STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Cavendish BO 1442(38)

TOWN HIGHWAY 1, BRIDGE 58 OVER THE BLACK RIVER

March 31, 2015

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I. Site Information

Bridge 58 is a Town owned bridge located on Depot Street (Town Highway 1) approximately 0.1 miles southeast of the junction with Vermont Route 131. There is a sharp horizontal curve after the bridge; the bridge is partially located on this curve. Depot Street connects VT Route 131 with VT Route 103. 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	Local Road (Class 2 Town Highway)
Bridge Type	2-Span Concrete T-beam Bridge
Bridge Length	87 feet
Year Built	1940
Ownership	Town of Cavendish

Need

Bridge 58 carries Town Highway 1 across the Black River. The following is a list of deficiencies of Bridge 58 and Town Highway 1 in this location:

1. Bridge 58 is considered structurally deficient, with all bridge components rated as Poor. The existing T-beams, backwalls, and abutments have a significant amount of exposed rebar and are deteriorating at a rapid rate. Full depth holes have needed patching in the past, and full depth holes are possible in the future.

2. The bridge railing does not meet crash test standards.

3. There is a substandard sharp horizontal curve after the bridge.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2017 and 2037.

TRAFFIC DATA	2017	2037
AADT	1,000	1,100
DHV	140	170
ADTT	50	70
%T	5.5	7.2
%D	54	54

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 1,100 and a design speed of 35 mph for a Local Road.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 6.3	10'/2' (24') Sidewalk on left side of road	9'/2' (22')	
Bridge Lane and Shoulder Widths	VSS Section 6.7	10'/2' (24') - 5' sidewalk on each side of bridge	9'/2' (22')	
Clear Zone Distance	VSS Table 6.5	No Issues Noted	12' fill / 10' cut	
Banking	VSS Section 6.12	Varies, RC at curve	8% (max)	
Speed		35 mph (Posted)	35 mph (design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R = 220'	R_{min} = 3,120' @ RC	Substandard
Vertical Grade	VSS Table 6.6	-0.8696%	7% for level terrain	
K Values for Vertical Curves	VSS Table 6.1	No Vertical Curve	40 crest / 50 sag	
Vertical Clearance	VSS Section 6.7	No Issues Noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 6.1	230'	225'	
Bicycle/Pedestrian Criteria	VSS Table 6.7	2' shoulder	2' Shoulder	
Bridge Railing	Structures Design Manual Section 13	3-Rail aluminum rail	TL-2	Substandard
Hydraulics	VTrans Hydraulics Section	Passes Q_{25} storm event with 1.3' of freeboard	Pass Q_{25} storm event with 1.0' of freeboard	
Structural Capacity	SM, Ch. 3.4.1	Structurally Deficient	Design Live Load: HL-93	Substandard

Inspection Report Summary

Deck Rating	4 Poor
Superstructure Rating	4 Poor
Substructure Rating	4 Poor
Channel Rating	6 Satisfactory

5/21/2014 – Structure is in poor condition. Deck will need replacement in the near future. Holes in the deck have been covered with steel plates but holes could occur at any time. A replacement should be considered soon. ~FRE/TJB

5/21/2013 – Structure is in poor condition. Deck and super continue to deteriorate and should be considered for rehab in the near future. Due to the saturation in the deck holes could form at any time. ~FRE/MK

4/16/2012 – Beams should be cleaned and patched along with the bridge seat areas. Backwall on abutment #1 should be cleaned and patched. Debris on the upstream side of the pier and on the top should be clean out. ~FRE/DCP

7/18/2011 – The deck was patched at abutment 2 and at the pier. The tee beams are in poor condition. The pier is in poor condition. The bridge should be replaced in the near future. ~DCP/FRE

Hydraulics

The existing structure meets the current standards of the VTrans Hydraulic Manual. The standard is to pass a Q_{25} design storm event with 1 foot of free board. The current bridge passes the Q_{25} storm event with 1.3' of freeboard. If a one span structure with a deeper superstructure is chosen, there should be no rise in the Q100 water surface elevation. The VTrans Hydraulics Section has made recommendations for a replacement project. These recommendations can be found in the preliminary hydraulics report in the Appendix.

Utilities

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

Municipal Utilities

- There are municipal water and sewer mains in the vicinity of the bridge. There is an 8'' sewer main (Gravity) attached to the existing bridge on the easterly side and an 8'' insulated water main attached to the existing bridge on the westerly side.

Public Utilities (Aerial)

- The primary aerial electric transmission lines (3 phase) and communication cables generally run along the westerly edge of TH # 1; however, there are numerous aerial electric and telephone service lines passing over TH # 1; most of these aerial crossing are north of the RR tracks. There are aerial electric transmission lines (Single Phase) and communication cables which cross TH # 1 just off the southern end of the bridge and extend up and along Pratt Hill Road.

Public Utilities (Underground)

- There are no known buried utilities (telephone cable, etc) in the vicinity of this bridge; there are however some buried electric lines which run from the RR Signal Control Cabinets to poles on either side of the tracks. There are no buried utilities running along the RR tracks within the RR ROW.

It is anticipated that relocation of utilities will be necessary for construction. Coordination with the Municipality and Public utility companies will be necessary during design of any construction project.

Right Of Way

The southeast wingwall is currently located within three feet of the existing Right-of-Way. As such, it is anticipated that any construction project will require additional rights to be obtained. The existing Right-of-Way is plotted on the Existing Conditions Layout Sheet.

Railroad Crossing

The existing bridge is located approximately 250 feet south of an at-grade railroad crossing. No impacts to the railroad are anticipated.

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

Biological:

Wetlands/Watercourses
There are no wetlands located in the project area.

Impact below OHW / Fisheries / AOP
The Black River is the only regulated natural resource in the immediate project area, and only impacts below OHW are regulated.

Species / Habitats of Special Concern
There are no species or habitats of special concern within the project area.

Agricultural Soils / Floodplains
There are no agricultural or Floodplain Soils within the project area.

Hazardous Materials:

According to the Vermont Agency of Natural Resources (VANR) Vermont Hazardous Sites List, there are no hazardous waste sites located in the immediate project area. It is anticipated that no hazardous waste sites will be impacted. A map of hazardous sites in the project area can be found in the Appendix.

Historic:

Bridge 58 is not a historic bridge, however, it is located within a historic district and there are adjacent historic properties.

There are historic properties at the NE and NW quadrants of the bridge. The NE and SE wingwalls are part of long stone walls, which are contributing features to the historic district. Concerns for historic review will include takes from historic properties, proposed railing replacement, and elements of design such as bridge width.

Archaeological:

The project area consists of a small neighborhood containing historic residential properties and is adjacent to the Rutland – Burlington rail line. The area has been disturbed from historic development and does not contain any known sites or archaeologically sensitive areas. There are two stone retaining walls on either side of the bridge along the NE and SE quads. These have been picked up by Historic Preservation as part of the adjacent properties but they are not associated with any archaeological features.

Stormwater:

There are no stormwater concerns for this project.

II. Maintenance of Traffic

The Vermont Agency of Transportation reviews each new project to determine suitability for the Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right of Way, as well as faster construction of projects in the field. One practice that will help in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects 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 will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Construction should provide enhanced safety for the workers and the travelling public while maintaining project quality. The following options have been considered:

Option 1: Off-Site Detour

This option would close the bridge and reroute traffic onto an offsite detour. Since the bridge is located on a Class 2 Town Highway, it would be the responsibility of the Town of Cavendish to choose the preferred detour route, and to sign it according to the MUTCD manual.

There are several routes that could be used for a detour at this site. The most likely route has an end-to-end distance of 1.7 miles, and adds approximately 0.7 miles to travel distance. The vehicle detour route is as follows:

1. Depot Street (Town Highway 1), to VT Route 131, VT Route 103, back to Depot Street (Town Highway 1) (1.7 mi end-to-end)

Since there is a sidewalk on the existing bridge, a pedestrian detour is necessary. A separate route would be recommended at this site. This route has an end-to-end distance of 1.4 miles, and adds approximately 0.8 miles to travel distance. The pedestrian detour route is as follows:

2. Depot Street (Town Highway 1), to VT Route 131, VT Route 103, Greven Road, back to Depot Street (Town Highway 1) (1.4 mi end-to-end)

The speed limit on VT Route 103 is 50 mph. In order to create a safer environment for pedestrians, it is recommended that the speed limit on VT Route 103 is reduced between VT Route 131 and Greven Road, during the bridge closure. Additionally, pedestrian signs should be placed in order to encourage both northbound and southbound pedestrians to stay on the eastern shoulder of the road, so that pedestrians are not crossing VT Route 103. Placing a traffic barrier for pedestrians on VT Route 103 should also be considered.

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

Advantages: This option would eliminate the need for a temporary bridge, which would significantly decrease cost and time of construction. This option would not require the need to obtain rights from adjacent property owners for a temporary bridge. Also, this option would not have impacts to historic resources adjacent to the bridge. This option reduces the time and cost of the project both at the development stage and construction.

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

Option 2: Phased Construction

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

While the time required to develop a phased construction project would remain the same, the time required to complete a phased construction project increases because some of the construction tasks have to be performed multiple times. In addition to the increased design and construction costs mentioned above, the costs also increase for phased construction because of the inconvenience of working around traffic and the effort involved in coordinating the joints between the phases. Another negative aspect of phased construction is the decreased safety of the workers and vehicular traffic, which is caused by increasing the proximity and extending the duration that workers and moving vehicles are operating in the same confined space. Phased construction is usually considered when the benefits include reduced impacts to resources and decreased costs and development time by not requiring the purchase of additional ROW.

Additionally, since there is a sidewalk on the existing structure, pedestrian traffic should be maintained as well. In order to accommodate these requirements, phased construction would not be possible without unnecessarily widening the bridge. This is not desirable; it would result in additional acquisition of permanent right of way, as well as additional impacts to resources and property owners. As such phased construction will not be considered in the report.

Option 3: Temporary Bridge

It would be difficult to place a temporary bridge on both the upstream and downstream sides of Bridge 58. There are houses in every quadrant of the bridge, which are all fairly close to the roadway.

The temporary roadway for an upstream temporary bridge would have to be constructed approximately 5 feet from the corner of the house in the southwest quadrant. Additionally, a downstream temporary bridge would be impossible to construct without the removal of the historic house in the northeast quadrant. As such, if a temporary bridge is the desired method for traffic control, the upstream option would be more feasible.

Significant additional costs would be incurred to use a temporary bridge, including the cost of the bridge itself, installation and removal, restoration of the disturbed area, and the time and money associated with the temporary Right-of -Way. Additional permit review would be triggered by any impacts to historic properties.

Since there is a sidewalk on the existing bridge, pedestrian traffic should be maintained on any temporary bridge. A one-way temporary bridge with accommodations for pedestrians would be appropriate based on the daily traffic volumes. A signal would be recommended due to the tight curve and minimal sight distance. The upstream and downstream temporary bridge layouts can be found in the Appendix.

IV. Alternatives Discussion

No Action

This alternative would involve leaving the bridge in its current condition. A good rule of thumb for the "No Action" alternative is whether the bridge can stay in place without any work being performed on the bridge in the next 10 years. Bridge 58 is considered structurally deficient, with all bridge components rated as "Poor". The existing T-beams, backwalls, and abutments have a significant amount of exposed rebar and are deteriorating at a rapid rate. Full depth holes have required patching in the past, and full depth holes are possible in the future. Since the bridge is in poor condition, it is unlikely that it will last another 10 years without performing work on the structure; something will have to be done to improve this bridge in the near future, or it will eventually be closed to traffic. In the interest of safety to the traveling public, the No Action alternative is not recommended. A cost estimate has not been provided for this alternative since there are no immediate costs.

Permanent Bridge Closure

This option would close the bridge to traffic permanently. Depot Street runs as a shortcut between Vermont Route 131 and Vermont Route 103, so through traffic would not be impacted by closing this section of road. The traffic volume utilizing this stretch of road is relatively small and the lengths of the potential detours are relatively short as well.

The work required for a permanent closure would be as follows:

- Work would need to be performed to prevent the existing structure from falling into the river; the existing deck and superstructure would be removed and the abutments would be strengthened as necessary to continue to hold back the fill behind them.

- The paved area on the north end of the bridge would be expanded to allow for a turn around since this end would be a dead end. A cul-de-sac could possibly be paved, but would require permanent right-of-way from the adjacent land owners.

- Railing or fencing would be set along the existing abutments to eliminate a fall hazard.

This would provide the lowest cost solution to rectify the issues at this site. In addition, the future maintenance costs would be reduced because there would be no bridge to maintain and the section of Depot Street near the existing bridge would see much less traffic if Depot Street were no longer a through route.

Superstructure Repair or Replacement

This alternative involves the rehabilitation of the existing abutments and removal of the existing pier, and replacement of the existing superstructure.

This option would include removal of the superstructure and replacement with an 85 foot span steel beam superstructure. A superstructure replacement cost for a bridge this size would be approximately $500,000. Additionally, there would be some substructure repairs:

- New backwalls would need to be poured, and extensive concrete repair to the abutments be performed.

Placing a new superstructure on an existing substructure makes economic sense if the substructures are in good condition. However, the existing substructure is 74 years old and in poor condition. Additionally, scour has been observed through the bridge. Any project would include scour protection measures that would likely encroach into the channel. Excavating the material behind the abutment, placing flowable fill under the abutment and patch the existing deterioration on a 74 year old abutment does not make sense. Therefore, this alternative will not be considered further in this report.

Full Bridge Replacement On Alignment

This alternative would remove the existing bridge and replace it with new substructure units and a new superstructure on the existing alignment.

The existing structure is partially located on a substandard horizontal curve. However, an off alignment alternative will not be evaluated due to the tight sight constraints. Realigning the current roadway would require additional adverse impacts to adjacent property owners, and more Right-of-Way acquisition than is required for an on-alignment option.

By maintaining the existing horizontal alignment, impacts to resources and adjacent properties will be minimized. It is recommended that any new bridge is raised by three inches for improved hydraulics. The various considerations under this option include: the bridge width and length, skew, superstructure type and substructure type.

a. Bridge Width

The existing lane widths and shoulders on the bridge are 10 feet wide and 2 feet wide respectively; this exceeds the minimum standard of 9 feet and 2 feet respectively. In addition to the existing lane and shoulder widths, there is a 5 foot wide sidewalk on each side of the bridge. The sidewalk continues off the bridge on the east side of Town Highway 1. The sidewalk on the west side of Town Highway 1 only exists on the bridge and does not continue along the roadway. It is proposed that the sidewalk on the western side of the bridge is eliminated, and a 5'-6" wide sidewalk only be provided on the eastern side of the bridge to match the existing site conditions. Additionally, it is proposed that the current 10 foot lanes and 2 foot shoulders are maintained. A 5-6" wide sidewalk on the east side of the bridge with two 10 foot travel lanes and 2 foot shoulders will be proposed.

b. Bridge Length and Skew

The existing bridge has two spans with a total bridge length of 87 feet and a skew of 10 degrees. Each span has a clear span of approximately 40 feet normal to the channel. Vertical abutments with a minimum clearspan of 81 feet would be acceptable from a hydraulic standpoint. There are historically significant stone walls on either side of the cannel on the downstream end of the bridge. These walls dictate the hydraulics at this site since they create a pinch point. Therefore, widening the bridge beyond this length would not improve the hydraulic capacity of the bridge. Therefore, setting the clearspan equal to 81 feet to match into these walls would result in a bridge span of 84 feet. Another option is to drive piles behind the existing abutments and place the new abutments behind the old abutments. The pier would be saw-cut down resulting in a single span of approximately 90 feet. This option would have the least impacts to the historic walls and would have a shorter construction duration. A skew of 10 degrees will be recommended in order to match the existing site conditions, for wither of the span options chosen.

c. Superstructure Type

A precast structure will be the preferred choice, due to decreased construction time. The possible 84' to 90' length bridge types that can accommodate a 10 degree skew, that are most commonly used in Vermont are box beams with a structural overlay, NEXT Beams, and steel beams with a composite concrete deck. The superstructure depth is critical for hydraulics, so the shallowest beam available should be chosen to maximize the hydraulic performance.

d. Substructure Type

The existing foundation type is unknown. However borings preformed at the project site indicate that either a pile cap on piles or spread footings founded on the medium dense silty sand at the site would be appropriate substructure types. Since the proposed bridge needs to match into the existing historic stone walls, it does not make sense to extend the structure length and propose integral abutments. Therefore, either vertical abutments founded on spread footings of abutments founded on piles would be recommended. Borings were taken to verify the in-situ ground conditions, and it was determined that bedrock is located approximately 100 feet below the ground surface, therefore there should not be obstacles with the use if precast footings and abutments. In order to reduce construction time, precast abutment components may be used where possible. If a pile supported structure were placed behind the existing abutments, it would eliminate the need for cofferdams, resulting in a faster construction project. The preliminary geotechnical report and boring logs can be found in the Appendix.

e. Maintenance of Traffic:

The possible options for traffic control at this site are an offsite detour or a temporary bridge.

V. Alternatives Summary

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

Alternative 1: Permanent Bridge Closure
Alternative 2a: Full Bridge Replacement with Traffic Maintained on an offsite Detour
Alternative 2b: Full Bridge Replacement with Traffic Maintained on a One-Lane Temporary Bridge

VI. Cost Matrix[1]

Cavendish BO 1442(38)		Do Nothing	Alt 1	Alt 2a	Alt 2b
			Permanent Bridge Closure	Full Bridge Replacement	
				Offsite Detour	Temporary Bridge
COST	Bridge Cost	$0	$74,000	$1,227,000	$1,227,000
	Removal of Structure	$0	$81,000	$126,000	$126,000
	Roadway	$0	$80,000	$276,000	$276,000
	Maintenance of Traffic	$0	$44,000	$66,000	$296,000
	Construction Costs	$0	$279,000	$1,695,000	$1,925,000
	Construction Engineering + Contingencies	$0	$84,000	$509,000	$578,000
	Total Construction Costs w CEC	**$0**	**$362,700**	**$2,203,500**	**$2,502,500**
	Preliminary Engineering[2]	**$0**	**$97,650**	**$339,000**	**$385,000**
	Right of Way	**$0**	**$41,850**	**$152,550**	**$173,250**
	Total Project Costs	$0	$502,200	$2,695,050	$3,060,750
	Annualized Costs	$0	$0	$33,700	$38,300
TOWN SHARE			$12,560 (2.5%)	$134,750 (5%)	$306,075 (10%)
SCHEDULING	Project Development Duration[3]		4 years	4 years	4 years
	Construction Duration		2 months	8 months	18 months
	Closure Duration (If Applicable)		∞	10 weeks	N/A
ENGINEERING	Typical Section - Roadway (feet)	24'	24'	24'	24’
	Typical Section - Bridge (feet)	5 sidewalk-2-10-10-2-5 sidewalk	N/A	5.5 sidewalk-2-10-10-2	5.5 sidewalk-2-10-10-2
	Geometric Design Criteria	Substandard horizontal curve	Substandard horizontal curve	Substandard horizontal curve	Substandard horizontal curve
	Traffic Safety	No Change	Improved	Improved	Improved
	Alignment Change	No	No	Vertical raised 3 inches	Vertical raised 3 inches
	Bicycle Access	No Change	No Change	No Change	No Change
	Hydraulic Performance	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria
	Pedestrian Access	No Change	No Change	No Change	No Change
	Utility	No Change	Relocation	Relocation	Relocation
OTHER	ROW Acquisition	No	Yes	Yes	Yes
	Road Closure	No	Yes	Yes	No
	Design Life	<10 years	∞	80 Years	80 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.

VII. Conclusion

We recommend **Alternative 2a**; to replace the existing structure while maintaining traffic on an offsite detour.

Whenever the least expensive option is not chosen as the preferred option, some extra justification is usually required.

The least expensive upfront and long-term option for this site is to permanent close the bridge and not replace it. This is most likely the least expensive construction and maintenance option for 99.9% of the bridges on the system. Thus, the question becomes, when is there enough redundancy in the system to accommodate closing a road to through traffic without putting undue burden on the travelling public? While an ADT of 1000 is not a large volume, it is not as small as it could be either. The Vermont State Standards recognize a volume classification for Collector roads between 0-400 and a classification for Local roads between 0-25. But, even with higher volumes of traffic, if there are easily accessible alternate routes, it may be the fiscally responsible decision to close a section of road. The shortest possible bypass route to get from one end of the bridge to the other without using the bridge is 1.4 miles and would take approximately 4 minutes in a passenger vehicle. It is the responsibility of the local community to maintain this route, thus the savings to the State from closing the bridge would be somewhat transferred to the town in increased maintenance costs for their infrastructure. While closing the road was considered here, it is not clear that there is enough benefit to justify the savings and remove this level of redundancy.

Structure:
The proposed solution would include a completely new bridge that is 87 feet long and 24 feet wide curb to curb with a 5'-6" sidewalk on the eastern side of the bridge. Traffic would be maintained on an offsite detour.

This alternative would address all of the existing deficiencies at the river crossing with a new structure designed to last another 80+ years. A rehabilitation option was not evaluated for this bridge because of the poor condition of all bridge components. The substructure has large areas of fully exposed reinforcing steel and spalling concrete, and it would not make economic sense to repair.

It is proposed that the sidewalk on the western side of the bridge is eliminated. The proposed structure will match the existing geometry in regards to horizontal alignment, and will be raised three inches for improved hydraulics. The existing structure does not meet the minimum horizontal curve requirements; however, due to the tight site constraints, none of the alternatives evaluated will meet the standard. The current structure just meets the minimum hydraulic standards, therefore, the new superstructure type should be chosen based on the minimum depth. In order to reduce the closure time and impacts to historic resources, it is recommended that the new abutments are placed on piles behind the existing abutments. This will eliminate the need for cofferdams, and result in a more economical project. The existing pier could be saw-cut down to the stream bed in order to improve the hydraulic opening.

Traffic Control:
The recommended method of traffic control is to close the bridge for 10 weeks, and maintain traffic on an offsite detour. The detour for this project location would add approximately 0.7 miles to the through route, and have an end-to-end distance of 1.7 miles.

The ADT on Town Highway 1 through the project area is 1,000, which is considered relatively low. The option to close the road is the least expensive and the safest option compared to phasing.

Since there is a sidewalk on the existing bridge, pedestrian traffic should be maintained on a detour during the closure. The speed limit on VT Route 103 is 50 mph. In order to create a safer environment for pedestrians, it is recommended that during the closure, the speed limit on VT Route 103 is reduced between VT Route 131 and Greven Road. Additionally, pedestrian signs should be placed in order to encourage both northbound and southbound pedestrians to stay on the eastern shoulder of the road, so that pedestrians are not crossing VT Route 103. Placing a traffic barrier for pedestrians on VT Route 103 should also be considered.

Additionally, by closing the bridge to traffic during construction, the local share is reduced by 50%.

Design Criteria:

Town Highway 1: Town Highway 1 currently has several substandard design features through the project area; the horizontal alignment, the bridge railing, and structural capacity are substandard. For this alternative, all substandard features except the horizontal alignment will be brought up to standard. The horizontal alignment will remain unchanged due to site constraints. A design exception should be obtained for this substandard geometric feature.

VIII. Appendices

- Site Pictures
- Town Map
- Bridge Inspection Report
- Hydraulics Memo
- Preliminary Geotechnical Information
- Natural Resources Memo
- Archeology Memo
- Historic Memo
- Hazardous Sites Map
- Local Input
- Detour Map
- Plans
    - Existing Conditions
    - Proposed Typical Sections, Layout, and Profile
    - Traffic Control Sheets

Looking South over Bridge

Looking North over bridge.

Substructure (Pier) deterioration

T-Beam deterioration.

Looking Downstream

Looking Upstream

Historic wall at wingwall 2

Historic wall at wingwall 4

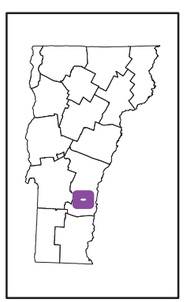
CAVENDISH BR 58
BO 1442(38)

Scale 1:47,689

N

- INTERSTATE
- STATE LONG
- STATE SHORT
- TOWN LONG
- FAS/FAU
- FAS/FAU HWY
- INTERSTATE
- STATE HIGHWAY
- CLASS 1
- CLASS 2
- CLASS 3
- CLASS 4
- LEGAL TRAIL
- PRIVATE
- DISCONTINUED
- DISTRICT
- POLITICAL BOUNDARY
- NAMED RIVERS-STREAMS
- UNNAMED RIVERS-STREAMS

Produced by:
Mapping Unit
Vermont Agency of Transportation
August 2011



CAVENDISH
WINDSOR COUNTY
DISTRICT # 2

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for CAVENDISH **bridge no.:** 00058 **District:** 2

Located on: C2001 **over** BLACK RIVER **approximately** 0.1 MI TO JCT W VT131 **Owner:** 03 TOWN-OWNED

CONDITION

Deck Rating: 4 POOR

Superstructure Rating: 4 POOR

Substructure Rating: 4 POOR

Channel Rating: 6 SATISFACTORY

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 101406005814061

Federal Sufficiency Rating: 064.8

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1940 **Year Reconstructed:** 0000

Service On: 5 HIGHWAY-PEDESTRIAN

Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 02

ADT: 000600 **% Truck ADT:** 02

Year of ADT: 2007

GEOMETRIC DATA

Length of Maximum Span (ft): 0043

Structure Length (ft): 000087

Lt Curb/Sidewalk Width (ft): 5

Rt Curb/Sidewalk Width (ft): 5

Bridge Rdwy Width Curb-to-Curb (ft): 34

Deck Width Out-to-Out (ft): 36.8

Appr. Roadway Width (ft): 024

Skew: 00

Bridge Median: 0 NO MEDIAN

Min Vertical Clr Over (ft): 99 FT 99 IN

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 00 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: 2 SPAN CONC. T-BEAM

Number of Approach Spans 0000 **Number of Main Spans:** 002

Kind of Material and/or Design: 1 CONCRETE

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane 0 NONE

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 1 MEETS CURRENT STANDARD

Transitions: 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail Ends: 0 DOES NOT MEET CURRENT STANDARD

Structural Evaluation: 4 MEETS MINIMUM TOLERABLE CRITERIA

Deck Geometry: 6 EQUAL TO MINIMUM CRITERIA

Underclearances Vertical and Horizontal: N NOT APPLICABLE

Waterway Adequacy: 7 SLIGHT CHANCE OF OVERTOPPING BRIDGE & ROADWAY

Approach Roadway Alignment: 7 BETTER THAN MINIMUM CRITERIA

Scour Critical Bridges: U UNKNOWN FOUNDATION

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): 1 LOAD FACTOR (LF)

Posting Status: P POSTED FOR LOAD

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 02 BRIDGE IS LEGALLY LOAD POSTED AT BOTH ENDS

Posted Vehicle: 6 GROSS LOAD ONLY

Posted Weight (tons): 10

Design Load: 0 OTHER OR UNKNOWN

INSPECTION and CROSS REFERENCE

X-Ref. Route:

Insp. Date: 052014 **Insp. Freq. (months)** 12 **X-Ref. BrNum:**

INSPECTION SUMMARY and NEEDS

5/21/2014 Structure is in poor condition. Deck will need replacement in the near future. Holes in the deck have been covered with steel plates but hole could accure at anytime. Should consider replacement soon. ~FRE/TJB

5/21/2013 Structure is in poor condition. Deck and super continue to deteriorate and should be considered for rehab in the near future. Due to the saturation in the deck holes could form at anytime. ~FRE/MK

4/16/2012 Beams should be cleaned and patched along with the bridge seat areas. Backwall on abutment #1 should be cleaned and patched. Debris on the upstream side of the pier and on the top should be clean out. ~FRE/DCP

7/18/2011 The deck was patched at abutment 2 and at the pier. The tee beams are in poor condition. The pier is in poor condition. The bridge should be replaced in the near future. ~DCP/FRE

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Chris Williams, Structures Project Manager

FROM: Leslie Russell, P.E., Hydraulics Project Supervisor

DATE: 25 September 2014

SUBJECT: Cavendish BO 1442(38) = TH 1 BR 58 over the Black River – Preliminary Hydraulics

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

Existing Conditions

The existing bridge is a two-span concrete t-beam bridge. The abutments are concrete. Each span has a clear span of about 40' and a clear height of about 13' 6". The total clear span is about 81'. The river goes relatively straight through the structure. The pier collects debris. The bridge inspection reports do not indicate any hydraulic problems although there are unknown foundations at this site. Some scour was observed during a field inspection occurring through the bridge. The channel is incised and is in an urban area. **There is a rail bridge just downstream of this bridge that backs water up into this bridge.**

Our calculations, field observations and measurements indicate the existing structure does meet the current standards of the VTrans Hydraulic Manual because it has 1.3' of freeboard at Q25. However, this bridge is in a floodplain and water does overtop the roadway below the Q50 at elevation 928.8'. The floodplain is quite wide here stretching all the way to VT 131 to the north and the town road to the south. The existing structure does not constrict the channel much. The channel is incised and in an urban area, so there are several constraints at the site.

Recommendations

In sizing a new structure we attempt to select structures that meet both the current VTrans hydraulic standards, state environmental standards with regard to span length and opening height, and allow for roadway grade and other **site constraints, such as, buildings, driveways, a town highway, downstream retaining walls and a wide floodplain.**

Removing the pier is always a desired option. In doing so, the bridge superstructure depth will become larger. There is a Flood Insurance Study at this site. Therefore, another important consideration is that the Q100 water surface elevation not be raised. A slightly wider bridge can be constructed here, but without the pier, the superstructure depth will become larger. Also, there is a retaining wall downstream and a larger bridge will need to tie back into that wall. With a minimum rise in roadway elevation, a larger superstructure depth and no pier, the options become limited.

Based on the above considerations and the information available, we recommend any of the following structures as a replacement at this site:

1. A bridge with an 81' wide clear span with no pier. The average low beam elevation should be

927.5'. This bridge will provide 1.2' of freeboard at Q25. If the roadway and bridge are raised any higher than 0.3', the Q100 water surface will go up and this is not acceptable at sites with a Flood Insurance Study. The minimum waterway opening of this bridge is 1045 sq. ft. Water will still overtop the roadway below the Q50, but the overtopping flow at Q100 lowers by 435 cfs. There should be no new fill placed in front of the abutments or in the channel as compared to the existing structure. This information is based on an assumed beam depth. The model is very sensitive to changes in low beam and finish grade elevations. We tested multiple variations and the above recommendations appear to be the only elevations that will meet the hydraulics standard for Q25 and the regulatory requirement for Q100. There may be other slight variations that will work, so if you have other designs that you would like checked please let us know. Once a beam type/depth is known it will be easier for us to optimize these elevations.

2. Any similar structure with a minimum clear span of 81' and at least 1045 sq. ft. of waterway area, that fits the site conditions, could be considered, as long as the bridge remains hydraulically adequate and there is no rise in the Q100 water surface elevation or roadway overtopping.

General Comments

If a new bridge is installed, the bottom of abutment footings should be at least six feet below the channel bottom, or to ledge, to prevent undermining. Abutments on piles should be designed to be free standing for a scour depth at least 6' below channel bottom.

It is always desirable for a new structure of this size to have flared wingwalls at the inlet and outlet, to smoothly transition flow through the structure, and to protect the structure and roadway approaches from erosion. The wingwalls should match into the channel banks. Any new structure should be properly aligned with the channel, and constructed on a grade that matches the channel. A new structure should span the natural channel width.

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

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

LGR

cc: Hydraulics Project File via NJW
Hydraulics Chrono File

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Chris Williams, P.E., Structures Project Manager
MLM

From: Marcy Meyers, Geotechnical Engineer via Callie Ewald, P.E., Senior Geotechnical Engineer
CEE

Date: July 31st, 2014

Subject: Cavendish BO 1442(38) – Preliminary Subsurface Investigation

1.0 INTRODUCTION

We have completed our preliminary geological and geotechnical subsurface investigation for the proposed replacement of Bridge No. 58 located on TH 1 (Depot Street) over the Black River in Cavendish, Vermont. The proposed project includes the replacement of the existing concrete T-beam bridge with a new structure. Contained herein are the results of field sampling and testing, laboratory analyses of soil and rock samples, as well as boring logs.

2.0 FIELD INVESTIGATION

The field investigation was conducted between July 2nd, 2014 and July 23rd, 2014. Two standard penetration borings were drilled to determine the existing subsurface stratum. A summary of the location of each boring and corresponding ground surface elevation can be found in Table 1. A boring location plan is also attached to this report. The values for the Northings and Eastings are based on the Vermont State Plane Grid Coordinate System NAD 83, and were located by a handheld GPS. Elevations, stations, and offsets were then taken off a provided survey file.

Table 1: Boring Locations and Elevations

Boring Number	Station (ft)	Offset (ft)	Northing (ft)	Easting (ft)	Ground Elevation (ft)	Bedrock Elevation (ft)
B – 101	43+11	12.3	321088.86	1604273.38	931.4	811.4
B – 102	44+44	-10.2	321165.60	1604160.35	929.5	796.0

Borings were performed in general accordance with AASHTO T206, *Standard Method of Test for Penetration Test and Split-Barrel Sampling of Soils*. During the boring operations, split spoon samples and standard penetration tests (SPT) were taken at five foot intervals until thirty feet and every ten feet thereafter until bedrock for Boring B-101 and continuously to thirty feet and every five feet thereafter until bedrock for Boring B-102. When bedrock was encountered, BX rock cores were taken approximately 10 feet into bedrock to collect five foot core sample runs. The notation 'BXDC' or 'NXDC' found on the boring logs signifies that the core barrel was used to core ahead through a boulder, cobble, or very dense material. For each boring, soil samples were visually identified and SPT blow counts were recorded on the boring logs.

3.0 FIELD AND LABORATORY TESTING

The standard penetration resistance of the in-situ soil is determined by the number of blows required to drive a 2 inch OD split barrel sampler into the soil with a 140 pound hammer dropped from a height of 30 inches, in accordance with procedures specified in AASHTO T206. During the standard penetration test (SPT), the sampler is driven for a total length of 2 feet, while counting the blows for each 6 inch increment. The SPT N-value, which is defined as the sum of the number of blows required to drive the sampler through the second and third increments, is commonly used with established correlations to estimate a number of soil parameters, particularly the shear strength and density of cohesionless soils. The N values provided on the boring logs are raw values and have not been corrected for energy, borehole diameter, rod length or overburden pressure. The VT Agency of Transportation has determined a hammer correction value, C_E, to account for the efficiency of the SPT hammer on the drill rig. For this project, both a CME 45C Skid Rig and CME 55 Track Rig were used, with hammer energy correction factors of 1.33 and 1.46, respectively. These values, included on the boring logs, should be used in calculations to determine soil parameters. Laboratory tests were conducted on all samples to evaluate grain size, moisture content, and percent finer than No. 200 sieve. Results from this testing can be found on the attached boring logs.

A detailed description of the rock cores is presented on the boring logs including run length, drill times, recovery, and Rock Quality Designation (RQD). Recovery is defined as the length of core obtained expressed as a percentage of the total length cored. In accordance with ASTM D6032, RQD is the total length of core pieces, 4 inches or greater in length, expressed as a percentage of the total length cored. RQD provides an indication of the integrity of the rock mass and relative extent of seams, jointing, and bending planes. The Rock Mass Rating (RMR) is also included on the logs. RMR is AASHTO's (LRFD Bridge Design Specifications) recommended method of classifying rock, and is based on five different parameters that all have relative ratings which combine to form the RMR. These parameters include rock strength, RQD, joint spacing, joint condition, and groundwater (AASHTO Section 10.4.6.4).

4.0 SOIL AND ROCK PROFILE

A review of the laboratory data and boring logs revealed the following information pertaining to the soil strata. It should be noted that groundwater elevations are subject to change given the fact that boreholes were generally left open for a short period of time. Because groundwater elevations can fluctuate seasonally and are affected by temperature and precipitation, groundwater may be encountered during construction when not previously noted in the logs.

4.1 B-101: The ground surface elevation at B-101 was approximately 931.4 feet. Groundwater was encountered at depths of 12.4 feet and 13.4 feet below the ground surface before drilling operations began on 7/22/14 and after drilling operations were complete on 7/23/14, respectively. Bedrock was encountered at 120.0 feet below the ground surface, and a 9 foot BX rock core was sampled from 120.0 feet until 129.0 feet.

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 10 feet	Very Dense Sandy Gravel with Broken Rock
10 – 120 feet	Loose to Medium Dense Silty Sand
> 120 feet	Bedrock

4.2 B-102: The ground surface elevation at B-102 was approximately 929.5 feet. Groundwater was encountered at depths between 3 and 13 feet below the ground surface during drilling operations. Groundwater depths and dates taken can be found on the boring log. Bedrock was encountered at 133.5 feet below the ground surface, and a 10 foot BX rock core was sampled from 133.5 feet until 143.5 feet.

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 110 feet	Medium Dense to Dense Gravelly Silty Sand
110 – 133.5 feet	Dense Gravelly Silty Sand w/ Cobbles and Boulders
> 133.5 feet	Bedrock

A summary of the rock core findings is listed in Table 2 and results are also available in the attached boring logs. Information from the cores indicated a hard amphibolite and gnessic hornblende-biotite tonalite to be present at the boring locations. The bedrock had an average rock mass rating (RMR) of 60, indicating fair rock.

Table 2: Rock Core Results

Boring	Run Number	Core Size	Depth (Below GSE)	Recovery (%)	RQD (%)	Dip (degrees)	Lithologic Description	RMR
B-101	1	BX	120.0 – 124.0 ft	70	58	55	Dark green, amphibolite. Hard. Unweathered.	72
	2		124.0 – 129.0 ft	80	8	55	Dark green, amphibolite, and light gray to white gneissic hornblende-biotite tonalite. Hard. Unweathered.	52
B-102	1*	BX	133.5 – 134.5 ft	94	0	--	Dark green, amphibolites. Hard. Unweathered.	52
			134.5 – 138.5 ft				Light gray to white, gnessic hornblende-biotite tonalite. Hard. Unweathered.	52
	2		138.5 – 143.5 ft	74	60	--	Light gray to white, gnessic hornblende-biotite tonalite. Hard. Unweathered.	72

* Note the first sample for B-102 was split into two rock types.

5.0 FOUNDATION RECOMMENDATIONS

Based on a preliminary look at the subsurface investigation results and the presence of bedrock at depths greater than 100 feet below the ground surface, integral abutments supported on piles appear to be a feasible option. Spread footings bearing on the medium dense silty sand stratum should also be considered as a feasible alternative.

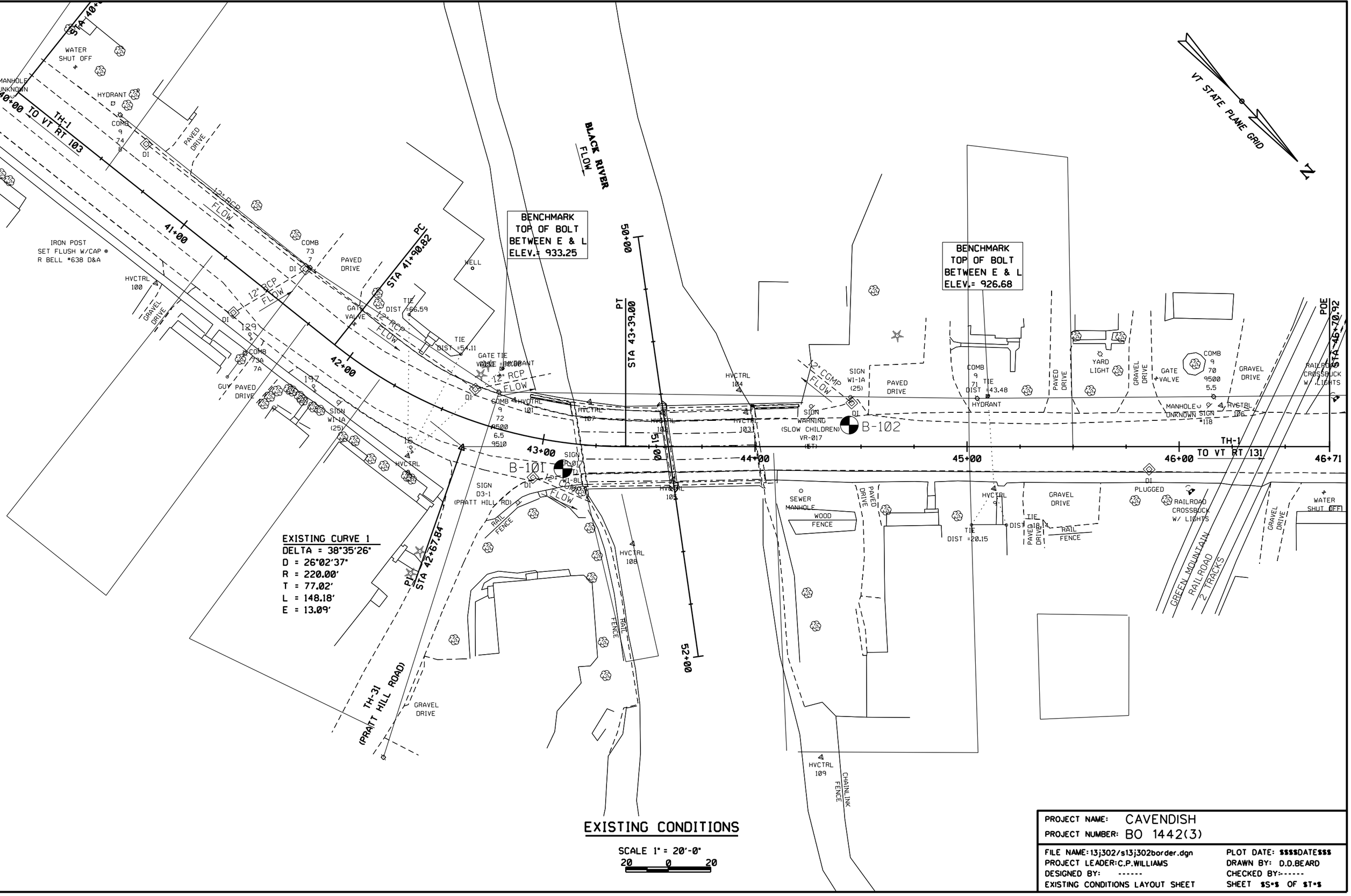
6.0 CONCLUSION

Once further information becomes available, we would be happy to assist in the analysis and design of components of the substructure. If you have any questions, or you would like to discuss this report, please contact us at (802) 828-2561. The boring logs are attached as available in the M:Projects\13J302\MaterialsResearch folder.

Enclosures: Boring Location Plan – 1 page
Boring Logs – 7 pages

cc: Electronic Read File/DJH
Project File/CCB
MLM

Z:\Highways\ConstructionMaterials\MatTestingCert\Soils and Foundations\Projects\Cavendish BO 1442(38)\REPORTS\Cavendish BO 1442(38) Subsurface Investigation.docx



EXISTING CONDITIONS

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: CAVENDISH	
PROJECT NUMBER: BO 1442(3)	
FILE NAME: 13j302/s13j302border.dgn	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY:------
EXISTING CONDITIONS LAYOUT SHEET	SHEET $S#$ OF $T#$

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Cavendish
BO 1442(38)
TH-1 BR-58

Boring No.: **B-101**
Page No.: 1 of 3
Pin No.: 13J302
Checked By: MLM

Boring Crew: DAIGNEAULT, JUDKINS, HOOK
Date Started: 7/21/14 Date Finished: 7/23/14
VTSPG NAD83: N 321088.86 ft E 1604273.38 ft
Station: 43+11 Offset: 12.30
Ground Elevation: 931.4 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 55 TRACK	C_F = 1.46

Groundwater Observations

Date	Depth (ft)	Notes
07/22/14	12.4	before drilling
07/23/14	13.4	after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 0.64 ft								
		A-1-a, SaGr, brn-gry, Moist, Rec. = 0.25 ft, Lab Note: Broken Rock was within sample.				R@3.5" (R)	11.2	63.3	27.7	9.0
		Field Note:, NXDC, Cleaned out casing.								
		A-1-b, GrSa, brn-gry, Moist, Rec. = 0.25 ft, Lab Note: Broken Rock was within sample.				R@5.0" (R)	12.6	33.5	50.6	15.9
		Field Note:, NXDC, Cleaned out casing.								
10		A-1-b, GrSa, brn, Moist, Rec. = 1.0 ft, Lab Note: Broken Rock was within sample.				6-4-5-4 (9)	13.6	38.7	48.3	13.0
		Field Note:, NXDC, Cleaned out casing.								
		Field Note:, No Recovery. Appears to be silty sand., Rock plugged end of sampler.				5-2-1-2 (3)				
20		Field Note:, Cleaned out with Roller cone								
		A-2-4, Sa, brn, MTW, Rec. = 0.5 ft				1-1-1-3 (2)	28.6	2.0	85.1	12.9
		Field Note:, Cleaned out with Roller cone								
		A-4, SiSa, brn, Moist, Rec. = 0.8 ft				2-2-3-3 (5)	30.4	0.2	62.5	37.3
30		Field Note:, Cleaned out with Roller cone								
		A-2-4, Sa, brn, Moist, Rec. = 0.8 ft				2-3-3-4 (6)	26.9	0.1	82.8	17.1
40		SiSa, brn, Moist, Rec. = 1.0 ft, 40.0 ft - 42.0 ft				2-3-3-4 (6)	30.6		53.9	46.1
		Field Note:, Cleaned out with Roller cone								
50		Field Note:, No Recovery. Appears to be sand.				1-3-3-5 (6)				
		Field Note:, Cleaned out with Roller cone								

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

BORING LOG 2 CAVENDISH BO 1442(38).GPJ VERMONT AOT.GDT 7/30/14

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Cavendish
BO 1442(38)
TH-1 BR-58

Boring No.: **B-101**
Page No.: 2 of 3
Pin No.: 13J302
Checked By: MLM

Boring Crew: DAIGNEAULT, JUDKINS, HOOK
Date Started: 7/21/14 Date Finished: 7/23/14
VTSPG NAD83: N 321088.86 ft E 1604273.38 ft
Station: 43+11 Offset: 12.30
Ground Elevation: 931.4 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 55 TRACK	C_F = 1.46

Groundwater Observations

Date	Depth (ft)	Notes
07/22/14	12.4	before drilling
07/23/14	13.4	after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		A-2-4, SiSa, brn, Moist, Rec. = 0.6 ft				5-7-8-8 (15)	28.3	0.6	73.5	25.9
70		A-2-4, Sa, brn, Moist, Rec. = 1.7 ft				7-8-11-12 (19)	23.0	5.5	75.4	19.1
		Field Note:, Cleaned out with Roller cone								
80		A-2-4, SiSa, brn, Moist, Rec. = 0.8 ft				6-7-8-7 (15)	27.9		76.5	23.5
90		A-2-4, Sa, brn, Moist, Rec. = 0.7 ft				16-32-20-23 (52)	22.0	2.8	78.7	18.5
		A-2-4, SiSa, gry-brn, Moist, Rec. = 0.6 ft					15.4	19.3	59.5	21.2
		Field Note:, Cleaned out with Roller cone								
100		A-2-4, SiSa, brn, Moist, Rec. = 0.2 ft				6-10-15-16 (25)	20.9	15.2	64.7	20.1
110		A-2-4, Sa, brn, Moist, Rec. = 0.4 ft				R@5.0" (R)	23.6	7.3	73.1	19.6
		Field Note:, BXDC, Cleaned out casing.								

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

BORING LOG 2 CAVENDISH BO 1442(38).GPJ VERMONT AOT.GDT 7/30/14

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Cavendish
BO 1442(38)
TH-1 BR-58

Boring No.: **B-101**
Page No.: 3 of 3
Pin No.: 13J302
Checked By: MLM

Boring Crew: DAIGNEAULT, JUDKINS, HOOK
Date Started: 7/21/14 Date Finished: 7/23/14
VTSPG NAD83: N 321088.86 ft E 1604273.38 ft
Station: 43+11 Offset: 12.30
Ground Elevation: 931.4 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 55 TRACK	C_F = 1.46

Groundwater Observations

Date	Depth (ft)	Notes
07/22/14	12.4	before drilling
07/23/14	13.4	after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		120.0 ft - 124.0 ft, Dark green, Amphibolite, Hard, Unweathered, Good rock, BX, RMR=72	1 (55)	70 (58)	9 3 3 6	Top of Bedrock @ 120.0 ft				
		124.0 ft - 129.0 ft, Dark green, Amphibolite, and light-gray to white, gneissic hornblende-biotite tonalite. Closely spaced horizontal jointing. Hard, Unweathered, Fair rock, BX, RMR=52	2 (55)	80 (8)	3 3 4 3 4					
130		Hole stopped @ 129.0 ft								

Remarks:
Hole collapsed at 33.6 ft.

140
150
160
170

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

BORING LOG 2 CAVENDISH BO 1442(38).GPJ VERMONT AOT.GDT 7/30/14

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Cavendish
BO 1442(38)
TH-1 BR-58

Boring No.: **B-102**
Page No.: 1 of 4
Pin No.: 13J302
Checked By: MLM

Boring Crew: DAVISON, JUDKINS, HOOK
Date Started: 7/02/14 Date Finished: 7/17/14
VTSPG NAD83: N 321165.60 ft E 1604160.35 ft
Station: 44+44 Offset: -10.20
Ground Elevation: 929.5 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 45C SKID	C_E = 1.33

Groundwater Observations

Date	Depth (ft)	Notes
07/08/14	12.5	while drilling
07/09/14	3.3	before drilling
07/15/14	10.1	while drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 0.64 ft								
		A-1-b, GrSa, brn, Moist, Rec. = 0.7 ft, Lab Note: Broken Rock was within sample.				9-8-12-9 (20)	9.9	39.7	43.8	16.5
		A-1-b, SiGrSa, brn, Moist, Rec. = 1.6 ft				5-5-4-4 (9)	8.8	33.1	46.3	20.6
5		A-1-b, SiGrSa, brn, Moist, Lab Note: Broken Rock was within sample.				4-11-4-15 (15)	9.8	35.3	42.5	22.2
		Visual Description:, Sandy Gravel with broken rock, gry, Moist, Rec. = 0.2 ft, Lab Note: Insufficient sample for testing.				11-6-2-2 (8)	27.7	0.8	56.8	42.4
		A-4, SiSa, brn, Moist, Rec. = 1.5 ft								
10		A-2-4, SiGrSa, brn, Moist, NXDC, Cleaned out casing.				3-3-3-3 (6)	13.4	27.1	50.1	22.8
		A-2-4, Sa, brn, MTW, Rec. = 0.25 ft				4-12-15-19 (27)	24.5	1.6	85.1	13.3
		A-1-a, SaGr, brn-white, MTW, Rec. = 1.0 ft, Lab Note: Broken Rock was within sample. NXDC, Cleaned out casing				25-25-38-R@1.0" (63)	11.8	49.5	38.8	11.7
15		Field Note:, NXDC, Cleaned out casing.								
		Visual Description:, Broken Rock, white, Dry, Rec. = 0.1 ft, NXDC, Cleaned out casing.				9-42-25-14 (67)				
		Field Note:, No Recovery. Appears to be GrSa				13-11-8-10 (19)				
20		A-2-4, Sa, brn, Moist, Rec. = 1.0 ft				6-5-5-7 (10)	24.9	1.0	84.0	15.0
25		A-2-4, Sa, brn, Moist, Rec. = 0.9 ft				3-5-6-5 (11)	23.1	0.2	84.6	15.2
30		A-2-4, SiSa, brn, MTW, Rec. = 1.0 ft				6-7-8-8 (15)	27.3	0.1	74.0	25.9
35		A-2-4, SiSa, brn, MTW, Rec. = 0.7 ft				8-6-6-8 (12)	26.6	0.1	74.0	25.9

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

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Cavendish
BO 1442(38)
TH-1 BR-58

Boring No.: **B-102**
Page No.: 2 of 4
Pin No.: 13J302
Checked By: MLM

Boring Crew: DAVISON, JUDKINS, HOOK
Date Started: 7/02/14 Date Finished: 7/17/14
VTSPG NAD83: N 321165.60 ft E 1604160.35 ft
Station: 44+44 Offset: -10.20
Ground Elevation: 929.5 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:		Auto/AWJ
Rig:	CME 45C SKID	C_e = 1.33

Groundwater Observations

Date	Depth (ft)	Notes
07/08/14	12.5	while drilling
07/09/14	3.3	before drilling
07/15/14	10.1	while drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		A-2-4, SiSa, brn, Moist, Rec. = 0.7 ft				4-5-6-7 (11)	24.1		73.6	26.4
45		A-2-4, SiSa, brn, MTW, Rec. = 0.6 ft				4-6-7-8 (13)	29.5		75.4	24.6
50		A-2-4, SiSa, brn, Moist, Rec. = 0.6 ft				5-6-7-8 (13)	27.5		73.4	26.6
		Field Note:, NXDC, Cleaned out casing.								
55		A-2-4, SiSa, brn, Moist, Rec. = 0.7 ft				3-6-8-8 (14)	28.6	0.1	74.9	25.0
60		A-2-4, SiSa, brn, Moist, Rec. = 0.7 ft				10-9-10-11 (19)	25.5	2.8	72.5	24.7
65		A-2-4, Sa, brn, Wet, Rec. = 0.5 ft				8-13-12-11 (25)	32.7	2.8	77.6	19.6
70		Field Note:, No Recovery				6-9-10-12 (19)				
75		A-2-4, SiSa, brn, Moist, Rec. = 1.2 ft				6-12-15-19 (27)	24.1	2.8	73.4	23.8

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

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Cavendish
BO 1442(38)
TH-1 BR-58

Boring No.: **B-102**
Page No.: 3 of 4
Pin No.: 13J302
Checked By: MLM

Boring Crew: DAVISON, JUDKINS, HOOK
Date Started: 7/02/14 Date Finished: 7/17/14
VTSPG NAD83: N 321165.60 ft E 1604160.35 ft
Station: 44+44 Offset: -10.20
Ground Elevation: 929.5 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:		Auto/AWJ
Rig:	CME 45C SKID	C_E = 1.33

Groundwater Observations

Date	Depth (ft)	Notes
07/08/14	12.5	while drilling
07/09/14	3.3	before drilling
07/15/14	10.1	while drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		A-2-4, SiSa, brn, Moist, Rec. = 0.8 ft				10-15-19-20 (34)	22.9	3.4	73.0	23.6
85		A-2-4, SiSa, brn, Moist, Rec. = 1.0 ft				11-15-19-21 (34)	24.1	0.7	73.1	26.2
90		A-2-4, SiSa, brn, Moist, Rec. = 0.8 ft				15-20-22-23 (42)	22.5	2.9	64.5	32.6
95										
100		A-2-4, SiSa, brn, Moist, Rec. = 0.5 ft				9-16-18-22 (34)	21.3	0.2	77.7	22.1
		Field Note:, NXDC, Cleaned out casing., Appears to be cobbles.								
105		Field Note:, Went inside 4" casing with 3" casing.								
		Field Note:, BXDC, Cleaned out casing.								
110		Field Note:, No Recovery, Appears to be a boulder.				R@0.0" (R)				
115										
		Field Note:, BXDC, Cleaned out casing.								

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

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Cavendish
BO 1442(38)
TH-1 BR-58

Boring No.: **B-102**
Page No.: 4 of 4
Pin No.: 13J302
Checked By: MLM

Boring Crew: DAVISON, JUDKINS, HOOK
Date Started: 7/02/14 Date Finished: 7/17/14
VTSPG NAD83: N 321165.60 ft E 1604160.35 ft
Station: 44+44 Offset: -10.20
Ground Elevation: 929.5 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 45C SKID	C_e = 1.33

Groundwater Observations

Date	Depth (ft)	Notes
07/08/14	12.5	while drilling
07/09/14	3.3	before drilling
07/15/14	10.1	while drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		A-2-4, GrSiSa, Lt/brn-gry, Moist, Rec. = 0.1 ft				R@0.5" (R)	11.4	23.5	47.3	29.2
125										
130		A-4, GrSaSi, gry, Moist, Rec. = 0.1 ft				R@0.5" (R)	12.7	23.6	26.3	50.1
		133.5 ft - 134.5 ft, Dark green, Amphibolite, Hard, Unweathered, Fair rock, BX, RMR=52	1 (?)	94 (0)	4	Top of Bedrock @ 133.5 ft				
135		134.5 ft - 138.5 ft, Light gray to white, Gnessic hornblende-biotite Tonalite, closely spaced horizontal jointing. Hard, Unweathered, Fair rock, RMR=52			4 6 6 4					
		138.5 ft - 143.5 ft, Light gray to white, Gnessic hornblende-biotite Tonalite, Hard, Unweathered, Good rock, BX, RMR=72	2 (?)	74 (60)	2 3 2 3 3					
140		Hole stopped @ 143.5 ft								
145										
150										
155										

Remarks:
1. Groundwater was noted by the drillers at 13.2 ft and 12.9 ft on 7/17/14 and 7/18/14, respectively.
2. Hole collapsed at 13.0 ft.

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

Goldstein, Lee

From: Lepore, John
Sent: Wednesday, May 07, 2014 2:41 PM
To: Goldstein, Lee
Subject: FW: CAVENDISH B_0 1442 (38) - Natural Resource ID

From: Lepore, John
Sent: Thursday, May 01, 2014 1:47 PM
To: Williams, Chris
Cc: Goldstein, Lee; Lepore, John
Subject: RE: CAVENDISH B_0 1442 (38) - Natural Resource ID

I'm sorry. I thought I had sent a follow-up on this. There are no wetlands present so you can close the file.

Let me know if you have questions…

From: Williams, Chris
Sent: Thursday, May 01, 2014 1:42 PM
To: Lepore, John
Subject: RE: CAVENDISH B_0 1442 (38) - Natural Resource ID

Hi John,

For what it's worth, I didn't get this by the due date so received an Artemis Error this month. These error messages count as a black mark for a project manager and are being tracked by management to measure our performance.

Please try to review your in-progress activities and provide the deliverable or a revised due date so the schedule can be adjusted before an error occurs.

If I received the information from you but failed to make note of it, please disregard this message and correct me as soon as possible.

Thanks,
chris

From: Lepore, John
Sent: Monday, January 06, 2014 10:57 AM
To: Williams, Chris; Goldstein, Lee
Subject: RE: CAVENDISH B_0 1442 (38) - Natural Resource ID

Yes, leave the activity open to play it safe. Most of your projects are going to fall into this category as there's only so much we can do without a site visit.

From: Williams, Chris
Sent: Monday, January 06, 2014 10:55 AM
To: Lepore, John; Goldstein, Lee
Subject: RE: CAVENDISH B_0 1442 (38) - Natural Resource ID

John, would you like me to complete the activity or leave it open until you have confirmation? If I complete it I fear it will slip between the cracks so my inclination would be to leave it incomplete but lemme no.

From: Lepore, John
Sent: Friday, January 03, 2014 2:31 PM
To: Goldstein, Lee
Cc: Williams, Chris; Lepore, John
Subject: CAVENDISH B_0 1442 (38) - Natural Resource ID

I will conduct a site visit in the spring to confirm that wetlands aren't in this area, but this is something for you to go on for now…

~ John ~

Project Name and Number: CAVENDISH BO 1442(38)
Bio Resource Identification

File(s): Z:\Projects-Engineering\CavendishBO1442(38)13j302\Structures\Memos\2013\Cavendish Town Map Br 58.pdf

Name: WILLIAMS, CHRISTOPHER (Structures)

Phone Number: (802) 828-0051
Email: chris.williams@state.vt.us

VERMONT

Jeannine Russell
VTrans Archaeology Officer
State of Vermont
Environmental Section
One National Life Drive
Montpelier, VT 05633-5001
www.aot.state.vt.us

Agency of Transportation

[phone] 802-828-3981
[fax] 802-828-2334
[ttd] 800-253-0191

To: Lee Goldstein, Environmental Specialist

From: Jeannine Russell, VTrans Archaeology Officer

Date: June 4, 2014

Subject: Cavendish BO 1442(38) – Archaeological Resource ID

The scope of this project has not yet been determined but includes the area surrounding Bridge 58 on VT RT 131 in Cavendish, VT. The VTrans Archaeology Officer conducted a field visit on 5-22-14. For the purposes of this resource ID, a 200 foot radius around the bridges was used as the project area.

The project area consists of a small neighborhood containing historic residential properties and is adjacent to the Rutland – Burlington rail line. The area has been disturbed from historic development and does not contain any known sites or archaeologically sensitive areas. There are two stone retaining walls on either side of the bridge along the NE and SE quads. These have been picked up by Historic Preservation as part of the adjacent properties but they are not associated with any archaeological features.

A formal clearance will be issued upon review of plans when available.

Please contact me if you have any questions.

Thank you,
Jen Russell
VTrans Archaeology Officer

VTrans Working to Get You There
Vermont Agency of Transportation

Goldstein, Lee

From: O'Shea, Kaitlin
Sent: Thursday, March 06, 2014 10:26 AM
To: Goldstein, Lee
Cc: Newman, Scott; Williams, Chris
Subject: Cavendish BO 1442(38) Historic resource Id

Hi Lee,

I have completed the historic resource ID for Cavendish BO 1442(38). Bridge 58 is not a historic bridge, however, it is located within a historic district and there are adjacent historic properties. These resources have been mapped and bookmarked in Arcmap.

There are historic properties at the NE and NW quadrants of the bridge. The NE and SE wingwalls are part of long stone walls, which are contributing features to the historic district. Concerns for historic review will include takes from historic properties, proposed railing replacement, and elements of design such as bridge width.

Let me know if you have any questions.

Thanks,
Kaitlin

Kaitlin O'Shea
Historic Preservation Specialist
Vermont Agency of Transportation

802-828-3962
Kaitlin.O'Shea@state.vt.us

Hazardous Waste Map

Local & Regional Input Questionnaire

Project Name: Cavendish Bridge 58 on Depot St (TH-1) over Black River
Project Number: BO 1442(38)

Attachments (Uploaded at https://drive.google.com/folderview?id=0B2jtfm2nTjt4SnAxRm5Ia1pfNU0&usp=sharing) (TOO BIG TO SEND BY EMAIL)

- Map of land uses and bridges
- Map of sidewalks in village
- Map of Sewer network in village
- Map of Water network in village
- Map of Irene damage and FEH area
- Photo of Sidewalk on the bridge

Community Considerations

IT SHOULD BE NOTED THAT THE TOWN OF CAVENDISH HAS TWO MAIN UNINCORPORATED VILLAGES – CAVENDISH AND PROCTORSVILLE. THE BRIDGE IS LOCATED IN THE DESIGNATED VILLAGE CENTER OF PROCTORSVILLE. THE TOWN HALL IS LOCATED IN THE CAVENDISH VILLAGE AREA.

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

   No. Easy detour using VT-131 and VT-103.

2. Is there a "slow season" or period of time from May through October where traffic is less?

   No significant seasonal slow down since that is a primarily residential street. No significant tourist traffic expected on this street.

3. Please describe the location of emergency responders (fire, police, ambulance) and emergency response routes.

   Proctorsville Volunteer Fire Dept – based at 513 Main St, Proctorsville, few hundred feet from the site. Can use VT-131 and VT-103 for detour. Fire Chief contact – Bob Glidden bobglidden@tds.net 226-7302

   Cavendish Volunteer Fire Dept – based at 2154 Main St, Cavendish. In the next village over (east on VT-131). Fire Chief contact – Shane Turco – cavendishfd_505@comcast.net (802) 342-8422. Note: there is an underscore "_" character between the d and f in Shane's email address

   Police – Vermont State Police (Rockingham Barracks) (802) 875-2112

   Ambulance – Ludlow Ambulance (from neighboring town) Can access both sides of bridge area from either direction without difficulty.

4. Where are the schools in your community and what are their schedules?

   Cavendish Elementary School – Main St in Proctorsville. See map attached. Class schedule generally is last week of August through third week of June. Schedule may vary slightly from year to year. Bus routes can be altered to go around this bridge.

   Black River High School in Ludlow – Main St in Ludlow. Unknown schedule. Should be unaffected by this bridge's anticipated closing.

5. In the vicinity of the bridge, 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? Please explain.

   The bridge currently has sidewalks on both sides. (see map attached). Foot and bicycling traffic would have to divert onto state highway 103 in order to go around due to the Black River and no other way to traverse.

6. Are there any businesses (including agricultural operations) that would be adversely impacted either by a detour or due to work zone proximity?

   No.

7. Are there any important public buildings (town hall or community center) or community facilities (recreational fields or library) in close proximity to the proposed project?

   Yes, but would not be significantly affected by temporary change in traffic pattern (see attached map).

8. Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road?

   Detour would most likely use VT-103 and VT-131 – so little impact on local town roads.

9. Are there any other municipal operations that could be adversely impacted if the bridge is closed during construction? If yes, please explain.

   No.

10. Please identify any local communication channels that are available—e.g. weekly or daily newspapers, blogs, radio, public access TV, Front Porch Forum, etc. Also include any unconventional means such as local low-power FM.

    Newspaper of Record – Vermont Journal 8 High Street, P.O. Box 228, Ludlow, VT. (802) 228-3600 publisher@vermontjournal.com

    Town official website - http://www.cavendishvt.org/

Unofficial (not Town government) local blogsite http://cavendishvt.blogspot.com/ - contact Margo Caulfield margoc@tds.net

Public Access TV = LPCTV with offices/studio at 37C Main Street, Ludlow, VT. Contact = Patrick Cody, Director (802) 228-8808 www.lpctv.org

11. Is there a local business association, chamber of commerce or other downtown group that we should be working with?

    Marji Graf, Executive Director of Okemo Valley Chamber of Commerce – 228-5830 mgraf@yourplaceinvermont.com

    No downtown group.

Design Considerations

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

   Yes, bridge adjacent to intersection with Pratt Hill Road, TH # 31, at a dangerous (advisory signed @ 25 mph) 45° bend on Depot Street.

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

   No.

3. What is the current level of bicycle and pedestrian use on the bridge?

   Moderate pedestrian and bicycle use. Depot Street is often used as a short cut from VT-131 to VT-103.

4. If a sidewalk or wide shoulder is present on the existing bridge, should the new structure have one? Are there existing bicycle and/or pedestrian facilities on the approaches to the bridge?

   The structure currently has curbed sidewalks on both sides (see attached photo). The new structure should have a sidewalk – to continue the sidewalk network that already exists. An alternate to sidewalk on both sides would be a sidewalk on the east side and a shoulder on the west side (to accommodate bicycle traffic) See attached map.

5. Does the Town have plans to construct either bicycle or pedestrian facilities leading up to the bridge? Please provide a copy of the planning document that demonstrates this (e.g. scoping study, master plan, corridor study) Please explain and provide documentation.

   The Town already has sidewalks on both sides of the bridge (see attached map).

6. Does the bridge provide an important link in the town or statewide bicycle or pedestrian network such that you feel that bicycle and pedestrian traffic should be accommodated during construction?

   No special accommodation needs to be made for bicyclists or pedestrians during construction.

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

   Not aware of any.

8. Are there any traffic, pedestrian or bicycle safety concerns associated with the current bridge? If yes, please explain.

   None other than those noted in 1. above.

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

   Yes, there is history of flooding nearby and at the structure – including TS Irene. Bridge in Fluvial Erosion Hazard (FEH) (River Corridor) area. (See attached map). During TS Irene flood event debris jammed against center support and against deck and rail. The insulated water main hung on the west side of the bridge had to be repaired due to damage from impacting flood debris. Ice jams have periodically been experienced at the bridge as ice chunks get caught at the upstream end of the center support pier.

10. Are you aware of any nearby Hazardous Material Sites?

    Unknown

11. Are you aware of any historic, archeological and/or other environmental resource issues?

    Unknown

12. Are there any other comments you feel are important for us to consider that we have not mentioned yet?

    The Bridge has both sewer and water lines attached to it (see attached map). They are attached on either side of the bridge. Will need to have temporary service for both lines to provide continuity of service during construction. Permanent lines need to be replaced at current elevations, on the replacement structure. Temporary bypass of water line must be sufficient to provide both potable water and have sufficient flows to provide adequate supply to numerous fire hydrants south of the project.

Land Use & Public Transit Considerations – to be filled out by the municipality or RPC.

1. Does your municipal land use plan reference the bridge in question? If so please provide a copy of the applicable section or sections of the plan.

No specific reference.

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

   Town currently re-doing Current and Future Land Use Maps in Town Plan Update. Old maps NOT attached. Current Land Use map from 2013 Village Center Designation map attached to give context.

   The project is specifically included in the DRAFT Capital Budget (scheduled for adoption in April 2014).

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

   None known.

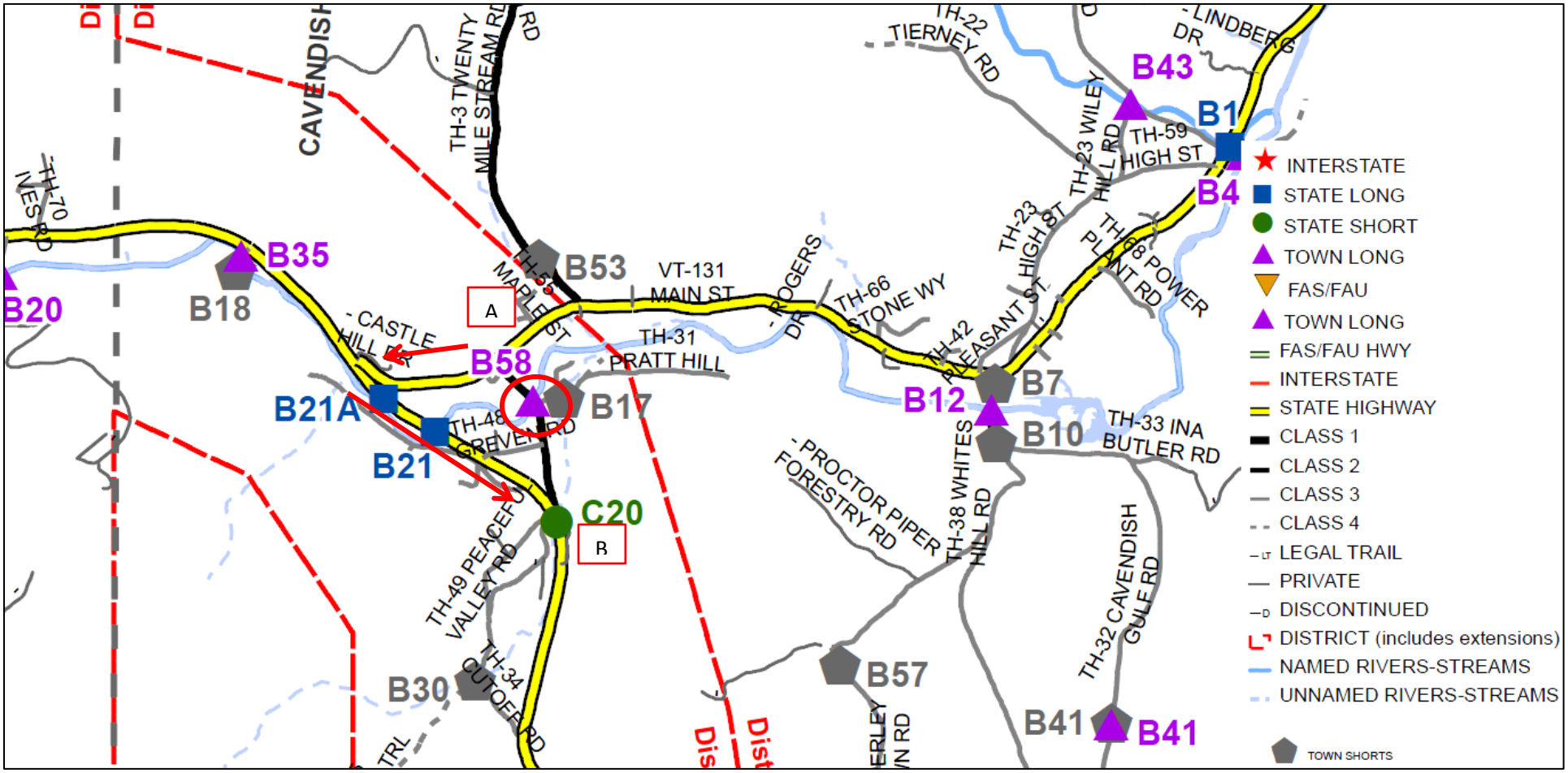
4. Is there any planned expansion of public transit service in the project area? If not known please contact your Regional Public Transit Provider.

   No planned expansion of public transit service in the project area. Service provider would be Connecticut River Transit (The Current). Transit does not presently run along Depot St.

LOCAL CONTACT INFORMATION:

Richard F. Svec
Town Manager
Town of Cavendish
P.O. Box 126, 37 High Street
Cavendish, Vermont 05142-0126

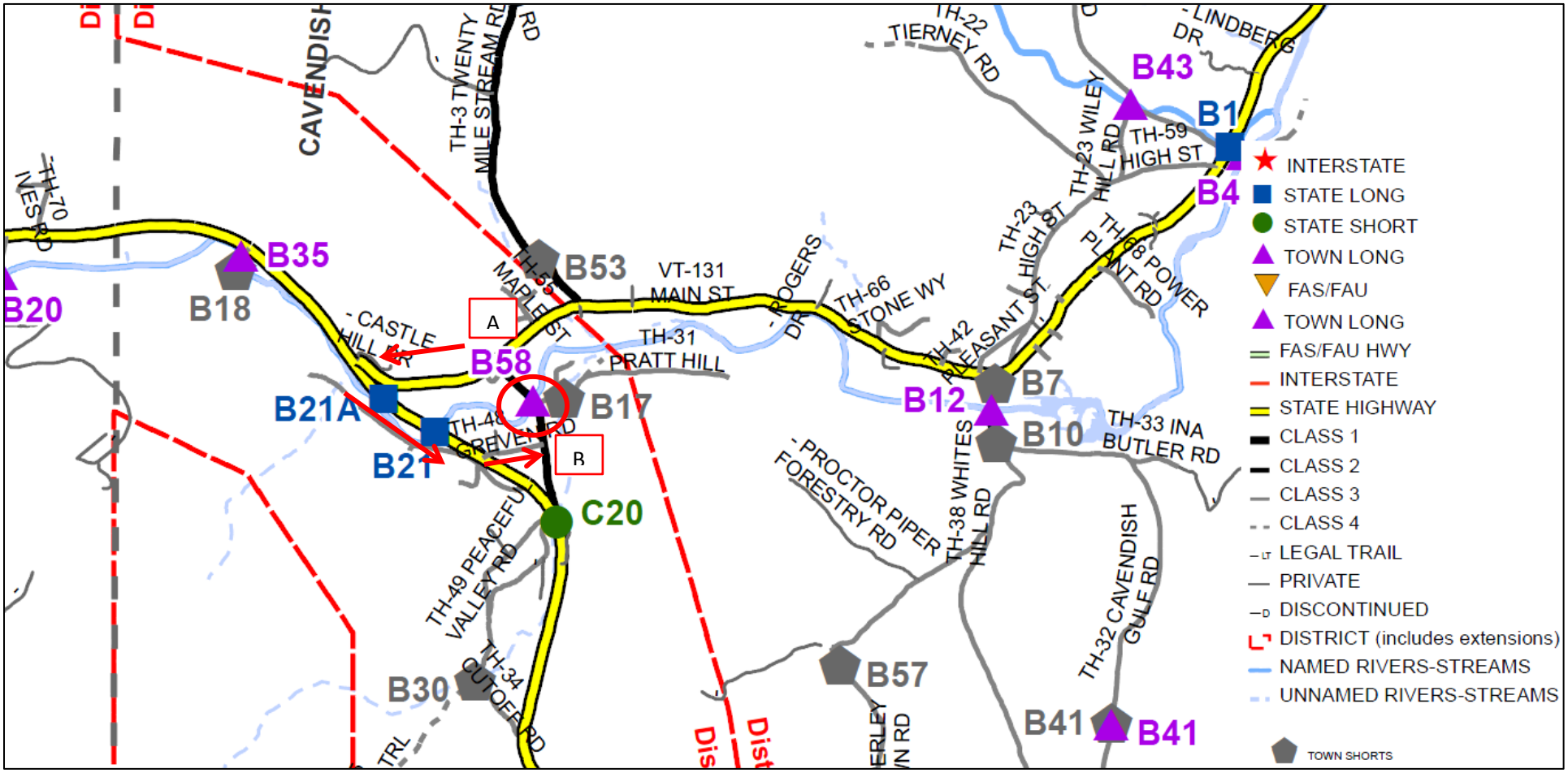
Ph: (802) 226-7291
Fax: (802) 226-7290
Cell: (802) 258-7558
Email: rsvec@comcast.net



1. Vehicle Detour Route

Depot Street (Town Highway 1), to VT Route 131, VT Route 103, back to Depot Street (Town Highway 1)

A – B Through Route: 0.5 Miles
A – B Detour Route: 1.2 Miles
Added Miles: 0.7 Miles
End-End Distance: 1.7 Miles



2. Pedestrian Detour Route

Depot Street (Town Highway 1), to VT Route 131, VT Route 103, Greven Road, back to Depot Street (Town Highway 1)

A – B Through Route: 0.3 Miles
A – B Detour Route: 1.1 Miles
Added Miles: 0.8 Miles
End-End Distance: 1.4 Miles

LAWRENCE, ROBERT
LAWRENCE, VICTOR L.

WEBSTER, DONALD R., NEIL R., ALAN D., NATHAN,
VERONICA J., JANICE J., & JENNIFER PAQUETTE

PROVANCE, FRANK A.

FOUR B'S LLC

VARGA, GEORGE F.

CHOINIERE, LUCIEN R.
CHOINIERE, CONSTANCE J.

GOODMAN, CRAIG & JESSICA

PIPKIN, ALLEN

LONGO, CHRISTINA

ROGALA, THADDEUS
ROGALA, JOHN

BLANCHARD, JACQUELINE
BLANCHARD, FLOYD L.

PIPKIN, JANET

PIPKIN, ALLEN
McLAUGHLIN, LEE ANN

GREEN MOUNTAIN RAILROAD CORPORATION-STATE OF VERMONT

BLACK RIVER
FLOW

TH-1
TO VT RT 103

TH-31
(PRATT HILL ROAD)

TH-1
TO VT RT

VT STATE PLANE GRID

N

BENCHMARK
TOP OF BOLT
BETWEEN E & L
ELEV. = 933.25

BENCHMARK
BOLT
BETWEEN E & L
ELEV. = 926.68

PC
STA 41+90.82

PT
STA 43+39.00

PC
STA 42+67.84

PT
STA 46+70.92

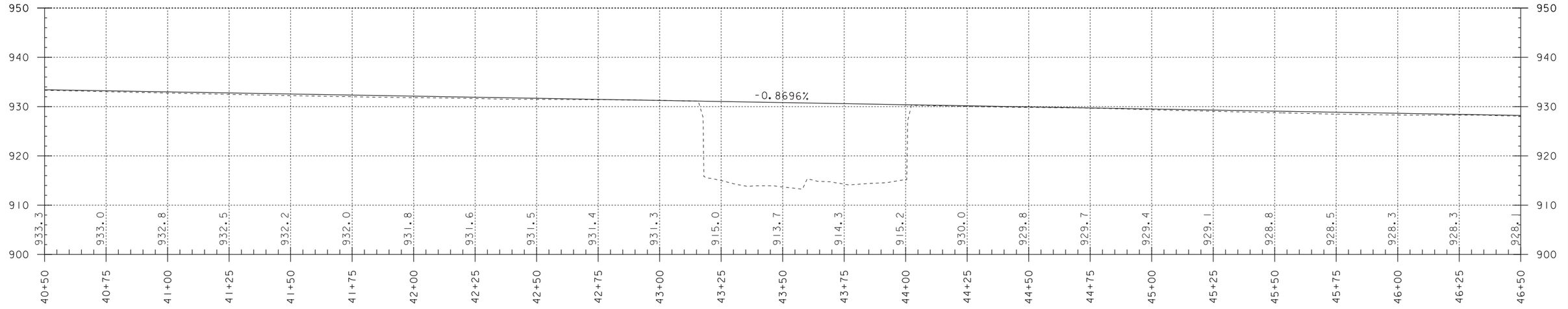
EXISTING CURVE 1
DELTA = 38°35'26"
D = 26°02'37"
R = 220.00'
T = 77.02'
L = 148.18'
E = 13.09'

40+00
41+00
42+00
43+00
44+00
45+00
46+00
46+71
50+00
51+00
52+00

EXISTING CONDITIONS

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

PROJECT NAME:	CAVENDISH
PROJECT NUMBER:	BO 1442(3)
FILE NAME: I3J302/sI3J302border.dgn	PLOT DATE: 23-OCT-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT SHEET	SHEET 1 OF 7



TH 1 PROFILE

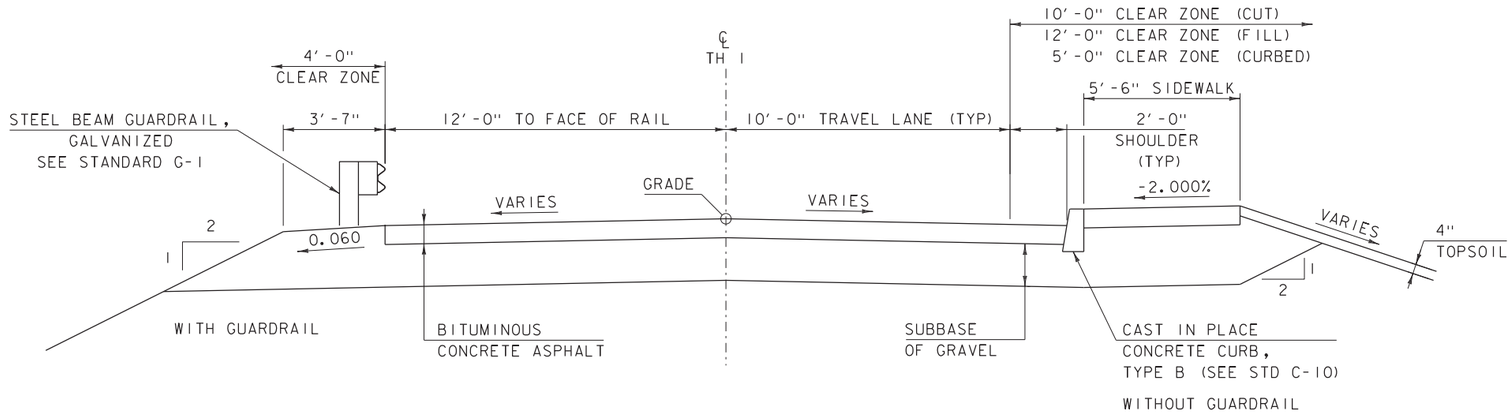
SCALE: HORIZONTAL 1" = 20'-0"
VERTICAL 1" = 10'-0"

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

PROJECT NAME: CAVENDISH
PROJECT NUMBER: BO 1442(3)

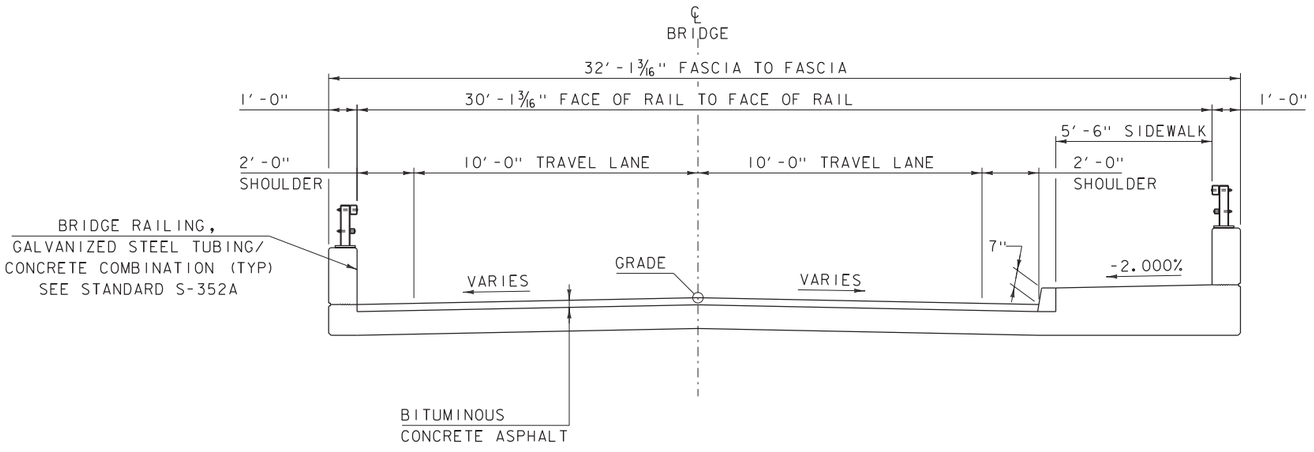
FILE NAME: 13j302/sl3j302profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
PROFILE SHEET

PLOT DATE: 23-OCT-2014
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 2 OF 7



PROPOSED TH 1 TYPICAL SECTION

SCALE 3/8" = 1'-0"



FLOW

PROPOSED BRIDGE TYPICAL SECTION

SCALE 3/8" = 1'-0"

NOTE: SUPERSTRUCTURE NOT YET DESIGNED

MATERIAL TOLERANCES

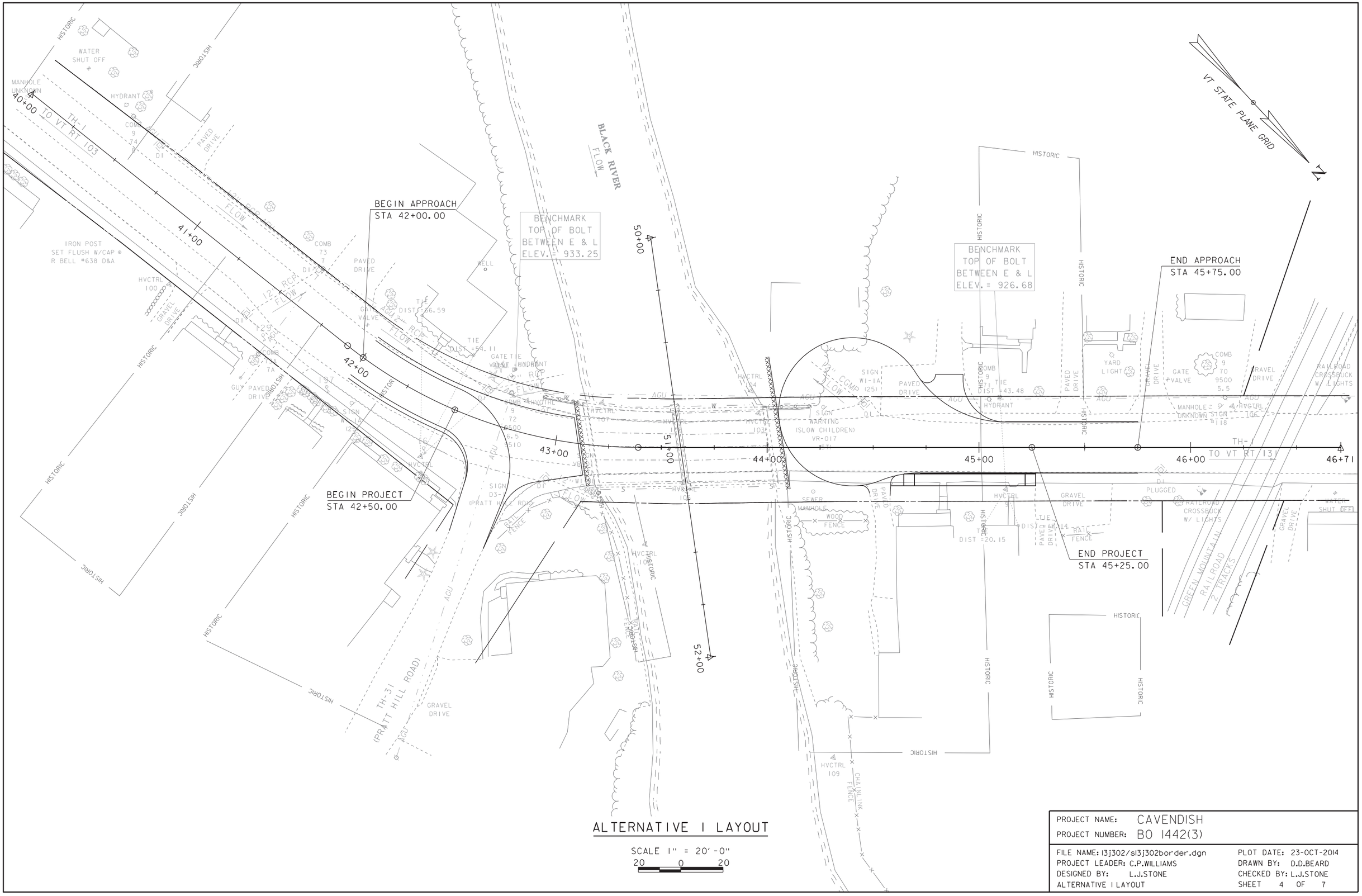
(IF USED ON PROJECT)

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

PROJECT NAME: CAVENDISH
PROJECT NUMBER: BO 1442(38)

FILE NAME: 13j302\sl3j302typical.dgn
PROJECT LEADER: -------
DESIGNED BY: L.J.STONE
TYPICAL SECTIONS

PLOT DATE: 23-OCT-2014
DRAWN BY: D.D.BEARD
CHECKED BY: L.J.STONE
SHEET 3 OF 7

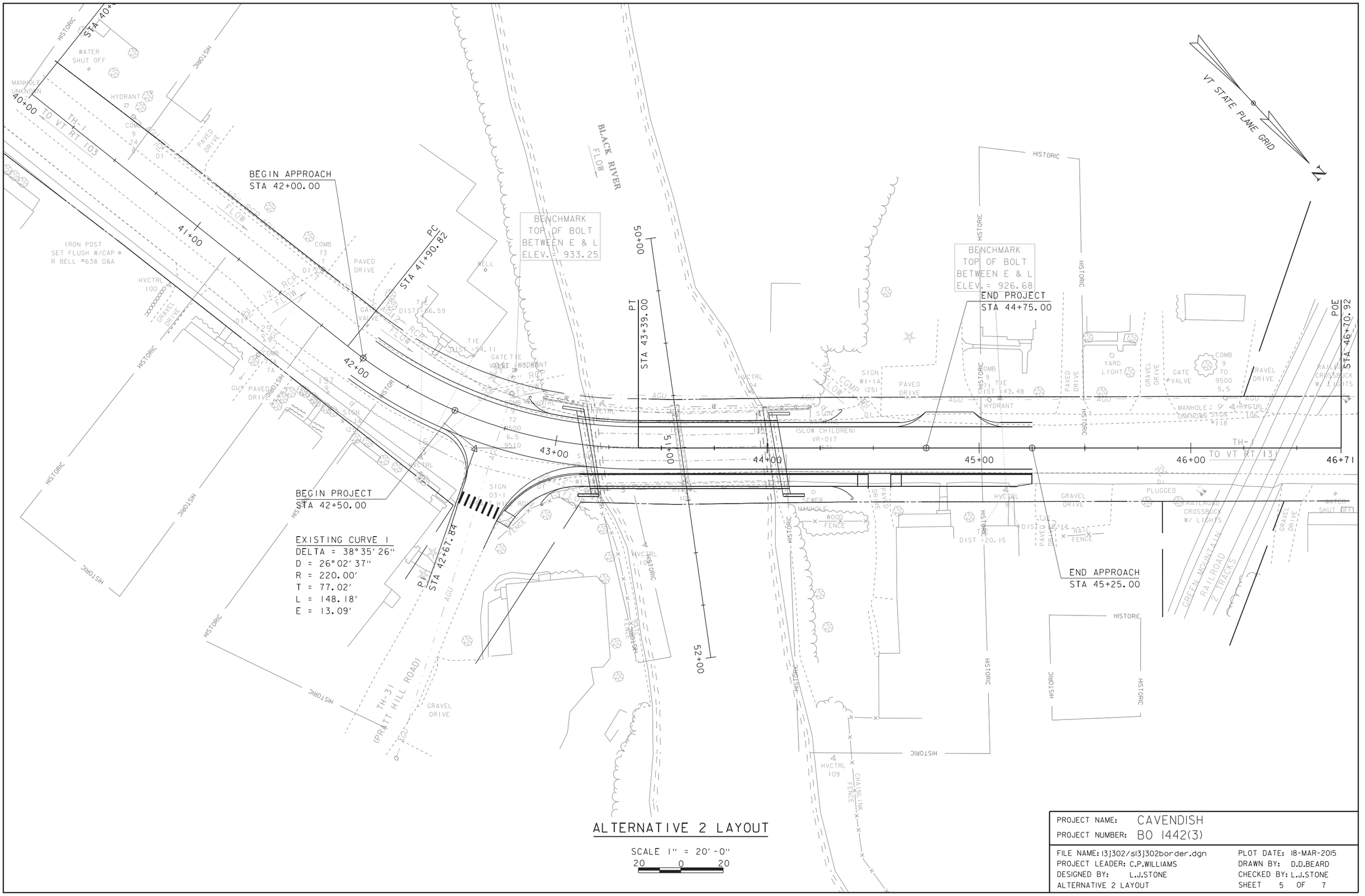


ALTERNATIVE I LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	CAVENDISH
PROJECT NUMBER:	BO 1442(3)
FILE NAME: I3J302/sI3J302border.dgn	PLOT DATE: 23-OCT-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: L.J.STONE	CHECKED BY: L.J.STONE
ALTERNATIVE I LAYOUT	SHEET 4 OF 7

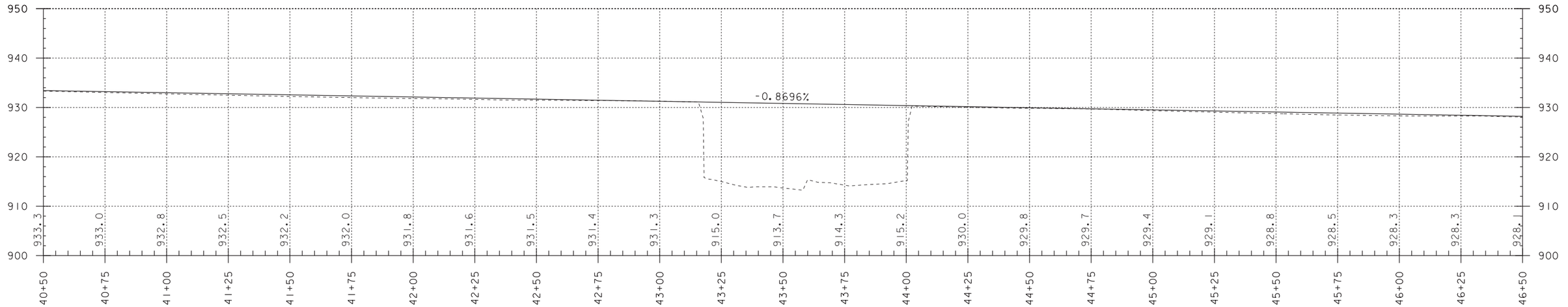


ALTERNATIVE 2 LAYOUT

SCALE 1" = 20'-0"

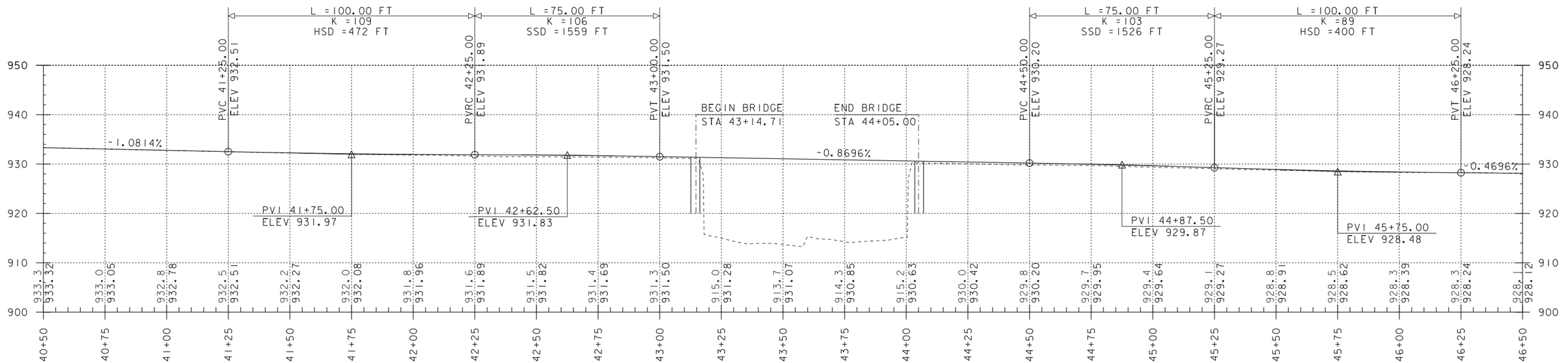
20 0 20

PROJECT NAME:	CAVENDISH
PROJECT NUMBER:	BO 1442(3)
FILE NAME: 13j302/sl3j302border.dgn	PLOT DATE: 18-MAR-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: L.J.STONE	CHECKED BY: L.J.STONE
ALTERNATIVE 2 LAYOUT	SHEET 5 OF 7



TH 1 EXISTING PROFILE

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

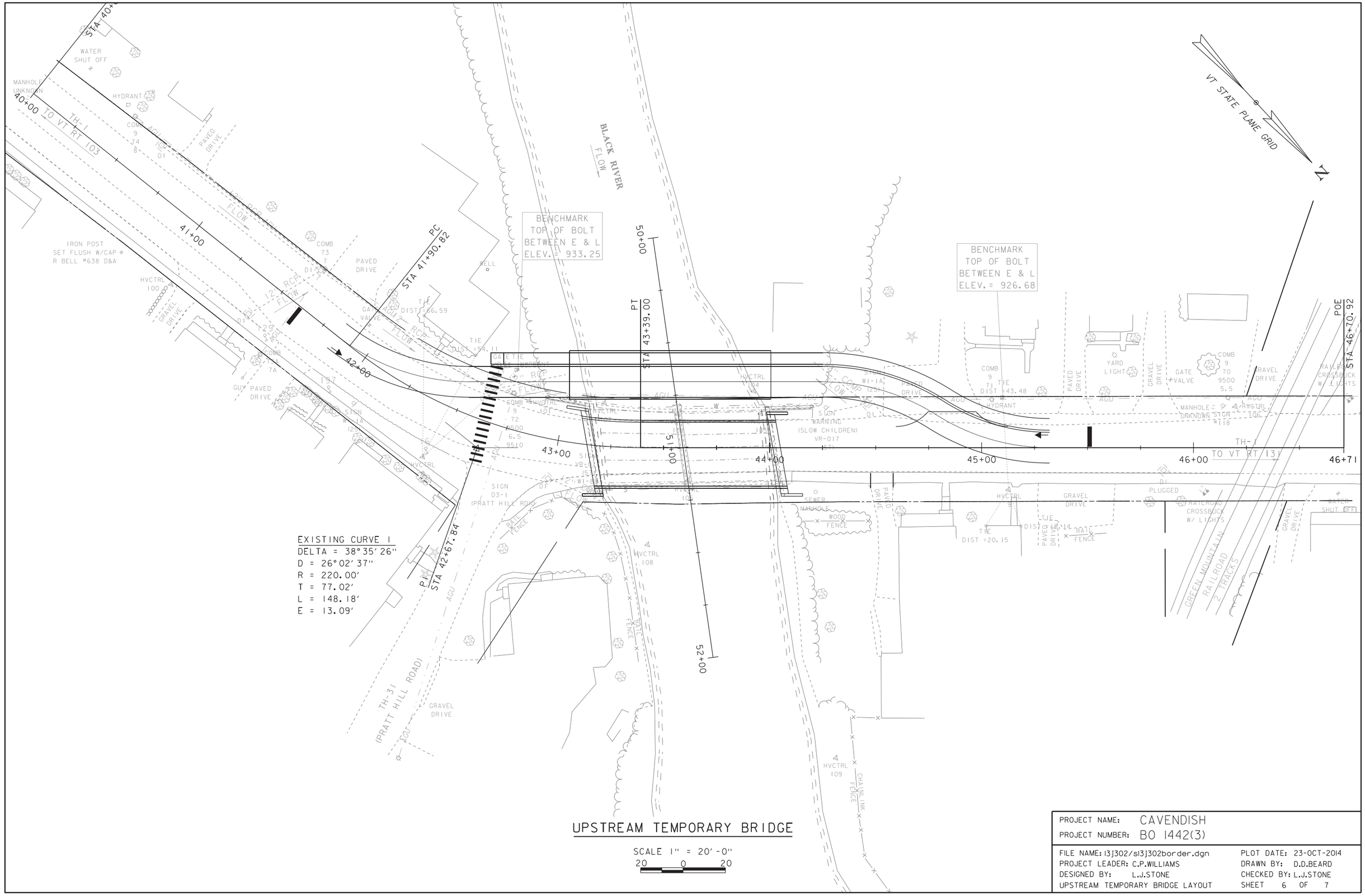


TH 1 PROFILE RAISED 3"

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:	CAVENDISH
PROJECT NUMBER:	BO 1442(3)
FILE NAME: 13j302/sl3j302profile.dgn	PLOT DATE: 18-MAR-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PROFILE SHEET	SHEET 2 OF 7



EXISTING CURVE 1
DELTA = 38°35'26"
D = 26°02'37"
R = 220.00'
T = 77.02'
L = 148.18'
E = 13.09'

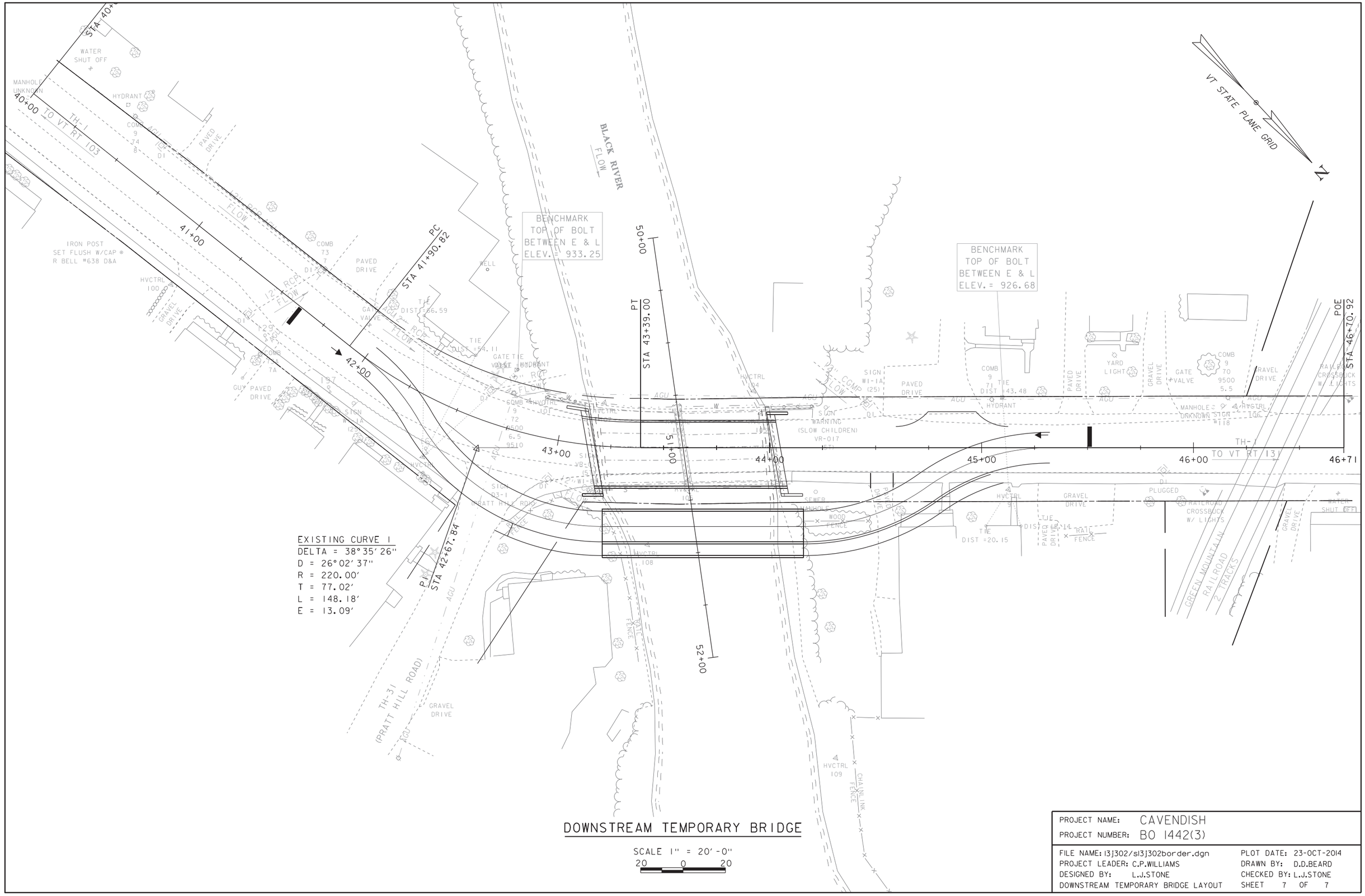
UPSTREAM TEMPORARY BRIDGE

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

PROJECT NAME: CAVENDISH
PROJECT NUMBER: BO 1442(3)

FILE NAME: 13j302/s13j302border.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: L.J.STONE
UPSTREAM TEMPORARY BRIDGE LAYOUT

PLOT DATE: 23-OCT-2014
DRAWN BY: D.D.BEARD
CHECKED BY: L.J.STONE
SHEET 6 OF 7



DOWNSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	CAVENDISH
PROJECT NUMBER:	BO 1442(3)
FILE NAME: 13j302/s13j302border.dgn	PLOT DATE: 23-OCT-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: L.J.STONE	CHECKED BY: L.J.STONE
DOWNSTREAM TEMPORARY BRIDGE LAYOUT	SHEET 7 OF 7