Precontact, unknown	1 chert flake
VT-CH-0670	Terrace east of VT 117	Precontact, unknown	Lithic scatter with quartz, quartzite, chert

SITE No.	LOCATION	PERIOD(S)	RESULTS
VT-CH-0671	Terrace above Winooski River, west of VT 117	Precontact, unknown	Quartzite lithic scatter
VT-CH-1189	Second terrace above Winooski River	Precontact, unknown	Three quartzite flakes recovered from surface

VDHP 2021

3. Historic Archaeological Sites in Vicinity of APE

No historic archaeological sites have been previously recorded within 1.6 kilometers (1 mile) of the APE. The closest site, VT-CH-1162, is located 2.5 miles to the east-southeast and consists of a historic foundry or furnace (VDHP 2021).

IV. Archaeological Assessment

A. Methods

WSP's goal for the ARA was to assess and survey the entire APE to identify archaeologically sensitive areas. This will allow VTrans maximum flexibility in avoiding sites that are eligible for the NRHP. To derive this assessment, WSP conducted background research, field inspection, and analysis of the APE using the *Environmental Predictive Model for Locating Precontact Archaeological Sites* (VDHP 2015).

1. Background Research

The background research included use of the Vermont ORC map tool (VDHP 2021), a review of site files from sites located within 1.6 kilometers (1 mile) of the APE, reports from projects conducted within the Town of Williston, historical maps, and local histories.

2. Determination of Archaeologically Sensitive Areas

WSP's archaeological assessment followed several stages. WSP first reviewed the APE using the VDHP ORC online map tool (2021) and *Environmental Predictive Model for Locating Precontact Archaeological Sites* (VDHP 2015; see Appendix A) to identify the distribution of key environmental criteria possibly affecting the location of precontact archaeological sites. The environmental criteria listed in these two predictive tools are summarized below.

Proximity to a:

- Permanent Stream/River
- Waterbody
- Wetlands
- Stream/Waterbody Confluence
- Head of Drainage
- Stream Confluence
- Waterfalls

The presence of:

- Glacial Lake Shore Line
- Glacial Outwash and Kame Terrace
- Floodplain Soils
- Level Terrain
- Significantly Sloped Terrain

For the seven criteria defined by proximity, the radius of proximity defined as significant is typically 180 meters (590 feet). The value attached to proximity was refined according to the Environmental Predictive Model, with a higher significance and greater score given to areas within 90 meters (295 feet) of a particular environmental criterion, versus a lower significance and half the score given to locations between 90 and 180 meters (295 and 590 feet) of the same criterion. The other five criteria are based on presence/absence (i.e., presence on level terrain versus presence on significantly sloped terrain) and not on varying levels of proximity. The Environmental Predictive Model attaches scores to each of these criteria as well as other criteria, including the presence of burials and known archaeological sites.

WSP determined sensitivity for the possibility of historic archaeological sites through an analysis of historical maps (see Figures 4 and 5) of the APE as well as regional histories. These historical maps are useful sources of information about old roads as well as the location of historic-era structures and other features. WSP also researched the VDHP site and report files available through the ORC as well as in-house resources to identify known sites and the results of previously conducted cultural resource management surveys surrounding the project, as described in Chapter III. Familiarity with known sites is useful both for understanding where sites might be located and for interpreting what is found and assessing its potential significance.

WSP consulted the Historic Front Yards study (Louis Berger 2005) to provide a context for identification of archaeological sensitivity in areas of historic building-road space. That study provides a guideline for assessing archaeological sensitivity and making recommendations for additional work. This includes identification of historic building-road spaces, eliminating historic building-road spaces that have been obviously and significantly disturbed, evaluating the archaeological sensitivity of each historic building-road space, and determining the setting and context of the space. The space and context setting variables are summarized below.

Space Setting

- Age of adjoining road compared to the adjoining historic building.
- Historical function of the building or building complex adjoining space and type of associated below-grade infrastructure to support the functions of the associated building.
- Overall general historical setting of the space.
- Distance of the historic building from the road and evidence of changing distance since the building was originally erected.
- Known previous buildings erected nearby or in the location of the historic building.
- Historical orientation of the historic building relative to the space.
- Historical functions of the historic building-road space.
- Evidence of archaeological features or deposits.

- Context Setting
  - Ability to pose research issues that might be investigated on the property where the historic building-road space is located, based on documentary research and field reconnaissance.
  - Presence of pertinent historical themes or associations that the property might illustrate.
  - The potential for the historic building-road space to contribute substantively to the possible overall significance of the property.

B. Results

1. Field Inspection

The results from the field inspection, in combination with the background research, indicate that the APE contains four areas of potential archaeological concern, discussed below (see Figure 2). The culvert is installed under a built-up roadway to accommodate a small stream that runs through pasture/hayfields (Plates 1 and 2). The southwest side of the culvert has wingwalls constructed of repurposed concrete/asphalt slabs (Plate 3). The soil above the culvert was brought in to extend the roadway over the small stream. The soils immediately adjoining either side of the culvert are probably also disturbed as a result of the initial installation and a replacement of the original culvert in the 1960s. The removal and replacement of this culvert will probably not impact any intact culturally sensitive soils because of these disturbances. However, it is WSP's opinion that further investigations may be necessary prior to the start of the planned

PLATE 1: Built-up Roadway Over East Side of Bridge, View South

PLATE 2: Built-up Roadway Over West Side of Bridge, View East

PLATE 3: Built-up Wingwalls of West Side of Bridge, View East

culvert improvements if a staging area or a temporary bridge is to be used during the upgrade; in addition, should project activities be expanded and the APE changed, further investigation may be warranted.

2. Analysis

The VDHP (2015) predictive model for precontact archaeological sites relies mainly on ecological variables, including distance to water, particular types of landforms, and slope, as well as possible archival or oral traditions and the known presence of sites and burials. Scoring according to this model is not meant to be taken rigidly, but rather as a guide to review possible environmental variables. The primary environmental variable related to precontact sites that applies to the APE is water sources. Elevated landforms are located too far from water sources to yield cumulative scores of 32 on the predictive model. The previous culvert and road construction operations have also resulted in surface and limited subsurface disturbances, that when combined with a lack of suitable intact landforms such as alluvial or outwash deposits, results in a negative score. Given the lack of positive environmental factors, the existing disturbance, and the generally low-density distribution of precontact sites in the vicinity, the APE is considered to have a low to very low sensitivity for precontact archaeological resources. Based on the predictive model, no portion of the APE scored 32 or higher, with a minimum score of 32 required to indicate archaeological sensitivity.

Application of criteria in Louis Berger's (2005) Historic Front Yards study showed that there is a low historic archaeological sensitivity within the APE. Although historical maps of the area depicted some historical activities in the general area of the APE, there were none that fell within the APE of the culvert itself. In addition, the roadway leading up to the culvert shows evidence of having been repaved several times since its installation, causing changes to the historic road space of the APE.

Given the density of precontact sites around the APE and their location on landforms similar to those in the APE, however, the area in and around the APE should be considered potentially sensitive for precontact archaeological resources.

V. Conclusions

On behalf of the VTrans, WSP completed an ARA for the proposed improvements to Williston Bridge No. 23, U.S. Route 2, Chittenden County. The scope for the project has yet to be defined; WSP therefore conducted this survey and resource assessment to consider the potential effects of site access, bridge installation and other potential project activities associated with improvements at the site of the bridge. The archaeological area of potential effect (APE) extends 30.5 meters (100 feet) from either end of the bridge to include all four quadrants of the bridge approaches.

No previously recorded archaeological sites are present in the APE. No other archaeological sites were identified during the ARA. Historical maps depict nineteenth- and twentieth-century Euro-American settlement in the immediate vicinity of the APE (although no previously recorded historic sites within 1.6 kilometers [1 mile] of the APE), and 14 precontact archaeological sites have been previously recorded within 1.6 kilometers (1 mile) of the APE. Given the lack of positive environmental factors combined with evidence of disturbance documented throughout the surrounding area, however, it is WSP's opinion that the APE is not sensitive for archaeological resources. Any subsurface disruption in the assumed APE has little potential for disturbing buried cultural deposits.

It is WSP's opinion that any future development carried out in the APE will have no impacts on any significant archaeological resources and would not have an adverse effect on archaeological sites that are eligible for or listed in the NRHP. WSP's opinion is that additional archaeological investigation of the APE is not necessary; however, should project activities be expanded and the APE changed, further investigation may be warranted.

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Appendix A: Environmental Predictive Model Checklist

Appendix A: Environmental Predictive Model Checklist

VERMONT DIVISION FOR HISTORIC PRESERVATION

Environmental Predictive Model for Locating Pre-contact Archaeological Sites

Project Name **County** **Town**
DHP No. **Map No.** **Staff Init.** **Date**

Additional Information

Environmental Variable	Proximity	Value	Assigned Score
A. RIVERS and STREAMS (EXISTING or RELICT):			
1) Distance to River or	0- 90 m	12	
Permanent Stream (measured from top of bank)	90- 180 m	6	
2) Distance to Intermittent Stream	0- 90 m	8	
	90-180 m	4	
3) Confluence of River/River or River/Stream	0-90 m	12	
	90 –180 m	6	
4) Confluence of Intermittent Streams	0 – 90 m	8	
	90 – 180 m	4	
5) Falls or Rapids	0 – 90 m	8	
	90 – 180 m	4	
6) Head of Draw	0 – 90 m	8	
	90 – 180 m	4	
7) Major Floodplain/Alluvial Terrace		32	
8) Knoll or swamp island		32	
9) Stable Riverine Island		32	
B. LAKES and PONDS (EXISTING or RELICT):			
10) Distance to Pond or Lake	0- 90 m	12	
	90 -180 m	6	
11) Confluence of River or Stream	0-90 m	12	
	90 –180 m	6	
12) Lake Cove/Peninsula/Head of Bay		12	
C. WETLANDS:			
13) Distance to Wetland	0- 90 m	12	
(wetland > one acre in size)	90 -180 m	6	
14) Knoll or swamp island		32	
D. VALLEY EDGE and GLACIAL LAND FORMS:			
15) High elevated landform such as Knoll Top/Ridge Crest/ Promontory		12	
16) Valley edge features such as Kame/Outwash Terrace**		12	

17) Marine/Lake Delta Complex**		12	
18) Champlain Sea or Glacial Lake Shore Line**		32	
E. OTHER ENVIRONMENTAL FACTORS:			
19) Caves /Rockshelters		32	
20) [ ] Natural Travel Corridor [ ] Sole or important access to another drainage [ ] Drainage divide		12	
21) Existing or Relict Spring	0 – 90 m 90 – 180 m	8 4	
22) Potential or Apparent Prehistoric Quarry for stone procurement	0 – 180 m	32	
23)) Special Environmental or Natural Area, such as Milton acquifer, mountain top, etc. (these may be historic or prehistoric sacred or traditional site locations and prehistoric site types as well)		32	
F. OTHER HIGH SENSITIVITY FACTORS:			
24) High Likelihood of Burials		32	
25) High Recorded Site Density		32	
26) High likelihood of containing significant site based on recorded or archival data or oral tradition		32	
G. NEGATIVE FACTORS:			
27) Excessive Slope (>15%) or Steep Erosional Slope (>20)		- 32	
28) Previously disturbed land as evaluated by a qualified archeological professional or engineer based on coring, earlier as-built plans, or obvious surface evidence (such as a gravel pit)		- 32	
**** refer to 1970 Surficial Geological Map of Vermont**			
		Total Score:	
Other Comments :			
0- 31 = Archeologically Non- Sensitive **32+ = Archeologically Sensitive**			

Appendix I: Stormwater Memo

VERMONT

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

Agency of Transportation

[phone] 802-498-5787

To: Julie Ann Held, VTrans Environmental Specialist Supervisor
From: Heather Voisin, VTrans Green Infrastructure Engineer
Date: August 2, 2021
Subject: Williston BF 5500(19) - Stormwater Resource ID Review

Project Description: I have reviewed the project area for Williston BF 5500(19) for stormwater related regulatory and water quality concerns. My evaluation has included the review of existing mapping and imagery (ANR Natural Resource Atlas, VTrans Operational Stormwater Permits, Google Street view) to capture existing stormwater features and existing drainage.

Regulatory Considerations
There do not appear to be any existing stormwater permits near the site area and the following are not noteworthy stormwater regulatory concerns at this time.

This project site is not within a designated public water supply source protection area.
The project site does not include an impaired (303(d) list) or stressed waters.

The need for stormwater treatment and/or permitting will be assessed as the project scope is further defined and will depend on how much earth disturbance and impervious area is involved in the eventual design.

Drainage Considerations
There does not appear to be any curbing of the roadway or other existing stormwater infrastructure. To the extent possible, a drainage design that allows runoff from the roadway to continue to flow overland onto adjacent properties and the streambank in a distributed manner is encouraged. Should collection of water be necessary, adequate outfall protection will be necessary to prevent erosion.

VERMONT

Williston BF 5500(19) Stormwater Resource ID

Vermont Agency of Natural Resources

vermont.gov

LEGEND

Stormwater Permits (Issued)

- Operational
- Construction
- Industrial - NOI
- Industrial - NOX
- Other

Stormwater Permits (Pending)

- Operational
- Construction
- Industrial - NOI
- Industrial - NOX
- Other

Existing stormwater point

- <all other values>
- Pipe Cross (not connected)
- Catchbasin
- Dry Well
- Drop Inlet
- Grate/Curb Inlet
- Yard drain
- Junction Box
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Pond outlet structure
- Treatment feature (see notes)
- Retrofit

NOTES

Map created using ANR's Natural Resources Atlas

222.0 0 111.00 222.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 364 Ft. 1cm = 44 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Appendix J: Local Input – No Response Received

Project Summary

This project, BF 5500(19), focuses on Bridge 23 on US Route 2 in Williston, 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: VTrans Operations Input

Culvert Scoping Project BF 5500(19)
Operations Input Questionnaire

The Structures Section has begun the scoping process for BF 5500(19), US Route 2, Culvert 23, over an unnamed brook. This is a culvert reconstructed in 1969. The Structure Inspection, Inventory, and Appraisal Sheet (attached) rates the culvert as a 3 (serious), and the channel as a 3 (serious). 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?
   This culvert has been on our radar as it shows significant signs of failure on the pavement surface along with view from down the barrel.

2. What are your comments on the current geometry and alignment of the roadway over the culvert (curve, sag, banking, sight distance)?
   Seems like the alignment has changed slightly therefor if the culvert could be placed at a skew.

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

4. Is the current roadway width adequate for winter maintenance including snow plowing?
   Yes; however, wider is always better.

5. Are the railings constantly in need of repair or replacement? What type of railing works best for your district? (We are recommending more and more box beam guardrail on our culverts because of crash-worthiness and compatibility with accelerated projects).
   We rather have W beam as that is a material that we readily have available.

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.
   None that we are aware of.

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.
   None that we are aware of.

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?
   Never have had any issues with water elevation at this pipe.

9. Does this culvert seem to catch an unusual amount of debris from the waterway?
   No, as it is mostly farm fields surrounding this pipe.

10. Are you familiar with traffic volumes in the area of this project?
    Very high. If a detour is needed maybe use North Williston Road if allowed. Could be a weekend closure so that commuting traffic is not impacted.

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?
    Yes please see answer to #10.

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.
    We have placed patch on the roadway surface here but that is the extent.

13. Are there any drainage issues that we should address on this project?
    None

14. Are you aware of any complaints that the public has about issues that we can address on this project?
    None

15. Is there anything else we should be aware of?
    None other than this structure needs replacement and we are glad to see it is starting to get programmed into a project.

Appendix L: Crash Data

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
													TH
	VT0040300/17SB008188	South Burlington	2.81	07/25/2017	01:27	Clear	Inattention, No improper driving	Rear End	0	0	0	E	SH Class 1 TH
	VT0040300/14SB003371	South Burlington	2.82	03/28/2014	07:51	Sleet, Hail (Freezing Rain or Drizzle)	Failure to keep in proper lane, No improper driving	Right Turn and Thru, Broadside ^<--	0	0	0	E, N	SH
	VT0040300/14SB005114	South Burlington	2.82	05/09/2014	15:27	Clear	Inattention, No improper driving	Rear End	1	0	0	W	SH
	VT0040300/14SB014069	South Burlington	2.82	12/12/2014	19:30	Snow	Unknown, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	E	SH
	VT0040300/15SB001859	South Burlington	2.82	02/14/2015	08:05	Snow	Driving too fast for conditions	Head On	2	0	0	E	SH
	VT0040300/15SB011021	South Burlington	2.82	09/11/2015	14:38	Clear	Other improper action, No improper driving	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	0	0	0	S, N	SH
	VT0040300/16SB004313	South Burlington	2.82	04/16/2016	02:04	Not Reported	Made an improper turn, No improper driving	Other - Explain in Narrative	0	0	0	S, E	SH Class 1 TH
	VT0040300/17SB001714	South Burlington	2.82	02/12/2017	18:33	Snow	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Single Vehicle Crash	0	0	0	E	SH Class 1 TH
	VT0040300/17SB008444	South Burlington	2.82	07/31/2017	12:38	Clear	Visibility obstructed	Other - Explain in Narrative	0	0	0	S, N	SH State Owned
	VT0040300/14SB003058	South Burlington	2.87	03/20/2014	10:58	[No Weather]		[No Direction of Collision]	0	0	0	W	SH
	VT0040300/14SB011660	South Burlington	2.87	10/12/2014	07:26	Clear	Fatigued, asleep	Other - Explain in Narrative	1	0	0	E	SH
	VT0040300/17SB013418	South Burlington	UNK	12/15/2017	18:21	Not Reported	Unknown	Same Direction Sideswipe	0	0	0	E	SH Class 1 TH
	VT0041000/18WT000638	Williston	0.07	01/26/2018	11:31	Clear	Inattention	Rear End	0	0	0	E	SH State Owned
	VT0041000/14WT01337	Williston	0.09	04/10/2014	12:38	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/14WT03691	Williston	0.09	09/17/2014	16:10	Clear	Followed too closely, No improper driving	Rear End	0	0	0	E	SH
	VT0041000/14WT04080	Williston	0.09	10/17/2014	12:58	Cloudy	Inattention, No improper driving	Rear End	0	0	0	E	SH
	VT0041000/16WT00245	Williston	0.09	01/19/2016	16:56	Snow	Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/17WT003673	Williston	0.09	06/27/2017	17:19	Cloudy	Followed too closely, No improper driving	Rear End	0	0	0	E	SH State Owned
	VT0041000/17WT007190	Williston	0.09	11/22/2017	09:36	[No Weather]		[No Direction of Collision]	0	0	0	W	SH State Owned
	VT0041000/14WT04759	Williston	0.18	12/08/2014	12:24	Clear	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	W	SH

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

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/16WT02846	Williston	0.18	07/14/2016	10:52	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	1	0	0	S, E	SH State Owned
	VT0041000/16WT03795	Williston	0.18	09/14/2016	12:02	Clear	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/15WT00951	Williston	0.21	03/12/2015	08:11	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, E	SH
	VT0041000/14WT02383	Williston	0.23	06/17/2014	16:08	Clear	Failed to yield right of way, Visibility obstructed, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	E, W	SH
	VT0041000/15WT00505	Williston	0.23	02/09/2015	09:22	Cloudy	No improper driving, Driving too fast for conditions, Followed too closely	Rear End	0	0	0	E	SH
	VT0041000/17WT002294	Williston	0.23	04/29/2017	14:55	Cloudy	Unknown, No improper driving	Same Direction Sideswipe	0	0	0	E	SH State Owned
	VT0041000/15WT02726	Williston	0.25	06/30/2015	17:35	Rain	Unknown	Rear End	0	0	0	E	SH
	VT0041000/14WT02536	Williston	0.26	06/28/2014	11:35	Clear	Inattention, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/14WT03701	Williston	0.26	09/18/2014	09:28	Cloudy	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/14WT04185	Williston	0.26	10/25/2014	13:52	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/14WT04777	Williston	0.26	12/09/2014	14:19	Sleet, Hail (Freezing Rain or Drizzle)	Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/15WT02623	Williston	0.26	06/25/2015	08:51	Clear	Other Inside Vehicle, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/15WT03838	Williston	0.26	09/09/2015	13:19	Cloudy	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, E	SH
	VT0041000/15WT03977	Williston	0.26	09/18/2015	14:35	Clear		Same Direction Sideswipe	0	0	0	E	SH
	VT0041000/16WT01956	Williston	0.26	05/18/2016	15:30	Clear	Failed to yield right of way, Failure to keep in proper lane, No improper driving	Same Direction Sideswipe	0	0	0	E	SH State Owned
	VT0041000/16WT02148	Williston	0.26	05/31/2016	13:27	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/16WT005208	Williston	0.26	10/13/2016	14:45	Clear	Inattention, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/17WT000520	Williston	0.26	01/31/2017	04:58	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/17WT001222	Williston	0.26	03/07/2017	15:17	Clear	Followed too closely	Rear End	0	0	0	W	SH State Owned
	VT0041000/17WT006231	Williston	0.26	10/07/2017	14:10	Rain	Followed too closely	Rear End	0	0	0	E	SH State Owned
	VT0041000/17WT007156	Williston	0.26	11/20/2017	13:28	Snow	Driving too fast for conditions, No improper driving	Rear End	0	0	0	W	SH Class 1 TH

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

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/18WT04126	Williston	0.26	07/19/2018	21:54	[No Weather]	Followed too closely, Under the influence of medication/drugs/alcohol	Rear End	0	0	0	W	SH State Owned
	VT0041000/15WT01034	Williston	0.28	03/17/2015	15:12	Clear	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/15WT02401	Williston	0.28	06/12/2015	15:57	Clear	Inattention, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/14WT02793	Williston	0.29	07/14/2014	14:33	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/16WT03635	Williston	0.30	09/02/2016	16:56	Clear	Inattention, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/18WT000316	Williston	0.30	01/14/2018	11:56	[No Weather]		[No Direction of Collision]	0	0	0	W	SH State Owned
	VT0041000/18WT03732	Williston	0.32	06/22/2018	16:04	Clear	Inattention, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/14WT00972	Williston	0.35	03/14/2014	07:50	Clear	No improper driving, Driving too fast for conditions	Other - Explain in Narrative	0	0	0	W	SH
	VT0041000/17WT001864	Williston	0.40	04/08/2017	15:48	Cloudy	Inattention, No improper driving	[No Direction of Collision]	1	0	0	W	SH State Owned
	VT0041000/14WT04792	Williston	0.59	12/10/2014	16:07	[No Weather]		[No Direction of Collision]	0	0	0	S, W, E	SH
	VT0041000/14WT04961	Williston	0.59	12/20/2014	14:28	Clear	Inattention, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/14WT03241	Williston	0.64	08/13/2014	13:02	Cloudy	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	E	SH
	VT0041000/17WT007529	Williston	0.65	12/05/2017	13:10	Cloudy	Followed too closely, Inattention, No improper driving	Rear End	0	0	0	E	SH State Owned
	VT0041000/14WT01220	Williston	0.66	04/01/2014	17:05	Cloudy	Failed to yield right of way, Visibility obstructed, No improper driving	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	0	0	0	W	SH
	VT0041000/17WT002227	Williston	0.66	04/25/2017	15:45	Rain	Other Inside Vehicle, Followed too closely, No improper driving	Rear End	0	0	0	E	SH State Owned
	VT0041000/15WT01616	Williston	0.68	04/23/2015	16:47	Clear	Made an improper turn, No improper driving	Left Turn and Thru, Broadside v<--	0	0	0	E, S	SH
	VT0041000/18WT05845	Williston	0.68	11/05/2018	06:50	Clear	Failed to yield right of way, Made an improper turn, No improper driving	Left Turn and Thru, Broadside v<--	0	0	0	S, W	SH State Owned
	VT0041000/15WT01598	Williston	0.70	04/22/2015	16:36	Rain	Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner	Single Vehicle Crash	0	0	0	W	SH
	VT0041000/15WT04606	Williston	0.70	10/30/2015	15:34	Clear	Talking on Hand-Held Electronic Device, Inattention, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/15WT04779	Williston	0.70	11/12/2015	14:32	Cloudy	Failed to yield right of way, No improper driving	Head On	0	0	0	S	SH
	VT0041000/16WT00279	Williston	0.70	01/22/2016	10:45	Cloudy	Inattention, No improper driving	Rear End	0	0	0	W	SH State Owned

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/16WT03707	Williston	0.70	09/07/2016	17:15	Cloudy	No improper driving, Inattention	Rear End	0	0	0	W	SH State Owned
	VT0041000/16WT005487	Williston	0.70	10/31/2016	12:21	Cloudy	Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/16WT006098	Williston	0.70	12/05/2016	08:04	[No Weather]		[No Direction of Collision]	0	0	0	N, S	SH State Owned
	VT0041000/16WT006334	Williston	0.70	12/17/2016	18:32	Cloudy	Under the influence of medication/drugs/alcohol, Failed to yield right of way, No improper driving	Rear End	1	0	0	W	SH State Owned
	VT0041000/17WT000847	Williston	0.70	02/17/2017	14:55	[No Weather]		[No Direction of Collision]	0	0	0	E, S	SH State Owned
	VT0041000/17WT001889	Williston	0.70	04/09/2017	23:11	Clear	Failure to keep in proper lane, Inattention	[No Direction of Collision]	1	0	0	W	SH State Owned
	VT0041000/17WT006388	Williston	0.70	10/16/2017	09:03	Cloudy	Followed too closely, No improper driving	Rear End	0	0	0	E	SH State Owned
	VT0041000/17WT007157	Williston	0.70	11/20/2017	13:47	Snow	Driving too fast for conditions, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/17WT008173	Williston	0.70	12/29/2017	13:47	Snow	Failed to yield right of way, No improper driving	Head On	0	0	0	N, S	SH State Owned
	VT0041000/18WT000756	Williston	0.70	01/29/2018	15:54	Clear	Failed to yield right of way, Made an improper turn, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	E, W	SH State Owned
	VT0041000/18WT04101	Williston	0.70	07/18/2018	13:08	Clear	Inattention, No improper driving	Rear End	0	0	0	E	SH State Owned
	VT0041000/18WT06224	Williston	0.70	11/28/2018	13:34	Snow		Rear End	0	0	0	W	SH State Owned
	VT0041000/17WT001226	Williston	0.71	03/07/2017	19:54	Cloudy	Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/17WT000317	Williston	0.80	01/18/2017	20:33	Clear	Failure to keep in proper lane, No improper driving	Head On	0	0	0	E, W	SH State Owned
	VT0041000/14WT00890	Williston	0.88	03/06/2014	17:17	Cloudy	Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/14WT01129	Williston	0.88	03/25/2014	14:24	Clear	Inattention, No improper driving	Rear End	1	0	0	W	SH
	VT0041000/17WT004788	Williston	0.90	08/09/2017	03:35	Clear	Inattention, No improper driving	Other - Explain in Narrative	0	0	0	E, P	SH State Owned
	VT0041000/16WT00074	Williston	0.99	01/07/2016	14:38	Clear	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	E	SH State Owned

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

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/15WT04799	Williston	1.04	11/13/2015	16:53	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, E	SH
	VT0041000/17WT005709	Williston	1.04	09/15/2017	16:55	Clear	Inattention	Rear End	0	0	0	E	SH State Owned
	VT0041000/18WT04225	Williston	1.04	07/26/2018	17:13	Clear	Disregarded traffic signs, signals, markings, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	N, W	SH State Owned
	VT0041000/14WT04923	Williston	1.05	12/17/2014	18:30	Cloudy	Inattention, No improper driving	Same Direction Sideswipe	0	0	0	W	SH
	VT0041000/15WT02114	Williston	1.05	05/27/2015	16:15	Clear	Followed too closely, Inattention, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/16WT00459	Williston	1.05	02/03/2016	09:45	Rain	Followed too closely, No improper driving	Rear End	0	0	0	E	SH State Owned
	VT0041000/16WT006300	Williston	1.05	12/16/2016	14:15	Clear	Followed too closely, Failed to yield right of way	Rear End	1	0	0	S	SH State Owned
	VT0040300/17SB008845	Williston	1.05	08/11/2017	16:39	Clear		Other - Explain in Narrative	0	0	0	E	SH State Owned
	VT0041000/17WT000797	Williston	1.06	02/15/2017	16:48	[No Weather]		[No Direction of Collision]	0	0	0	W	SH State Owned
	VT0041000/16WT02611	Williston	1.08	06/28/2016	12:54	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/16WT04029	Williston	1.25	09/29/2016	13:59	[No Weather]	Inattention	[No Direction of Collision]	0	0	0	E, P	SH State Owned
	VT0041000/16WT00048	Williston	1.29	01/05/2016	11:09	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	0	0	0	S, E	SH State Owned
	VT0041000/16WT006370	Williston	1.29	12/19/2016	16:38	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, W	SH State Owned
	VT0041000/15WT01683	Williston	1.3	04/29/2015	17:23	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, E	SH
	VT0041000/18WT001005	Williston	1.31	02/08/2018	16:51	Clear	Inattention	Rear End	0	0	0	E	SH State Owned
	VT0041000/14WT03632	Williston	1.32	09/12/2014	16:11	Clear	Failure to keep in proper lane, Inattention, No improper driving	Same Direction Sideswipe	0	0	0	E	SH
	VT0041000/15WT05399	Williston	1.32	12/24/2015	11:57	Cloudy	Visibility obstructed, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, E	SH
	VT0041000/16WT02497	Williston	1.32	06/20/2016	17:06	Clear	Failed to yield right of way, Visibility obstructed, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, E	SH State Owned
	VT0041000/18WT000636	Williston	1.34	01/26/2018	08:29	Clear	Visibility obstructed, No improper driving	Rear End	0	0	0	E	SH State Owned

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/14WT00143	Williston	1.35	01/08/2014	16:58	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Broadside v<--	0	0	0	N, E	SH
	VT0041000/14WT01177	Williston	1.35	03/28/2014	17:23	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, E	SH
	VT0041000/15WT00426	Williston	1.35	02/03/2015	16:54	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	1	0	0	S, E	SH
	VT0041000/15WT00558	Williston	1.35	02/12/2015	17:40	Clear	Failed to yield right of way	Left Turn and Thru, Angle Broadside -->v--	1	0	0	S, E	SH
	VT0041000/15WT01771	Williston	1.35	05/05/2015	16:40	Clear	Failed to yield right of way, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	N, E	SH
	VT0041000/15WT02234	Williston	1.35	06/03/2015	17:39	Clear	Inattention, Visibility obstructed, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	N, E	SH
	VT0041000/15WT02331	Williston	1.35	06/09/2015	17:38	Rain	Failed to yield right of way, Visibility obstructed, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, E	SH
	VT0041000/15WT02722	Williston	1.35	06/30/2015	16:42	Cloudy	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	N, E	SH
	VT0041000/15WT05064	Williston	1.35	12/01/2015	18:45	Rain	Failed to yield right of way, Visibility obstructed	Right Turn and Thru, Broadside ^<--	0	0	0	S, E	SH
	VT0041000/16WT01171	Williston	1.35	03/25/2016	11:10	Clear	Failed to yield right of way, Inattention, No improper driving	Same Direction Sideswipe	0	0	0	E	SH State Owned
	VT0041000/16WT03181	Williston	1.35	08/03/2016	17:39	[No Weather]	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, E	SH State Owned
	VT0041000/18WT03599	Williston	1.35	06/13/2018	17:06	Cloudy	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, E	SH State Owned
	VT0041000/18WT05894	Williston	1.35	11/07/2018	17:25	[No Weather]		[No Direction of Collision]	0	0	0	W, E	SH State Owned
	VT0041000/14WT03004	Williston	1.36	07/28/2014	15:49	Rain	Followed too closely, No improper driving	Rear End	2	0	0	W	SH
	VT0041000/15WT04939	Williston	1.36	11/24/2015	16:38	Clear	Inattention	Rear End	0	0	0	W	SH
	VT0041000/16WT00241	Williston	1.37	01/19/2016	14:40	Snow	Failed to yield right of way	Left Turn and Thru, Broadside v<--	0	0	0	E	SH State Owned
	VT0041000/16WT01646	Williston	1.38	04/29/2016	09:50	Clear	Inattention, Visibility obstructed	Same Direction Sideswipe	0	0	0	E	SH State Owned
	VT0041000/17WT004595	Williston	1.38	08/01/2017	16:38	Clear	Failed to yield right of way, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	S, W	SH State Owned
	VT0041000/14WT00405	Williston	1.39	01/29/2014	18:47	Clear		[No Direction of Collision]	0	0	0	E	SH
	VT0041000/14WT02752	Williston	1.39	07/12/2014	11:25	Clear	Failed to yield right of way, Visibility obstructed	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, E	SH
	VT0041000/15WT00749	Williston	1.40	02/25/2015	13:27	Clear	Inattention, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/18WT03079	Williston	1.40	05/11/2018	08:13	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Head On ^v--	0	0	0	E, W	SH State Owned

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/15WT01077	Williston	1.41	03/19/2015	16:44	Clear	Inattention, No improper driving	Same Direction Sideswipe	0	0	0	E	SH
	VT0041000/14WT01125	Williston	1.42	03/25/2014	12:51	Cloudy	Inattention	Rear End	0	0	0	E	SH
	VT0041000/14WT01601	Williston	1.42	04/26/2014	18:50	Rain	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	N, S	SH
	VT0041000/14WT01619	Williston	1.42	04/28/2014	11:47	Clear	Followed too closely	Rear End	0	0	0	W, E	SH
	VT0041000/14WT01635	Williston	1.42	04/29/2014	09:32	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0040200/14ES02847	Williston	1.42	05/19/2014	12:37	Clear	Inattention, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/14WT04019	Williston	1.42	10/13/2014	11:20	Clear	Failure to keep in proper lane, No improper driving	Same Direction Sideswipe	0	0	0	S, E	SH
	VT0041000/14WT04914	Williston	1.42	12/17/2014	08:01	Cloudy	Inattention, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/15WT00347	Williston	1.42	01/28/2015	18:39	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	1	0	0	S, E	SH
	VTVSP0100/15A100846	Williston	1.42	02/13/2015	15:03	Clear	Made an improper turn, Inattention, No improper driving	Other - Explain in Narrative	0	0	0	N, W	SH
	VT0041000/15WT00663	Williston	1.42	02/20/2015	08:20	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S	SH
	VT0041000/15WT00882	Williston	1.42	03/06/2015	17:25	Clear	Failed to yield right of way, No improper driving	Opp Direction Sideswipe	0	0	0	E, W	SH
	VT0041000/15WT00919	Williston	1.42	03/09/2015	17:33	Clear	Disregarded traffic signs, signals, markings, No improper driving	Left Turn and Thru, Angle Broadside -->v--	2	0	0	E, S	SH
	VT0041000/15WT00942	Williston	1.42	03/11/2015	13:48	[No Weather]	Failure to keep in proper lane, Inattention, No improper driving	Same Direction Sideswipe	0	0	0	W	SH
	VT0041000/15WT01567	Williston	1.42	04/20/2015	07:16	Cloudy	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, S	SH
	VT0041000/15WT02506	Williston	1.42	06/18/2015	15:44	Clear	Failed to yield right of way, Unknown	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, S	SH
	VT0041000/15WT02507	Williston	1.42	06/18/2015	15:58	Clear	Inattention, No improper driving	Rear End	0	0	0	E	SH
	VT0041000/15WT04440	Williston	1.42	10/22/2015	07:07	Cloudy	No improper driving, Failed to yield right of way	Head On	1	0	0	N, S	SH
	VT0041000/15WT04469	Williston	1.42	10/23/2015	16:44	Cloudy	Failed to yield right of way, No improper driving	Same Direction Sideswipe	0	0	0	W	SH
	VT0041000/15WT05401	Williston	1.42	12/24/2015	12:36	Clear	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	N	SH
	VT0041000/16WT01050	Williston	1.42	03/17/2016	11:42	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/16WT01812	Williston	1.42	05/09/2016	09:44	[No Weather]		[No Direction of Collision]	0	0	0	N	SH State Owned
	VT0041000/16WT02673	Williston	1.42	07/01/2016	18:43	Rain	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/16WT02806	Williston	1.42	07/11/2016	17:39	Clear	Followed too closely, No improper driving	Rear End	0	0	0	N	SH State Owned

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/16WT03615	Williston	1.42	09/01/2016	12:47	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, S	SH State Owned
	VT0041000/16WT005135	Williston	1.42	10/08/2016	14:22	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	3	0	0	S, E	SH State Owned
	VT0041000/16WT005409	Williston	1.42	10/26/2016	14:38	Cloudy	No improper driving, Failed to yield right of way, Other Inside Vehicle	Right Turn and Thru, Angle Broadside -->^--	0	0	0	N, W	SH State Owned
	VT0041000/2016WT005552	Williston	1.42	11/04/2016	07:07	Rain	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	3	0	0	E, N	SH State Owned
	VT0041000/16WT005976	Williston	1.42	11/27/2016	20:46	Clear	Failed to yield right of way	Opp Direction Sideswipe	0	0	0	N, S	SH State Owned
	VT0041000/16WT006290	Williston	1.42	12/15/2016	17:21	Blowing Sand, Soil, Dirt, Snow	Visibility obstructed, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	S, E	SH State Owned
	VT0041000/17WT000015	Williston	1.42	01/01/2017	14:52	[No Weather]		[No Direction of Collision]	0	0	0	S	SH State Owned
	VT0041000/17WT000963	Williston	1.42	02/22/2017	11:49	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, S	SH State Owned
	VTVSP0100/17A101178	Williston	1.42	03/15/2017	08:00	[No Weather]		[No Direction of Collision]	0	0	0		SH State Owned
	VT0041000/17WT003132	Williston	1.42	06/03/2017	15:28	Rain	Inattention, Made an improper turn	Same Direction Sideswipe	0	0	0	W	SH State Owned
	VT0041000/17WT003442	Williston	1.42	06/16/2017	12:49	Cloudy	No improper driving, Failure to keep in proper lane	Same Direction Sideswipe	0	0	0	W	SH State Owned
	VT0041000/17WT003932	Williston	1.42	07/08/2017	22:10	Cloudy	Failed to yield right of way, No improper driving	Same Direction Sideswipe	0	0	0	S, N	SH State Owned
	VT0041000/17WT005513	Williston	1.42	09/07/2017	10:28	Clear	Failed to yield right of way, Inattention, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	N	SH State Owned
	VT0041000/17WT006529	Williston	1.42	10/22/2017	16:25	Cloudy	Failed to yield right of way, No improper driving	Same Direction Sideswipe	0	0	0	E	SH State Owned
	VT0041000/18WT000751	Williston	1.42	01/29/2018	15:03	Cloudy	Followed too closely, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0041000/18WT001447	Williston	1.42	02/27/2018	18:14	Clear	Failed to yield right of way, Inattention, No improper driving	Right Turn and Thru, Same Direction Sideswipe/Angle Crash ^^--	0	0	0	N, E	SH State Owned
	VT0041000/18WT04035	Williston	1.42	07/13/2018	12:36	Clear	Failed to yield right of way, No improper driving	Head On	2	0	0	N, S	SH State Owned

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/18WT04149	Williston	1.42	07/21/2018	09:58	Clear	Failed to yield right of way, Inattention, No improper driving	Right Turn and Thru, Same Direction Sideswipe/Angle Crash ^^---	0	0	0	W, N	SH State Owned
	VT0041000/18WT04748	Williston	1.42	08/31/2018	07:45	Clear	Disregarded traffic signs, signals, markings, No improper driving	Left Turn and Thru, Head On ^v--	1	0	0	S, N	SH State Owned
	VT0041000/18WT05194	Williston	1.42	09/27/2018	19:50	Clear	Failed to yield right of way, No improper driving	Left and Right Turns, Simultaneous Turn Crash ,-vv--	0	0	0	S	SH State Owned
	VT0041000/18WT05328	Williston	1.42	10/05/2018	10:17	Clear	Disregarded traffic signs, signals, markings, No improper driving	Head On	3	0	0	W, E	SH State Owned
	VT0041000/18WT06533	Williston	1.42	12/18/2018	06:48	Cloudy	Other improper action, No improper driving	Rear End	0	0	0	N	SH State Owned
	VT0041000/15WT02400	Williston	1.43	06/12/2015	15:49	Clear	Inattention, No improper driving	Same Direction Sideswipe	0	0	0	W	SH
	VT0041000/18WT04688	Williston	1.43	08/27/2018	12:39	Clear	Failed to yield right of way, Inattention, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	N, E	SH State Owned
	VT0041000/14WT04356	Williston	1.44	11/08/2014	10:11	Clear	Failed to yield right of way	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, E	SH
	VT0041000/15WT02855	Williston	1.44	07/08/2015	12:45	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Broadside v<--	0	0	0	E, W	SH
	VT0041000/16WT005352	Williston	1.45	10/23/2016	16:46	Clear	Failed to yield right of way, Failure to keep in proper lane, No improper driving	Same Direction Sideswipe	0	0	0	W	SH State Owned
	VT0041000/16WT02645	Williston	1.47	06/30/2016	13:15	Clear	Failure to keep in proper lane, Wrong side or wrong way, No improper driving	Same Direction Sideswipe	0	0	0	W	SH State Owned
	VT0041000/16WT02739	Williston	1.48	07/06/2016	07:58	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	N, W	SH State Owned
	VT0041000/16WT02920	Williston	1.48	07/19/2016	12:30	Cloudy	Failed to yield right of way, No improper driving	Head On	0	0	0	E, W	SH State Owned
	VT0041000/16WT03375	Williston	1.48	08/15/2016	12:22	[No Weather]		[No Direction of Collision]	0	0	0	E, W	SH State Owned
	VT0041000/16WT03904	Williston	1.48	09/20/2016	18:11	[No Weather]		[No Direction of Collision]	0	0	0	S, E	SH State Owned
	VT0041000/17WT002888	Williston	1.48	05/24/2017	16:24	[No Weather]		[No Direction of Collision]	0	0	0	N, W	SH State Owned
	VT0041000/17WT006821	Williston	1.48	11/04/2017	16:15	Clear	Failed to yield right of way, Inattention	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, E	SH State Owned
	VT0041000/17WT007506	Williston	1.48	12/04/2017	18:14	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Broadside v<--	0	0	0	N, W	SH State Owned

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/18WT04693	Williston	1.48	08/27/2018	16:49	Clear	Inattention, No improper driving	Rear End	1	0	0	W	SH State Owned
	VT0041000/18WT05074	Williston	1.48	09/21/2018	19:12	Clear	Followed too closely, Other improper action, No improper driving	Rear End	0	0	0	N	SH State Owned
	VT0041000/15WT00416	Williston	1.58	02/03/2015	07:45	Cloudy	Driving too fast for conditions, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	E, N	SH
	VT0041000/15WT04605	Williston	1.58	10/30/2015	13:37	Clear	Disregarded traffic signs, signals, markings, Failed to yield right of way, No improper driving	Left Turn and Thru, Broadside v<--	0	0	0	E, N	SH
	VT0041000/18WT001510	Williston	1.58	03/02/2018	12:08	Snow	Driving too fast for conditions, No improper driving	Rear End	0	0	0	E	SH State Owned
	VT0041000/17WT002232	Williston	1.67	04/25/2017	20:06	Rain	Failed to yield right of way, Inattention, No improper driving	No Turns, Thru moves only, Broadside ^<	1	0	0	W, N	SH State Owned
	VT0041000/14WT00604	Williston	1.68	02/14/2014	16:29	Cloudy	Failed to yield right of way	Left Turn and Thru, Angle Broadside -->v--	0	0	0	S, E	SH
	VT0041000/15WT03012	Williston	1.68	07/19/2015	12:30	[No Weather]	Disregarded traffic signs, signals, markings, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	N, W	SH
	VT0041000/15WT05214	Williston	1.68	12/11/2015	17:15	Cloudy	Failed to yield right of way, No improper driving	Head On	1	0	0	W, E	SH
	VT0041000/16WT01706	Williston	1.68	05/02/2016	15:44	[No Weather]		[No Direction of Collision]	0	0	0	E, S	SH State Owned
	VT0041000/16WT005195	Williston	1.68	10/12/2016	16:42	Clear	Manually Operating an Electronic Communications Device (texting, typing, dialing), No improper driving	Rear End	0	0	0	E	SH State Owned
	VT0041000/16WT006131	Williston	1.68	12/06/2016	17:06	[No Weather]		[No Direction of Collision]	0	0	0	E, W	SH State Owned
	VT0041000/17WT002264	Williston	1.68	04/27/2017	12:02	Cloudy	Made an improper turn, No improper driving	Same Direction Sideswipe	0	0	0	W	SH State Owned
	VT0041000/17WT006170	Williston	1.68	10/05/2017	15:29	Clear	Disregarded traffic signs, signals, markings, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	W, N	SH State Owned
	VT0041000/17WT003598	Williston	1.74	06/23/2017	16:33	Cloudy	Inattention	Rear End	0	0	0	E	SH State Owned
	VT0041000/18WT03021	Williston	1.77	05/07/2018	19:46	Clear	Failed to yield right of way, No improper driving	Right Turn and Thru, Broadside ^<--	0	0	0	W	SH State Owned
	VT0041000/14WT02069	Williston	1.78	05/27/2014	17:29	Clear	Failure to keep in proper lane, Other improper action	Left Turns, Opposite Directions, Head On/Angle Crash --^v--	0	0	0	S	SH
	VT0041000/15WT03057	Williston	1.78	07/23/2015	09:11	Clear	Disregarded traffic signs, signals, markings, No improper driving	Right Turn and Thru, Same Direction Sideswipe/Angle Crash ^^--	0	0	0	S, W	SH

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/17WT006306	Williston	1.78	10/12/2017	16:14	Clear	Made an improper turn, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	N, W	SH State Owned
	VT0041000/18WT04517	Williston	1.78	08/14/2018	15:19	Clear	Followed too closely, No improper driving	Rear End	0	0	0	E	SH State Owned
	VT0041000/18WT05046	Williston	1.78	09/18/2018	14:54	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	E, S	SH State Owned
	VT0041000/17WT004959	Williston	1.97	08/14/2017	09:34	[No Weather]		[No Direction of Collision]	0	0	0	W	SH State Owned
	VT0041000/14WT01663	Williston	2.02	05/01/2014	07:54	Clear	Followed too closely, Distracted, No improper driving	Rear End	0	0	0	W, E	SH
	VT0041000/18WT000266	Williston	2.38	01/11/2018	08:13	Cloudy	Fatigued, asleep, Failure to keep in proper lane, No improper driving	Head On	2	0	0	E, W	SH State Owned
	VT0041000/14WT00950	Williston	2.50	03/12/2014	15:37	Snow	Driving too fast for conditions, No improper driving	Head On	0	0	0	W, E	SH
	VT0041000/15WT04054	Williston	2.52	09/24/2015	13:41	Clear	Failed to yield right of way, Inattention, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	N, E	SH
	VT0041000/17WT002735	Williston	2.52	05/19/2017	10:29	Cloudy	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Head On	0	0	0	E	SH State Owned
	VT0041000/15WT05211	Williston	2.64	12/11/2015	15:40	Cloudy		Rear End	0	0	0	W	SH
	VT0041000/16WT00091	Williston	2.64	01/08/2016	14:00	Cloudy	No improper driving, Unknown	Opp Direction Sideswipe	0	0	0	W, E	SH State Owned
	VT0041000/18WT001251	Williston	2.64	02/19/2018	07:47	Clear	Failed to yield right of way	Other - Explain in Narrative	0	0	0	W	SH State Owned
	VT0041000/14WT00945	Williston	2.65	03/12/2014	08:21	Snow	Driving too fast for conditions, No improper driving	Opp Direction Sideswipe	0	0	0	E, W	SH
	VT0041000/14WT04994	Williston	2.81	12/23/2014	15:32	Cloudy	Failure to keep in proper lane, No improper driving	Same Direction Sideswipe	0	0	0	E	SH
	VT0041000/17WT003691	Williston	2.88	06/28/2017	07:27	Clear	Operating defective equipment	Single Vehicle Crash	1	0	0	E	SH State Owned
	VT0041000/17WT003923	Williston	3.00	07/08/2017	14:31	Cloudy	Inattention	Same Direction Sideswipe	0	0	0	N	SH State Owned
	VT0041000/14WT03982	Williston	3.01	10/10/2014	08:18	Clear	Failure to keep in proper lane, Fatigued, asleep	Opp Direction Sideswipe	0	0	0	W	SH
	VT0041000/14WT05076	Williston	3.01	12/29/2014	07:21	Clear	Followed too closely, Driving too fast for conditions, No improper driving	Rear End	0	0	0	S	SH
	VT0041000/16WT02082	Williston	3.10	05/26/2016	17:44	Clear	Failed to yield right of way, Visibility obstructed, No improper driving	Left Turn and Thru, Broadside v<--	1	0	0	E, W	SH State Owned
	VT0041000/17WT001220	Williston	3.10	03/07/2017	11:19	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Broadside v<--	0	0	0	S, W	SH State

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

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

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
													Owned
	VT0041000/18WT03797	Williston	3.10	06/27/2018	17:30	Cloudy	Failed to yield right of way	No Turns, Thru moves only, Broadside ^<	1	0	0	S, E	SH State Owned
	VT0041000/15WT00643	Williston	3.16	02/19/2015	07:59	Cloudy	Failed to yield right of way, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	S, W	SH
	VT0041000/14WT02512	Williston	3.31	06/26/2014	17:45	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/17WT004364	Williston	3.32	07/24/2017	13:13	Rain	Driving too fast for conditions, Made an improper turn, No improper driving	Left Turn and Thru, Broadside v<--	0	0	0	W, N	SH State Owned
	VT0041000/14WT00475	Williston	3.34	02/05/2014	15:10	Snow		[No Direction of Collision]	0	0	0	W	SH
	VT0041000/16WT01896	Williston	3.50	05/14/2016	15:08	Cloudy	Followed too closely, Inattention	Rear End	0	0	0	W	SH State Owned
	VT0041000/16WT03432	Williston	3.50	08/19/2016	19:05	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	W	SH State Owned
	VT0041000/15WT01503	Williston	3.52	04/15/2015	20:15	Clear	No improper driving	Single Vehicle Crash	0	0	0	S	SH
	VT0041000/15WT03284	Williston	3.52	08/05/2015	15:35	Cloudy		Head On	0	0	0	S	SH
	VT0041000/15WT00263	Williston	3.65	01/22/2015	17:20	Cloudy	Inattention, No improper driving	Rear End	1	0	0	E	SH
	VT0041000/15WT04367	Williston	3.65	10/16/2015	16:57	Cloudy	Inattention, No improper driving	Rear End	0	0	0	E	SH
	VT0041000/17WT000820	Williston	3.73	02/16/2017	18:17	Cloudy	Failed to yield right of way, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	E, S	SH State Owned
	VT0041000/14WT03567	Williston	3.74	09/07/2014	09:53	Clear	Other improper action, Disregarded traffic signs, signals, markings, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	W, N	SH
	VT0041000/14WT04815	Williston	3.74	12/11/2014	13:20	Cloudy	Followed too closely, Inattention	Rear End	0	0	0	E	SH
	VT0041000/16WT01175	Williston	3.74	03/25/2016	12:46	Cloudy	Disregarded traffic signs, signals, markings, No improper driving	[No Direction of Collision]	1	0	0	E, W	SH State Owned
	VT0041000/16WT02561	Williston	3.74	06/24/2016	17:36	Clear	Unknown	No Turns, Thru moves only, Broadside ^<	0	0	0	E, S	SH State Owned
	VT0041000/16WT03484	Williston	3.74	08/22/2016	16:36	Clear	Unknown	No Turns, Thru moves only, Broadside ^<	0	0	0	S, E	SH State Owned
	VT0041000/18WT000095	Williston	3.74	01/03/2018	14:09	Cloudy	Disregarded traffic signs, signals, markings, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	W, S	SH State Owned
	VT0041000/18WT001443	Williston	3.74	02/27/2018	17:22	Clear	Failed to yield right of way, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	E, S	SH State Owned
	VT0041000/17WT002057	Williston	3.75	04/18/2017	10:14	Clear	Failed to yield right of way, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	W, S	SH State Owned

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

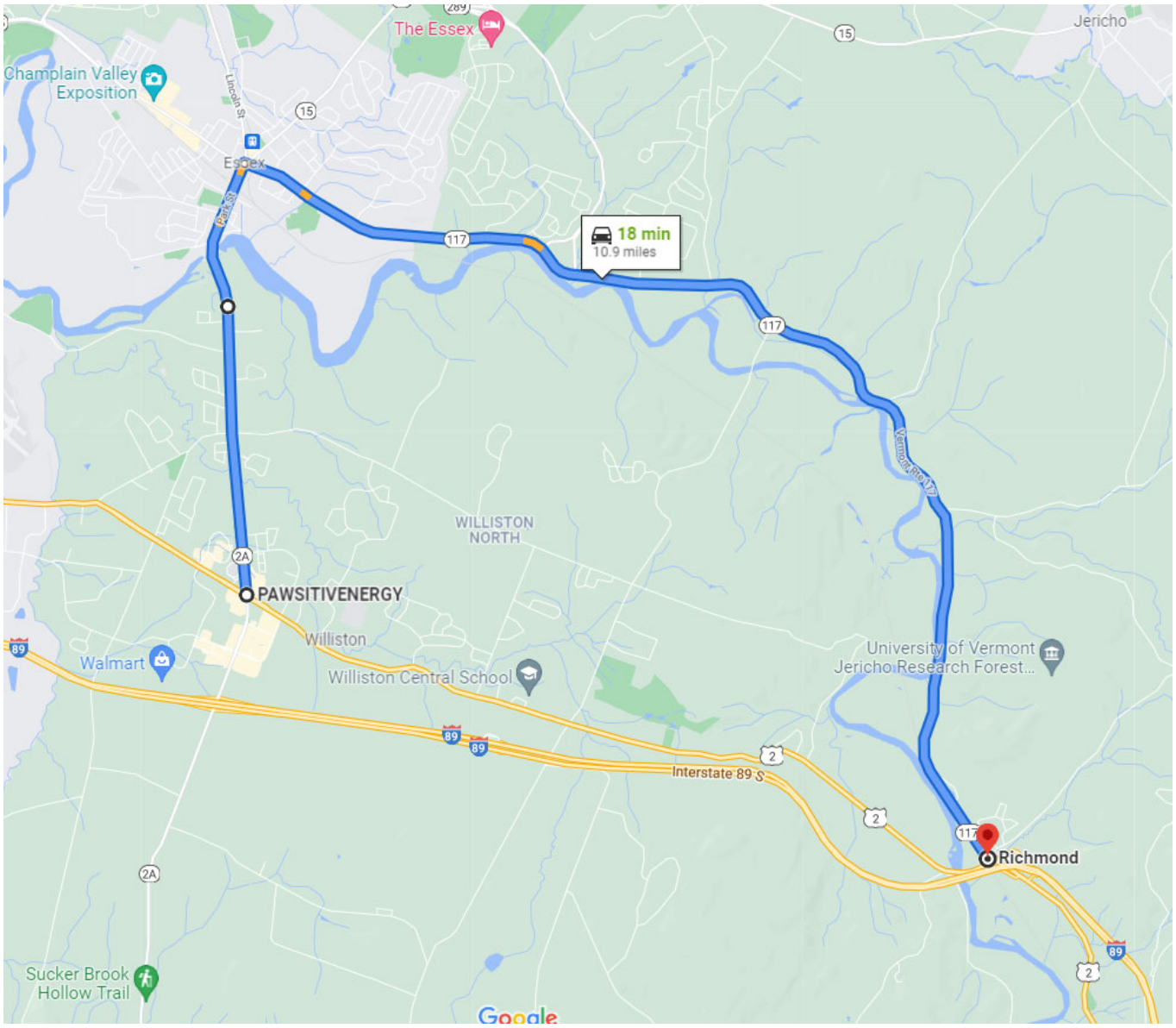
General Yearly Summaries - Crash Listing: State Highways and All Federal Aid Highway Systems

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/18WT00978	Williston	3.83	02/07/2018	08:16	Clear	Failed to yield right of way, Inattention	Left Turn and Thru, Angle Broadside -->v--	0	0	0	W, E	SH State Owned
	VT0041000/16WT006533	Williston	4.45	12/28/2016	14:32	Severe Crosswinds	Fatigued, asleep	Single Vehicle Crash	0	0	0	E	SH State Owned
	VT0041000/14WT00949	Williston	4.79	03/12/2014	12:28	Blowing Sand, Soil, Dirt, Snow	Followed too closely, Driving too fast for conditions, No improper driving	Rear End	0	0	0	W	SH
	VT0041000/15WT02843	Williston	4.79	07/07/2015	21:26	Clear	Disregarded traffic signs, signals, markings, No improper driving	Rear End	1	0	0	W	SH
	VT0041000/15WT03301	Williston	4.79	08/07/2015	15:18	[No Weather]		Head On	1	0	0	N, S	SH
	VT0041000/14WT02352	Williston	5.06	06/15/2014	14:30	Clear	Made an improper turn	Single Vehicle Crash	1	0	0	S	SH
	VT0041000/15WT02523	Williston	5.08	06/19/2015	19:20	Clear	Driving too fast for conditions, Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner	Single Vehicle Crash	0	0	0	E	SH
	VT0041000/17WT001388	Williston	5.08	03/15/2017	17:35	Cloudy	Driving too fast for conditions, Failure to keep in proper lane, No improper driving	Head On	0	0	0	E, W	SH State Owned
	VT0041000/14WT04252	Williston	5.30	10/31/2014	00:32	Clear		Single Vehicle Crash	1	0	0	E	SH State Owned
	VT0041000/17WT001190	Williston	5.31	03/03/2017	23:05	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0	S	SH State Owned
	VT0041000/14WT01003	Williston	5.36	03/16/2014	12:03	Cloudy	Failure to keep in proper lane	Single Vehicle Crash	1	0	0	W	SH
	VT0041000/17WT008174	Williston	5.36	12/29/2017	13:51	Snow	Driving too fast for conditions	Head On	0	0	0	E	SH State Owned
	VT0040800/16RM00064	Williston	5.40	01/19/2016	15:16	Clear	Driving too fast for conditions	Single Vehicle Crash	0	0	0	E	SH State Owned
	VT0041000/15WT05341	Williston	5.83	12/21/2015	08:06	Clear	Inattention	Single Vehicle Crash	0	0	0	W	SH
	VT0041000/16WT006104	Williston	5.83	12/05/2016	09:42	Snow	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	1	0	0	E	SH State Owned
	VT0040800/18RM00069	Williston	5.88	01/19/2018	08:51	Cloudy	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	E	SH State Owned
	VT0041000/18WT000959	Williston	UNK	02/06/2018	08:30	Cloudy	Visibility obstructed	Single Vehicle Crash	0	0	0	N	Other
	VT0120200/2014MP007660	Montpelier	0.00	10/29/2014	18:21	Clear	Failed to yield right of way, No improper driving	Same Direction Sideswipe	0	0	0	N	SH
	VT0120200/18MP003882	Montpelier	0.22	05/30/2018	16:50	Clear	Driving too fast for conditions, No improper driving	Rear End	1	0	0	E	SH Class 1 TH
	VT0120200/2015MP003090	Montpelier	0.25	05/05/2015	15:37	Clear	Visibility obstructed, Inattention, No improper driving	Other - Explain in Narrative	0	0	0	N, W	SH
	VT0120200/2015MP007059	Montpelier	0.26	09/17/2015	17:36	Clear	Unknown, No improper driving	Rear End	1	0	0	E	SH

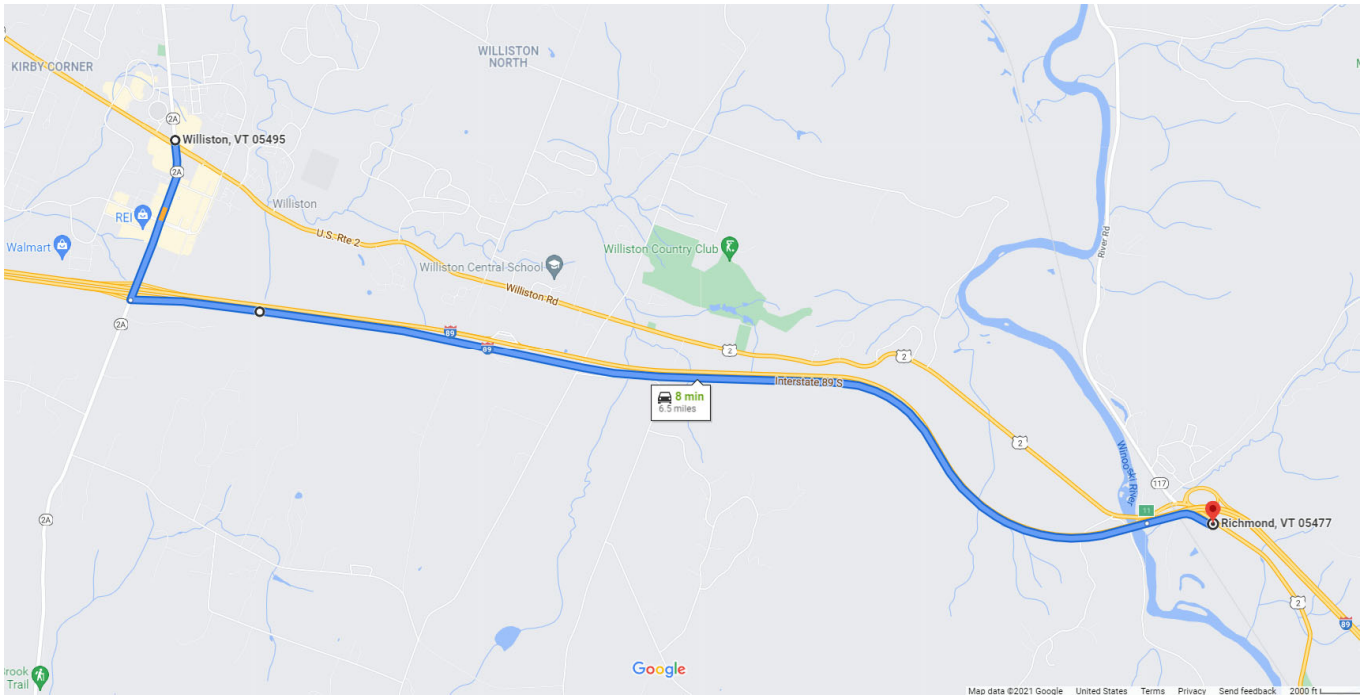
**Crash occurred prior to the last Highway Improvement Project. This data should not be used in a crash analysis. UNK indicates Mile Marker is Unknown.*

Appendix M: Detour and Local Bypass Maps



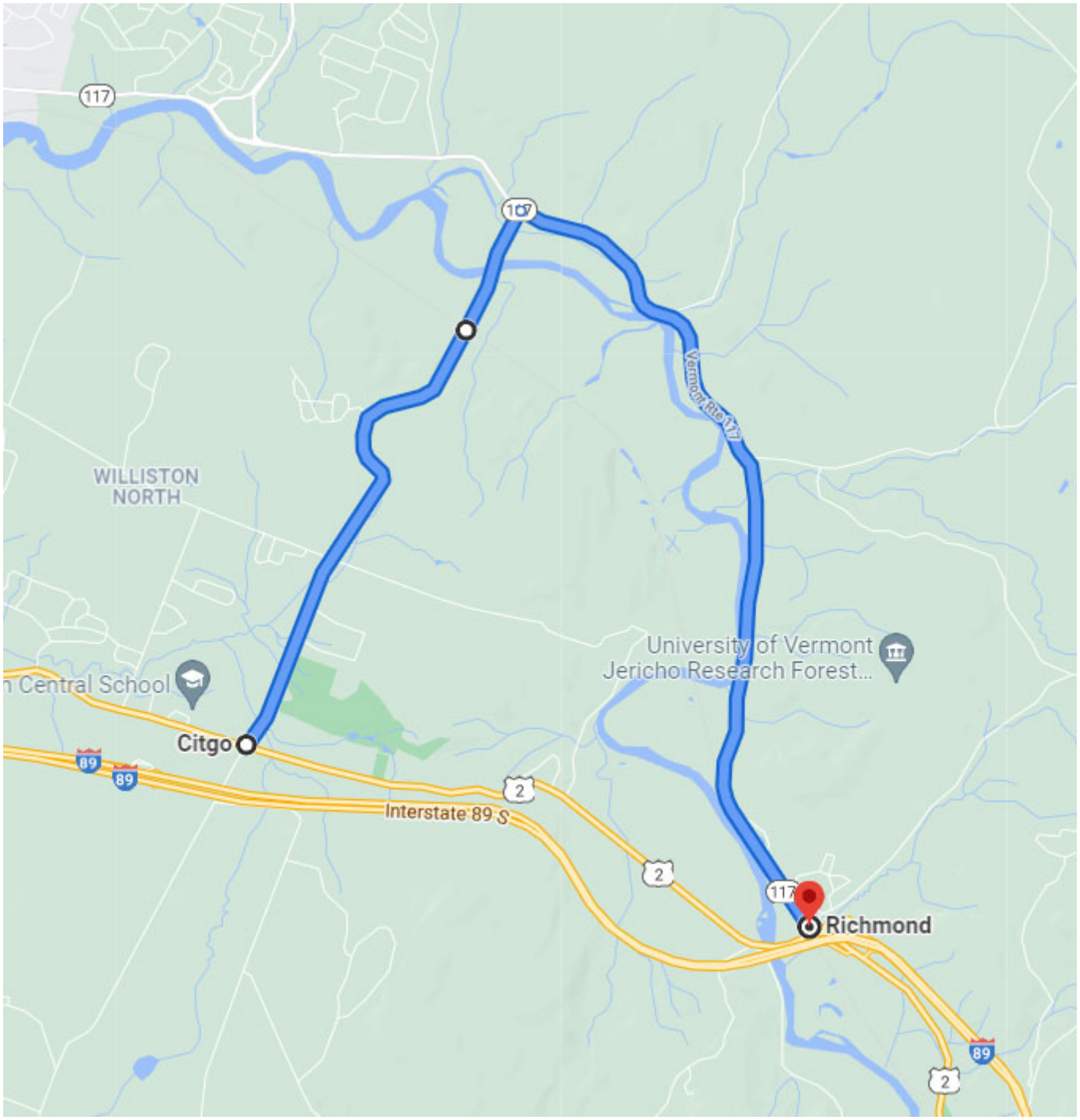
Regional Detour Route 1: US Route 2, to VT Route 117 and VT Route 2A, back to US Route 2.

Through Route: 5.4 miles
Detour Route: 10.9 miles
End-to-end Distance: 16.4 miles
Added Distance: 5.5 miles



Regional Detour Route 2: US Route 2, to I-89, and VT Route 2A, back to US Route 2.

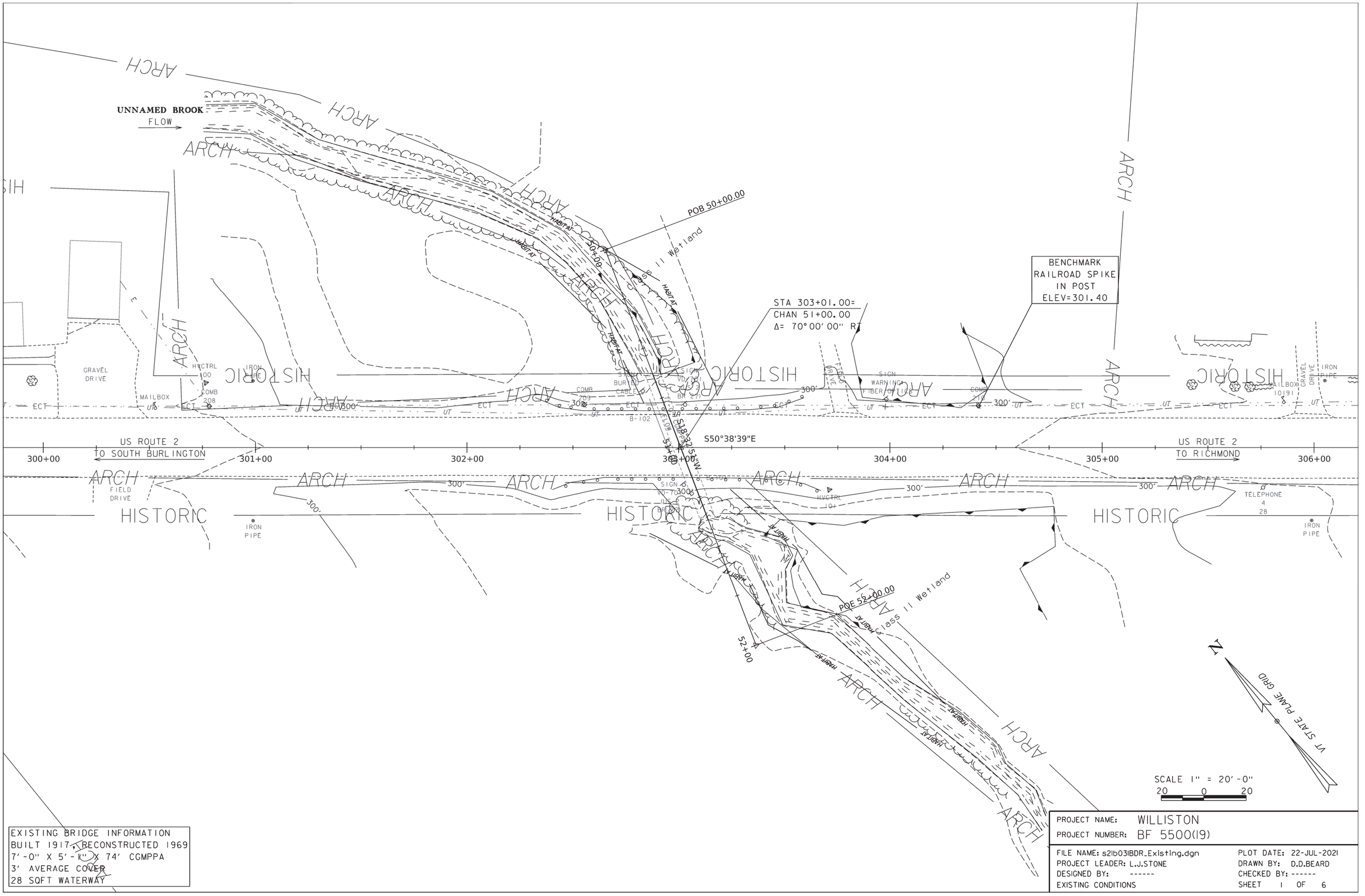
Through Route: 5.4 miles
Detour Route: 6.6 miles
End-to-end Distance: 12.0 miles
Added Distance: 1.2 miles



Local Bypass Route: US Route 2, to VT Route 117, and North Williston Road, back to US Route 2 (10.5 mi end-to-end)

Through Route: 3.1 miles
Detour Route: 7.4 miles
End-to-end Distance: 10.5 miles
Added Distance: 4.3 miles

Appendix N: Plans

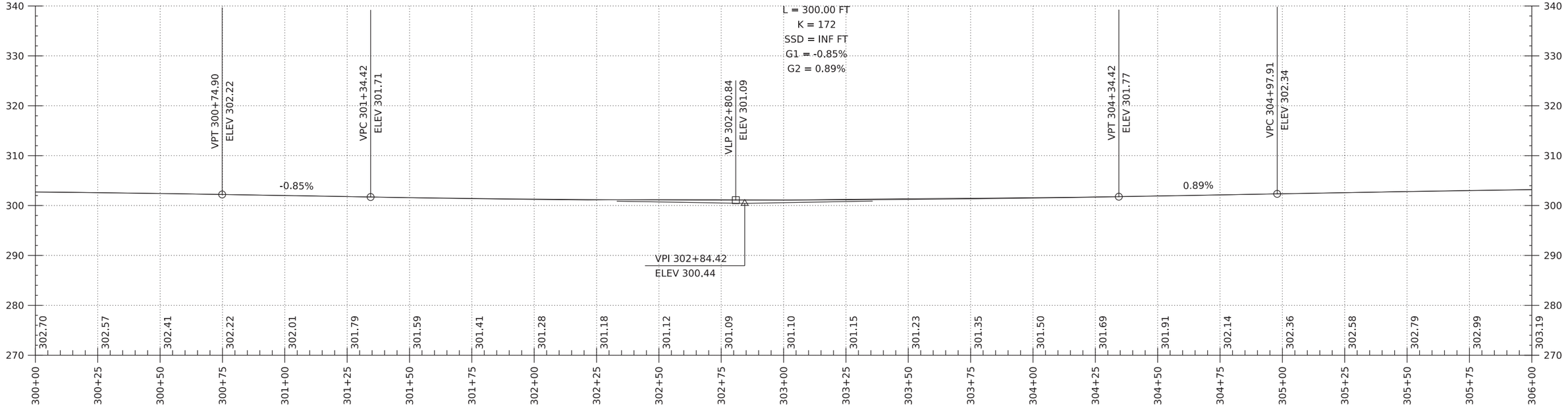


EXISTING BRIDGE INFORMATION
BUILT 1917, RECONSTRUCTED 1969
7'-0" X 5'-1" X 74' CGMPPA
3' AVERAGE COVER
28 SQFT WATERWAY

PROJECT NAME: WILLISTON
PROJECT NUMBER: BF 5500(19)

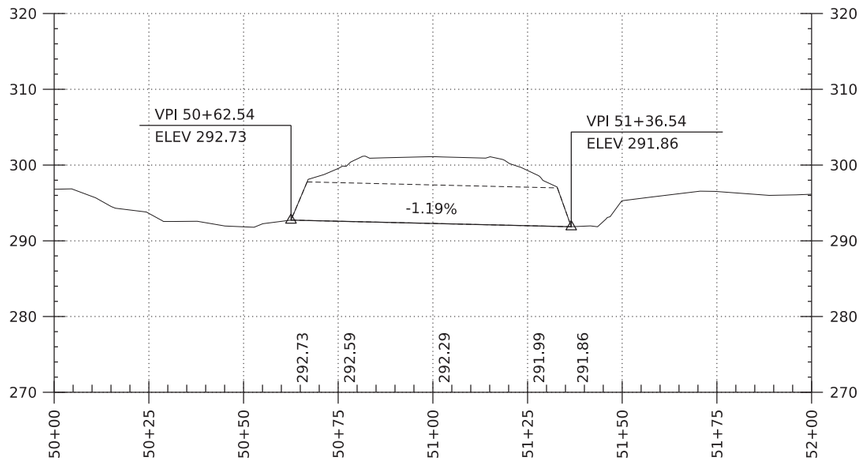
FILE NAME: s21b031BDR_Existing.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
EXISTING CONDITIONS

PLOT DATE: 22-JUL-2021
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 1 OF 6



US ROUTE 2 PROFILE

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

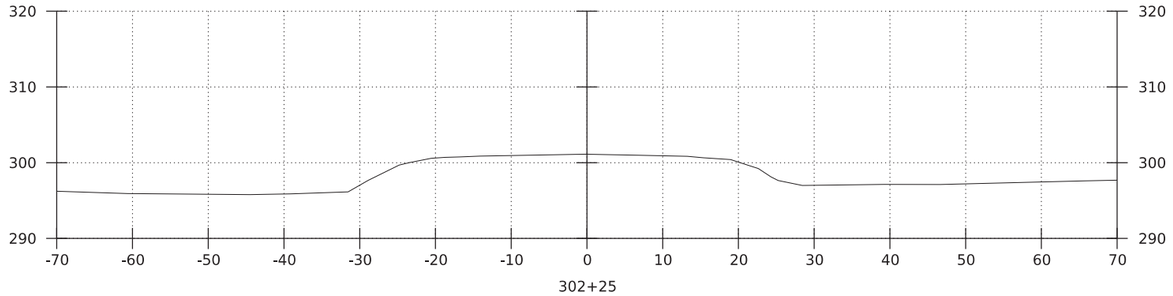


CULVERT 23 PROFILE

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:	WILLISTON
PROJECT NUMBER:	BF 5500(19)
FILE NAME: s21b031profile.dgn	PLOT DATE: 22-JUL-2021
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PROFILE SHEET	SHEET 2 OF 6



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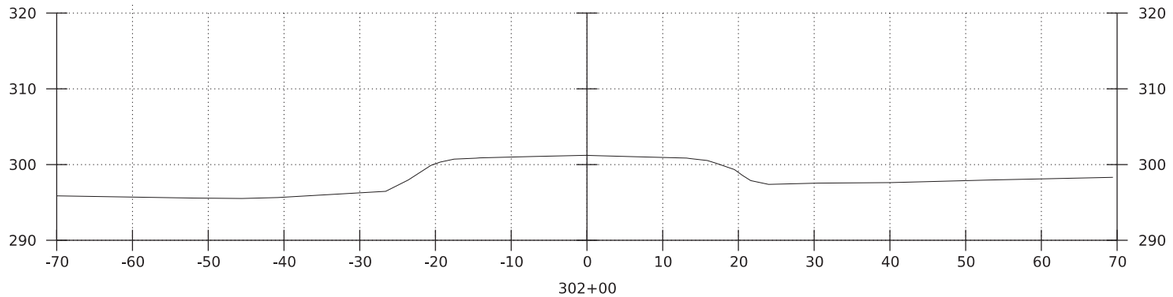

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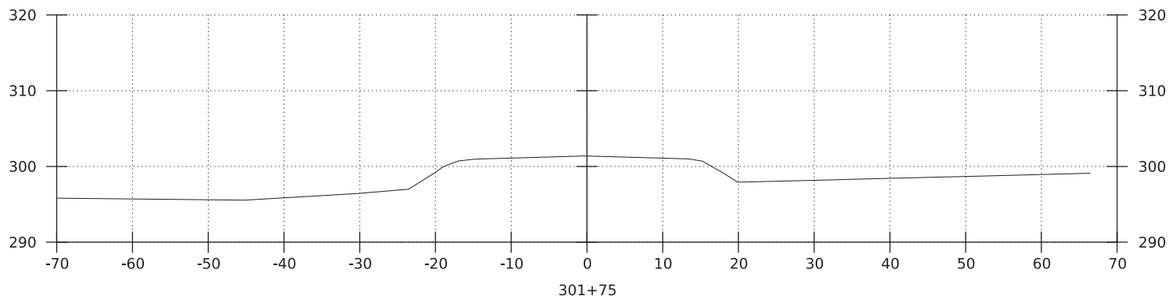

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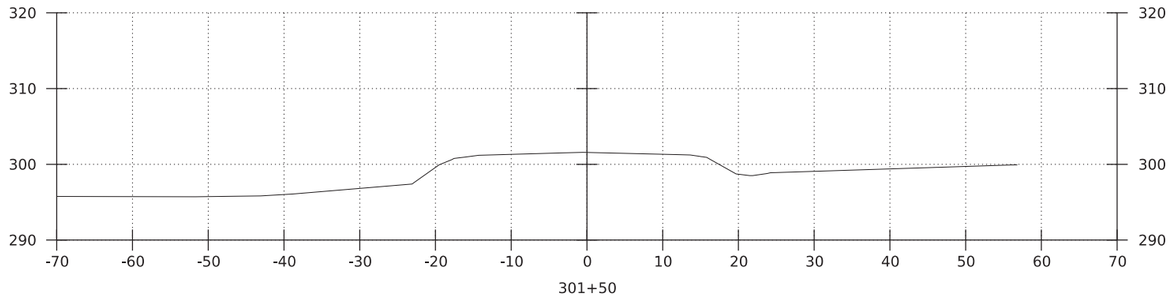

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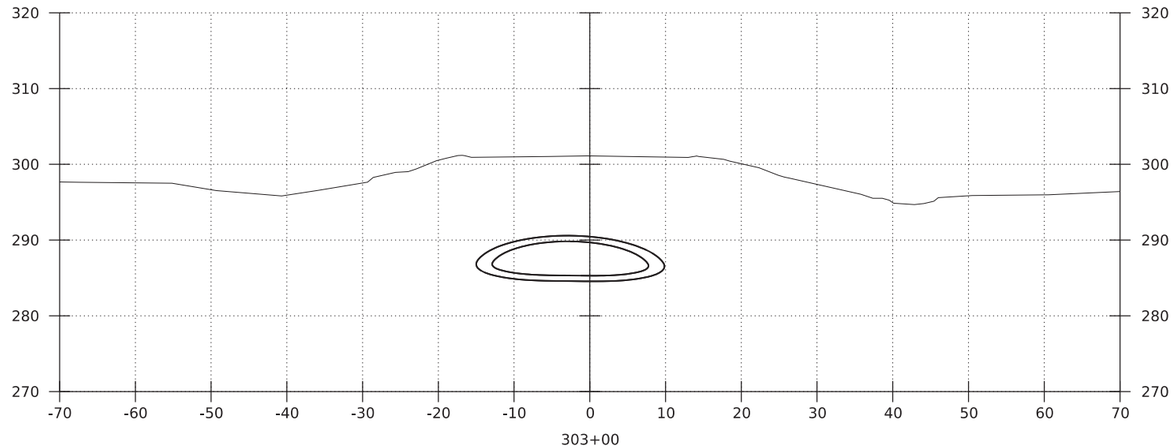

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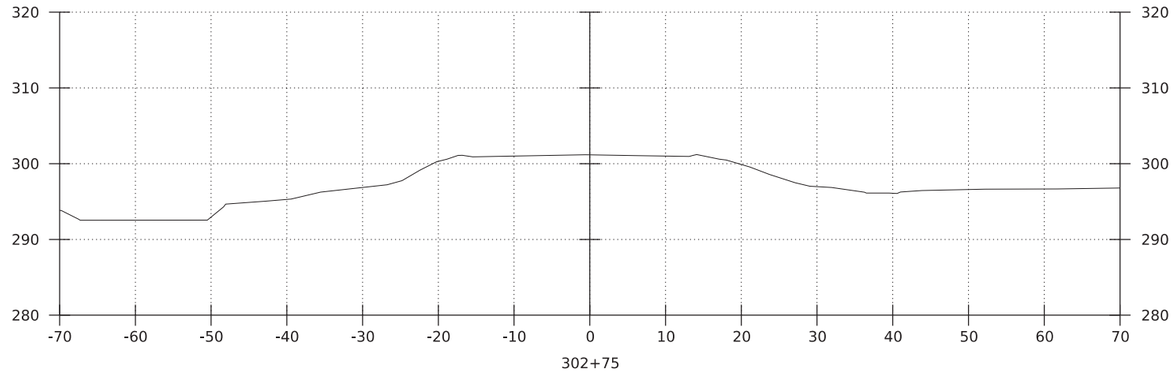

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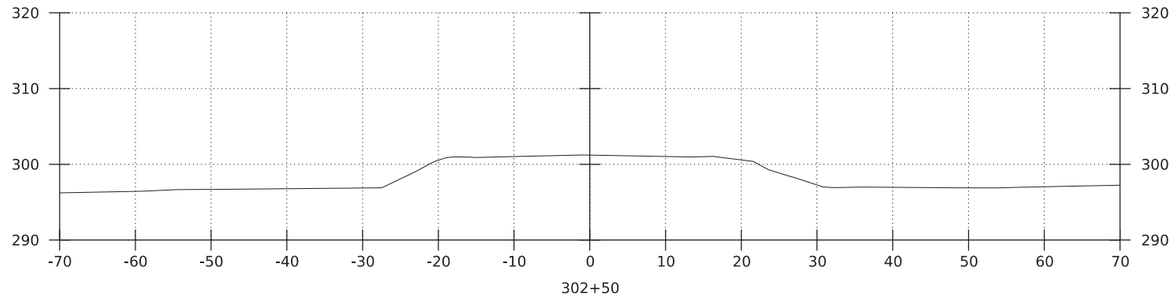

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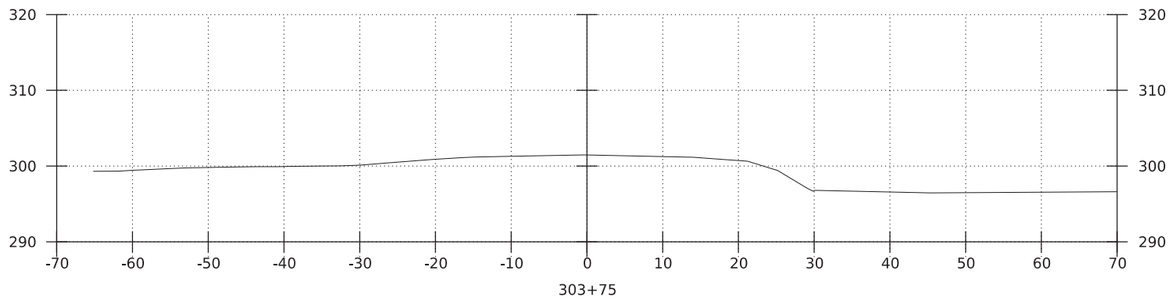
PROJECT NAME: WILLISTON	
PROJECT NUMBER: BF 5500(19)	
FILE NAME: s2lb03lxs.dgn	PLOT DATE: 22-JUL-2021
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ROADWAY CROSS SECTIONS I	SHEET 3 OF 6



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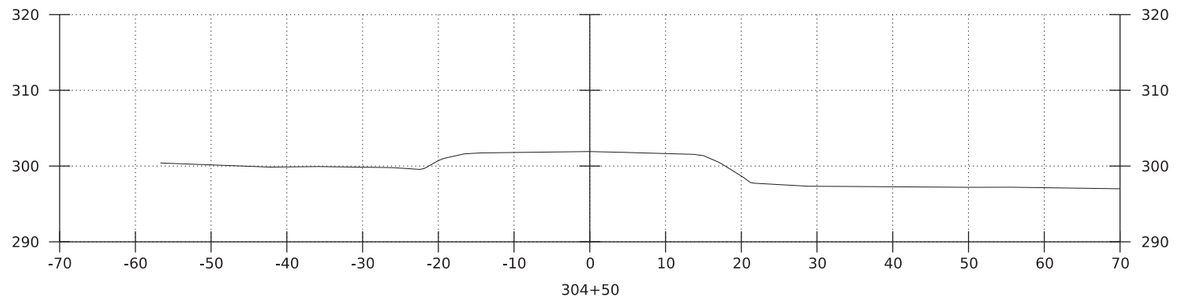

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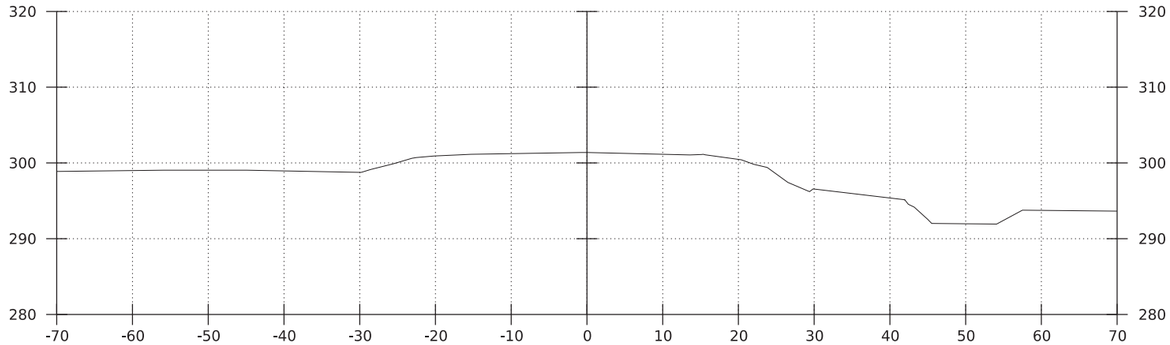

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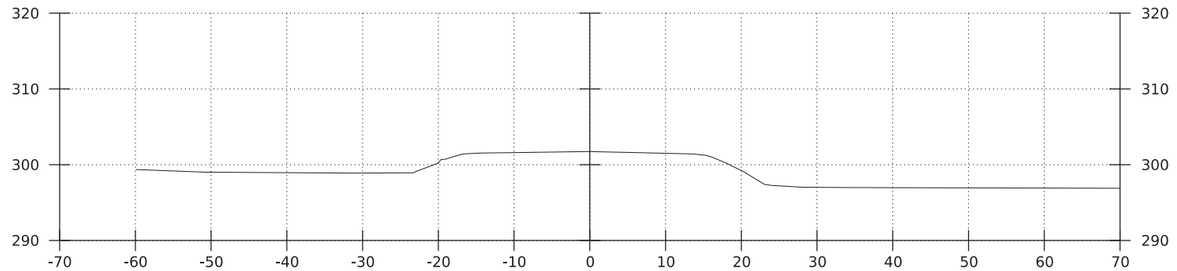

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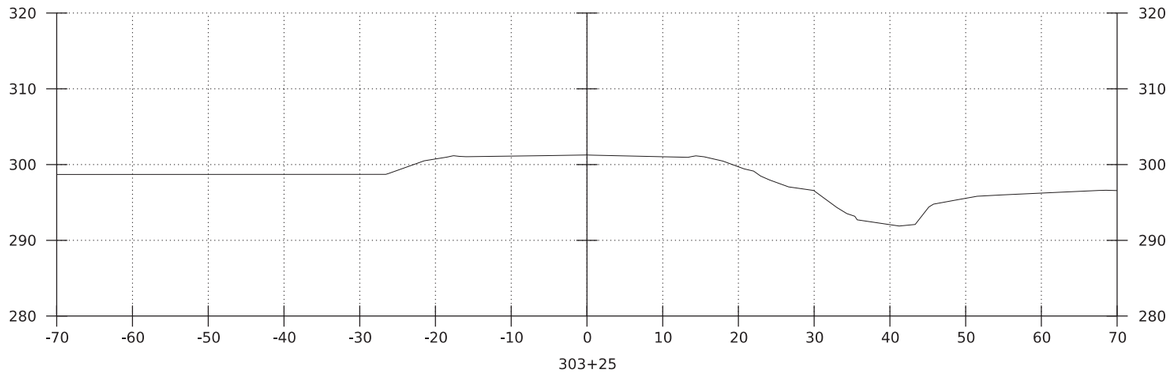

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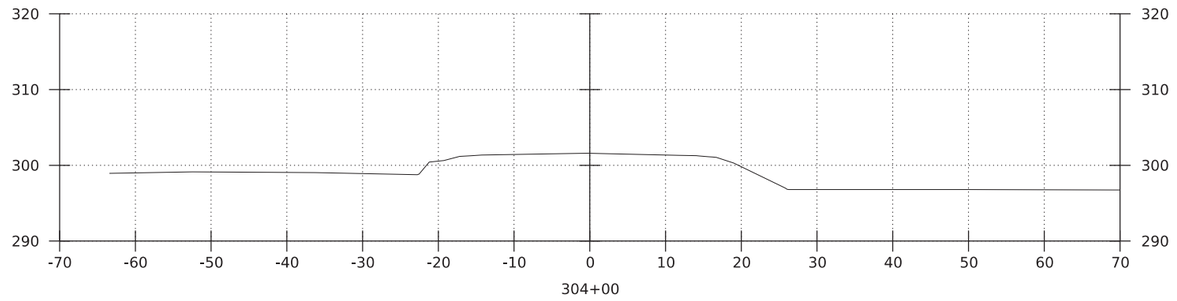

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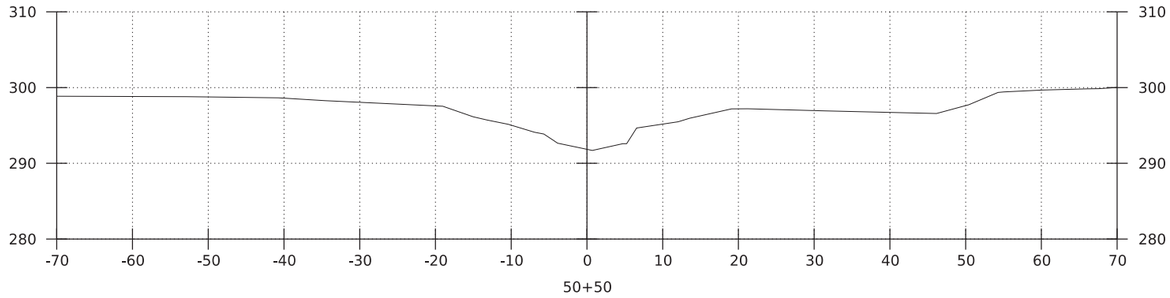
PROJECT NAME: WILLISTON	
PROJECT NUMBER: BF 5500(19)	
FILE NAME: s21b031xs.dgn	PLOT DATE: 22-JUL-2021
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ROADWAY CROSS SECTIONS 2	SHEET 4 OF 6



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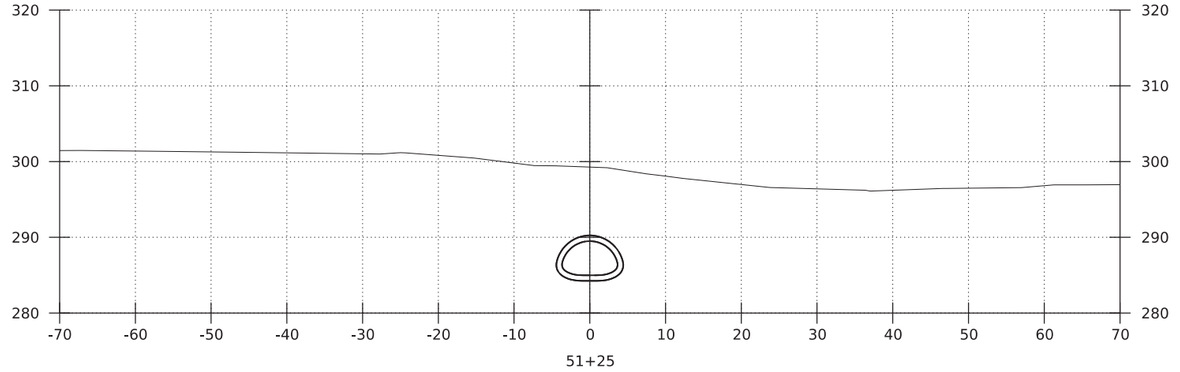

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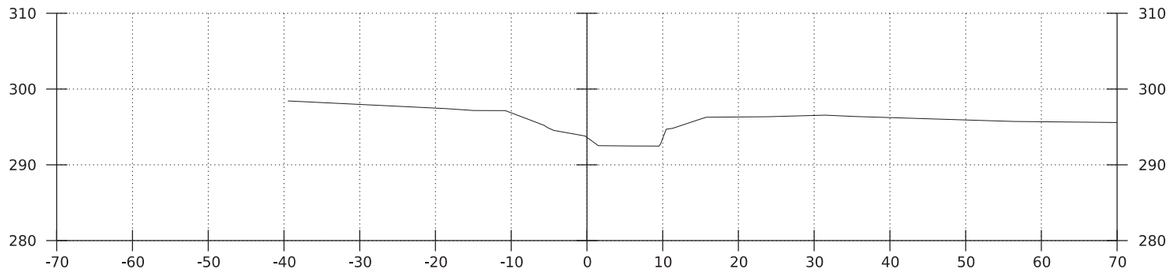

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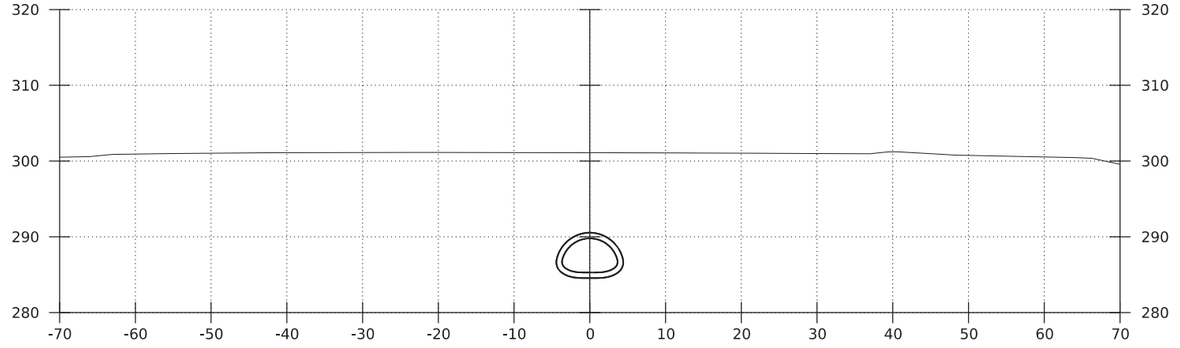

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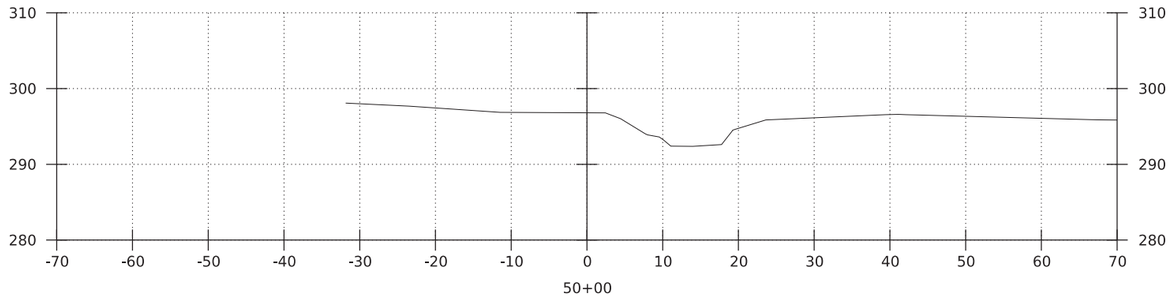

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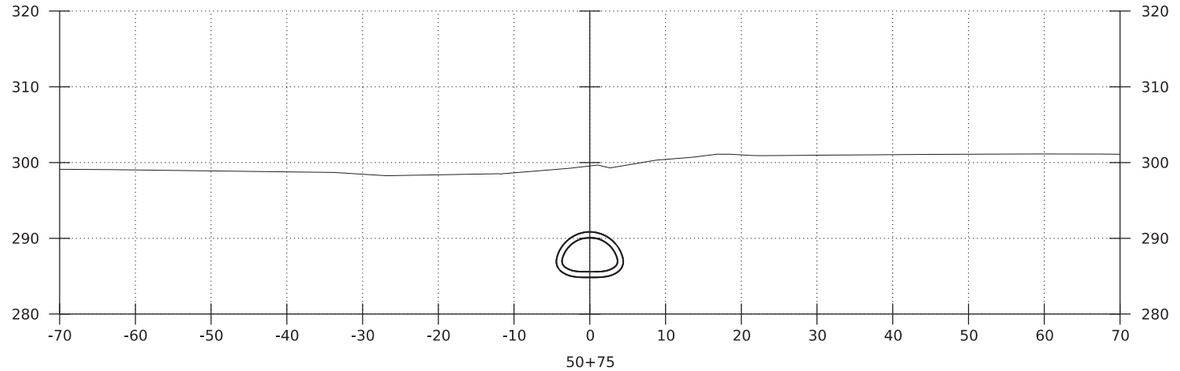

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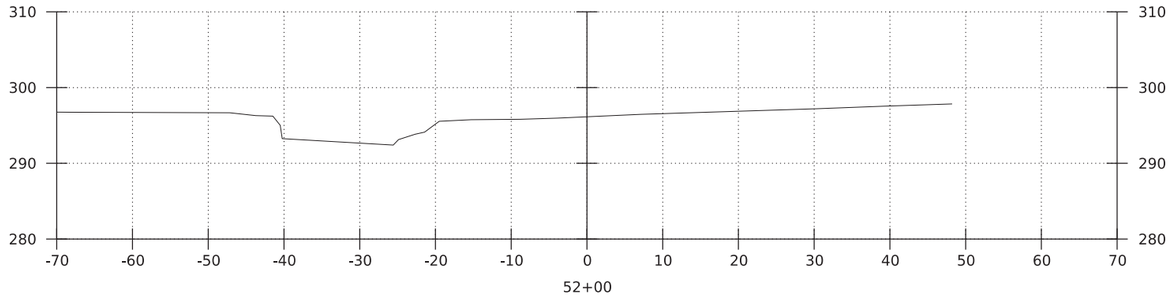
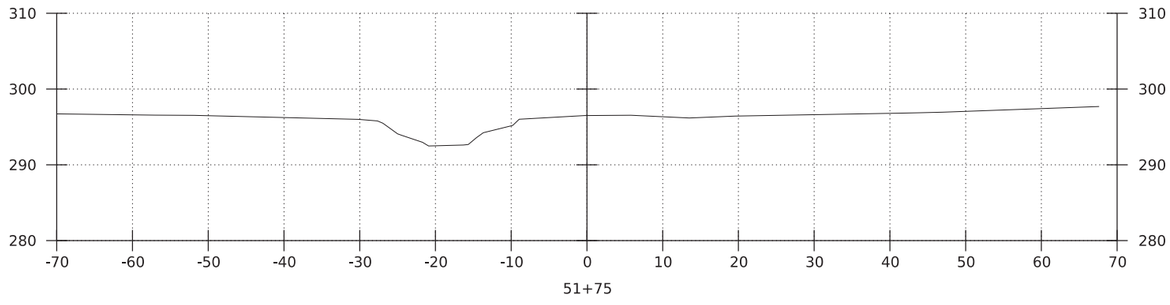
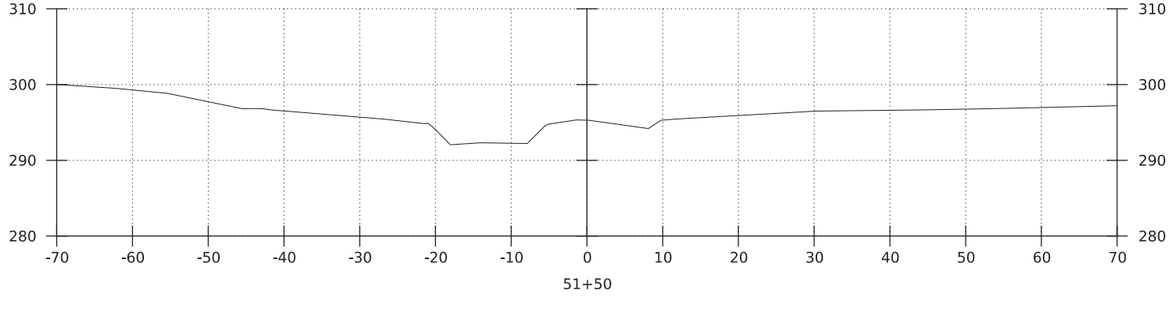
PROJECT NAME: WILLISTON	
PROJECT NUMBER: BF 5500(19)	
FILE NAME: s2lb031xs.dgn	PLOT DATE: 22-JUL-2021
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CHANNEL CROSS SECTIONS 1	SHEET 5 OF 6







PROJECT NAME: WILLISTON	
PROJECT NUMBER: BF 5500(19)	
FILE NAME: s21b031xs.dgn	PLOT DATE: 22-JUL-2021
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CHANNEL CROSS SECTIONS 2	SHEET 6 OF 6