SCOPING STUDY FOR WOODSTOCK BRF 0151(21) BRIDGE #24 ON VT ROUTE 106 OVER KEDRON BROOK

Contents

Introduction 3
Existing Conditions 3
Deficiencies 4
Inspection Report Information 4
Inspection Summary 4
Hydraulics 4
Utilities 4
Environmental Resources 4
Replacement Bridge 5
Accelerated Bridge Construction Discussion 7
Maintenance of Traffic Operations 8
Regional Detour 8
Local Bypass 11
Conclusion 12
Costs 12
Recommendation 13
Appendices 14

Introduction

Bridge 24 traverses the Kedron brook and is located on VT 106 in the Town of Woodstock. The existing bridge is a 29 foot long single span concrete T-beam structure. A replacement bridge is needed due to the deteriorated condition of the existing bridge and inadequate waterway opening.

The existing bridge will be replaced with a new single span structure consisting of NEXT beam superstructure supported on cantilever abutments located behind the existing abutments. The replacement bridge will be 30' wide and will be constructed on existing alignment. The span of the bridge will be lengthened to improve the hydraulic capacity of the structure. Local and through traffic along VT 106 will be impacted during construction. The purpose of this study is to identify traffic control alternatives and recommend a preferred alternative that best balances cost, construction duration, traffic impacts, right-of-way, utility and natural resource impacts.

Existing Conditions

VT 106 is classified as a Major Collector roadway with an Average Annual Daily Traffic (AADT) volume of 1500 vehicles per day. Trucks comprise approximately 5.1% of this volume (90 trucks per day). The design hourly volume is 170 vehicles per hour. Table 1 summarizes the traffic data for the construction and design years.

TRAFFIC DATA	2014	2034	2054
AADT	1500	1600	
DHV	170	180	
ADTT	90	150	
%T	5.1	7.7	
%D	66	66	
FLEXIBLE ESALS:	~	2014~2034 382,000	2014~2054 874,000

Table 1 – Traffic Data for Construction Year (2014); Data Shown for Design Years (2034 and 2054) Used for Pavement Design of Roadway Approaches

Bridge #24 is located on VT 106 at mile marker 3.04 between intersections with Kendall Road and Bryant Road. The existing bridge is a 29' long single span concrete T-beam structure. The current curb-to-curb width is 21' which does not meet the minimum Vermont State Standards of 28' (3' shoulders and 11' travel lanes in each direction). The existing alignment meets minimum Vermont State Standards both horizontally and vertically. The bridge substructure is rated as "poor" and the channel rating is "critical" based on the latest VTrans Structures Inspection completed on 5/20/2011.

Deficiencies

- Structural stability of the bridge substructure due to undermining
- Substandard bridge rail
- Travel width on the bridge
- Rehabilitation of this bridge is virtually impossible therefore replacement is the only viable alternative

Inspection Report Information

Bridge Deck Rating	6 Satisfactory
Superstructure Rating	7 Good
Substructure Rating	4 Poor
Channel Rating	3 Critical

Inspection Summary

"9/21/2011 – Very shallow undermining (-2") below the upstream half of abutment #2. Scour is nearly full depth of the footing at 2.5' to 3' deep along the entire length of the abutment, though noted as similar to this during past inspections. No indication of settlement at abutment 2. Channel has history of chronic scour issues (contraction type) and has been repaired with grout bags below abutment #1 a few years ago. Bridge built circa '24 and is satisfactory but scour should be addressed with stone or preferably check dam and or invert installation – MJ/DK"

Hydraulics

The existing Structure does not meet current design standards and does not provide 1' freeboard over the Q_{50}.

Utilities

There are overhead utilities on the East side of Kedron brook. There is a septic field located between Kendall Road and VT 106 and a water supply well near the project site.

Environmental Resources

There are several Class Three wetlands located in the vicinity of the project. The project will not affect any standing structures of architectural or historical significance which are included in or eligible for inclusion in the National register of Historic Places. A Phase 1 archeological review was completed and the project avoids all archeologically sensitive areas.

Replacement Bridge

The existing bridge will be replaced utilizing cantilever abutments and pre-cast NEXT beams. The bridge will be constructed essentially on existing alignment to minimize right-of-way, environmental resource and utility impacts. The new bridge will have 11’ lanes and 4’ shoulders in each direction, slightly wider than minimum, to accommodate horses on the shoulders. The bridge span will be lengthened to approximately 67’ with a skew of 30 degrees to allow the use of prefabricated bridge elements. The increased span length will greatly improve the hydraulic opening and will result in a low beam elevation of approximately 980.2’. Final hydraulics will be required to confirm that the waterway opening is adequate. In the event that a greater opening is required, it may be possible to raise the roadway profile and/or use a shallower depth superstructure. The increased span length will also allow the contractor to easily remove the existing abutments, or leave them in place to channel the water during construction. The roadway design criteria for Bridge #24 are shown in Table 2.

WOODSTOCK BRIDGE #24
BRF 0151(21)
DESIGN CRITERIA

Design Year	2033
Construction Year	2013
Design Vehicle	WB-62

		VT ROUTE 106		
	Source	Minimum	VTrans Design	Meets Minimum Criteria
Functional Classification		Major Collector (Rural)		
AADT	Vtrans 2010 (Route Log) AADTs State Highways	1,500		
Posted Speed (mph)		40		
Design Speed (mph)[1]		40		
Min. Stopping Sight Distance (ft)	VSS Table 5.1	275	> 300	YES
Min. Corner Sight Distance (ft)	VSS Table 5.2	440		
Minimum Typical Widths (ft)[2]	VSS Sect. 5.5	3-10-10-3	4-11-11-4	YES
Min. Clear Zone (ft)[3]				
- fill (1:4)	VSS Table 5.5	14	14	YES
- fill (1:3)[4]	VSS Table 5.5	*	14	YES
- cut (1:4)[5]	VSS Table 5.5	12	14	YES
- cut (1:3)[5]	VSS Table 5.5	12	14	YES
Max Grade.	VSS Table 5.6	10%	2.3%	YES
Max. Superelevation[6]	VSS Sect. 5.13	8.0%	8.0%	YES
Vert. Crest - K min	VSS Table 5.1	60	-	-
Vert. Sag - K min	VSS Table 5.1	60	-	-
Superelevation[8]	AASHTO	8.0%	7.2%	YES
Horz. - R min (ft)[7]	AASHTO	444	636	YES
Tangent Runout, L_T	AASHTO	48	48	YES
Tangent Runoff, L_R	AASHTO	193	193	YES
Runoff before PC, after PT (2/3 L_R)	VT RDM	129	129	YES

Notes:
1. Design speed of 25 mph may be used without design execption to minimize or avoid impacts to ROW, resources, etc. provided appropriate warnings are posted.
2. Minimum shoulder width to accommodate bicycles is 2 ft per VSS Table 5.8.
3. Clear zone behind curbing is 1.5 ft. Clear zone may be reduced to 10' to avoid or minimize impacts to resources.
4. Fixed objects should not be present within vicinity of toe of slope.
5. In cuts without guardrail, clear zone shall extend to back of ditch.
6. Maximum rollover is 7.0%. When side road intersects main road, max. superelevation should be 6%.
7. Minimum horizontal radius is based on superelevation of 2.1%. Horizontal curves up to 10 mph below stated design speed may be
8. Per plans received from VTrans
9. VSS refers to Vermont State Standards dated October 1997.
10. AASHTO refers to AASHTO 2011 Geometric Design of Highways and Streets.
11. VT RDM refers to Vermont Road Design Manual dated 1998.

Table 2 – Roadway Design Criteria for Bridge #24

Accelerated Bridge Construction Discussion

Accelerated Bridge Construction (ABC) is the first choice of project delivery to reduce impacts to the travelling public, increase contractor safety, minimize Right of Way impacts, and reduce construction costs. Generally, this method involves closing the bridge for the duration of construction. This allows the contractor uninterrupted access and can substantially reduce the construction time. To determine if ABC is appropriate for this project, several items were considered including:

- Right of Way: The new bridge will be located on the existing alignment. While it will be somewhat wider than the current structure, ROW impacts can be avoided by using shored excavation. If a temporary bridge were used, the ROW impacts would be significant.
- Environmental Impacts: Similar to ROW impacts, replacing the bridge on existing alignment will have little, if any impact to environmental resources. A temporary bridge would have to be located downstream of the existing and would likely have greater environmental impacts.
- Constructability: One of the requirements of ABC is the ability to use pre-fabricated bridge elements that can be assembled quickly in the field. Preferably, the skew angle is limited to 30 degrees (or less) to reduce the possibility of cracking in the top flange of the NEXT beams at release in the fabrication plant. Due to the angle of crossing of Kedron Brook and Route 106, the existing bridge has a large skew and limiting the skew angle to 30 degrees will increase the span length. However, the increased span provides additional waterway opening and is still within the limits of Precast Next Beams. The subsurface conditions are such that driving piles is not feasible; therefore spread footings will be used. To minimize the height of the abutments, a concrete sub footing is recommended that extends 4' below streambed elevation. This sub footing will provide scour protection as well as a uniform surface to place precast concrete footings for the abutments. The wing walls can also be precast, and with the increased span length they can be much shorter than would be required with a reduced span. This will allow the walls to be constructed in-line with the abutments at the obtuse corners or at 90 degrees at the acute corners, which will greatly simplify the fabrication and assembly of these components.
- Control of Water during Construction: Setting the new abutments behind the existing abutments will allow the contractor to leave the bottom portion of the existing abutments in-place to channel the water during construction. Alternatively, the contractor may elect to use sand bags, or other methods to divert the stream while excavating for the abutments. Either way is feasible and will allow the contractors to select the method that is most economical.

The most critical item to consider with ABC is the maintenance of traffic. A detailed investigation of various alternatives was completed and is discussed in the next section.

Maintenance of Traffic Operations

Two alternatives are being considered for maintenance of traffic during construction. The alternatives are a one-lane temporary bridge and an off project detour that would allow the new bridge to be constructed using Accelerated Bridge Construction techniques. This would minimize impacts to the traveling public and reduce costs by eliminating the need for a temporary bridge.

1. One Lane Temporary Bridge

Because of the low volume of traffic on VT Route 106 and very short span, a one lane temporary bridge is possible. One way alternating traffic will be allowed across the bridge and will be controlled by a temporary traffic signal at each approach. Only an alignment downstream of the existing bridge can be considered as there is a house directly upstream of the project site. While possible, the downstream alignment would have to traverse wetlands at both sides of Kedron Brook. The benefit of using a temporary bridge is that all traffic that currently uses VT 106 can continue to do so during construction. The drawbacks of using a temporary bridge include longer construction duration, wetland impacts, temporary easements and a much greater construction cost. Cost of the temporary bridge is anticipated to be approximately $250,000.

2. Off-Project Detour

The Vermont Agency of Transportation is considering using Accelerated Bridge Construction, which focuses on faster delivery of construction projects. One practice that will help in this endeavor is closing bridges for the duration of the construction period rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects early. The use of precast 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 traveling public while maintaining project quality.

In order to close VT 106 and utilize Accelerated Construction techniques, a temporary detour will need to be used. This could be accomplished as both a regional state system detour and a local bypass. The regional detour will detour VT 106 through traffic around the site utilizing the State highway system. Local traffic will still be able to utilize VT 106 and will be diverted around the project site utilizing a local bypass arranged by the town. The closure of VT 106 would be limited to a maximum of four weeks in duration.

Regional Detour

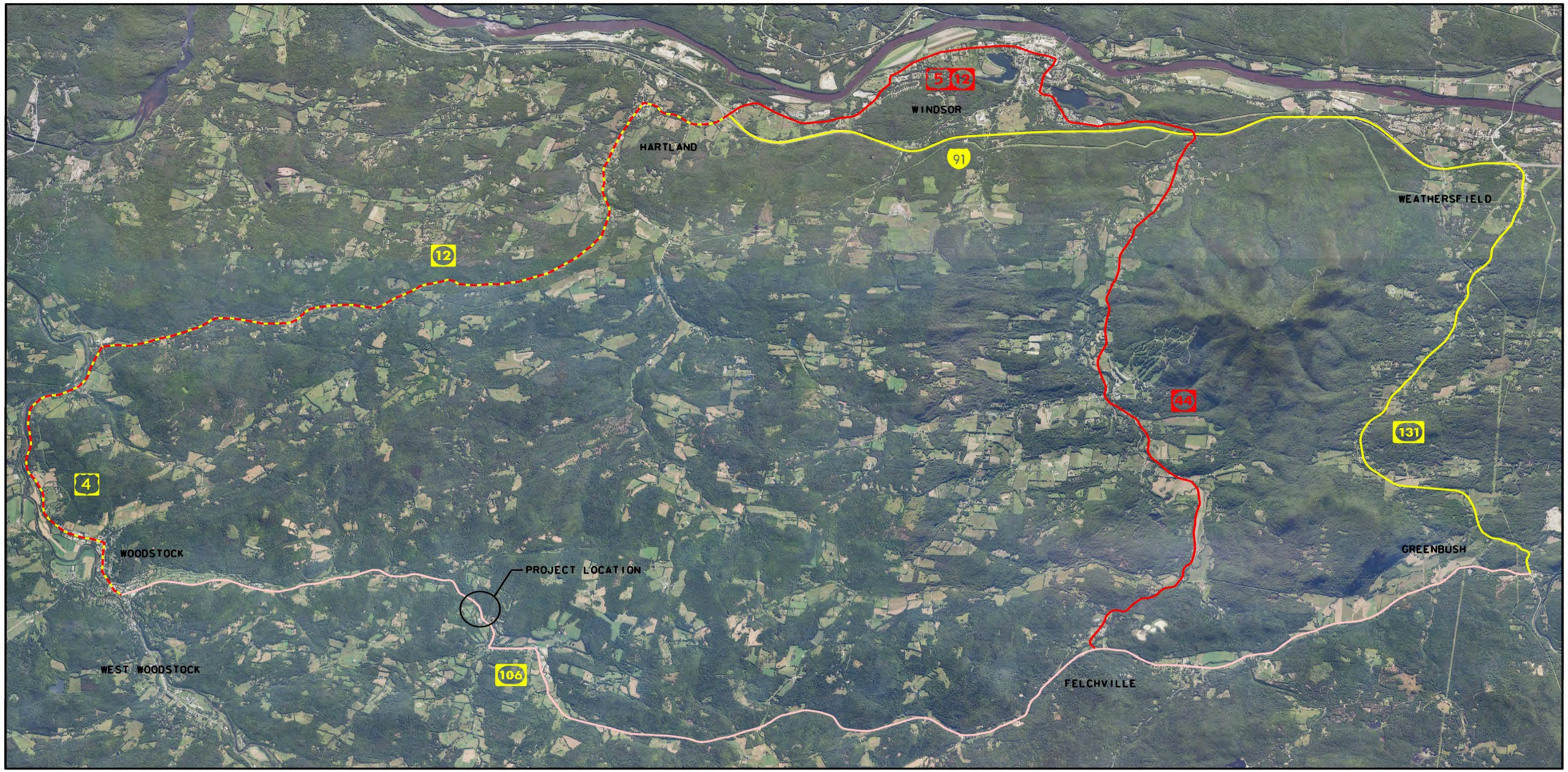
Two regional routes for through traffic were examined and are shown on Figure 1.

- Detour Option #1: vehicles traveling north on VT 106 would be detoured east on VT 131, north on I-91, north on VT 12 then west on US 4 to Woodstock (reversed for vehicles traveling south). This option uses only State and Federal highways and travels only 10 additional miles when compared to the un-detoured route. VT 131 is currently in very good condition and this route also has the advantage of traveling several miles of interstate highway. While avoiding the

centers of other towns along the way, this detour option does travel through the intersection of US 5 and VT 12 in the center of Hartland.

- Detour Option #2: alternatively, this detour would consist of northbound VT 106 traffic being detoured east on VT 44, north on US 12 then west on US 4 to Woodstock. This detour is advantageous because it is nearer to the project site than Detour Option #1. This route also uses only State and Federal highways and travels 14.5 miles farther than the un-detoured route. In addition to being a longer route than Option #1, the downside of this detour option is that it would travel through downtown Windsor in addition to traveling through Hartland.

While Detour Option #1 traverses a few less miles and takes a few less minutes to travel than Detour Option #2, both detours are reasonable and either route could be used. Because the condition of one of the routes may be better than the other at the time of construction, or because there may be roadway construction along one of the routes, having more than one viable detour route available adds to the advantage of using this alternative.



DETOUR OPTION #1 (VT 131)	
UNDETOURED DISTANCE:	17.9 MILES
UNDETOURED TIME:	24 MINUTES
DETOURED DISTANCE:	27.9 MILES
DETOURED TIME:	36 MINUTES
ADDITIONAL DISTANCE:	10 MILES
ADDITIONAL TIME:	12 MINUTES

DETOUR OPTION #2 (VT 44)	
UNDETOURED DISTANCE:	12.7 MILES
UNDETOURED TIME:	17 MINUTES
DETOURED DISTANCE:	27.2 MILES
DETOURED TIME:	41 MINUTES
ADDITIONAL DISTANCE:	14.5 MILES
ADDITIONAL TIME:	24 MINUTES

PROJECT NAME: WOODSTOCK BRIDGE #24
PROJECT NUMBER:
FILE NAME: ...\drawing\RegionalDetours.dgn PLOT DATE: 8/1/2012
PROJECT LEADER: DRAWN BY:
DESIGNED BY: CHECKED BY:
REGIONAL DETOUR PLAN SHEET OF

Figure 1 – Regional Detour Routes

Local Bypass

While it would be left to the Town of Woodstock to determine and manage a local bypass route, local traffic could be rerouted on class 2 highways. If the Town utilizes Church Hill Road, the total bypass distance would be roughly equal to the un-detoured route. The distance from one end of the bridge to the other, however, would be about 9 miles using this bypass. This may be acceptable to local drivers, though, given the short duration of the project. A possible local bypass route along Church Hill Road is shown in Figure 3.

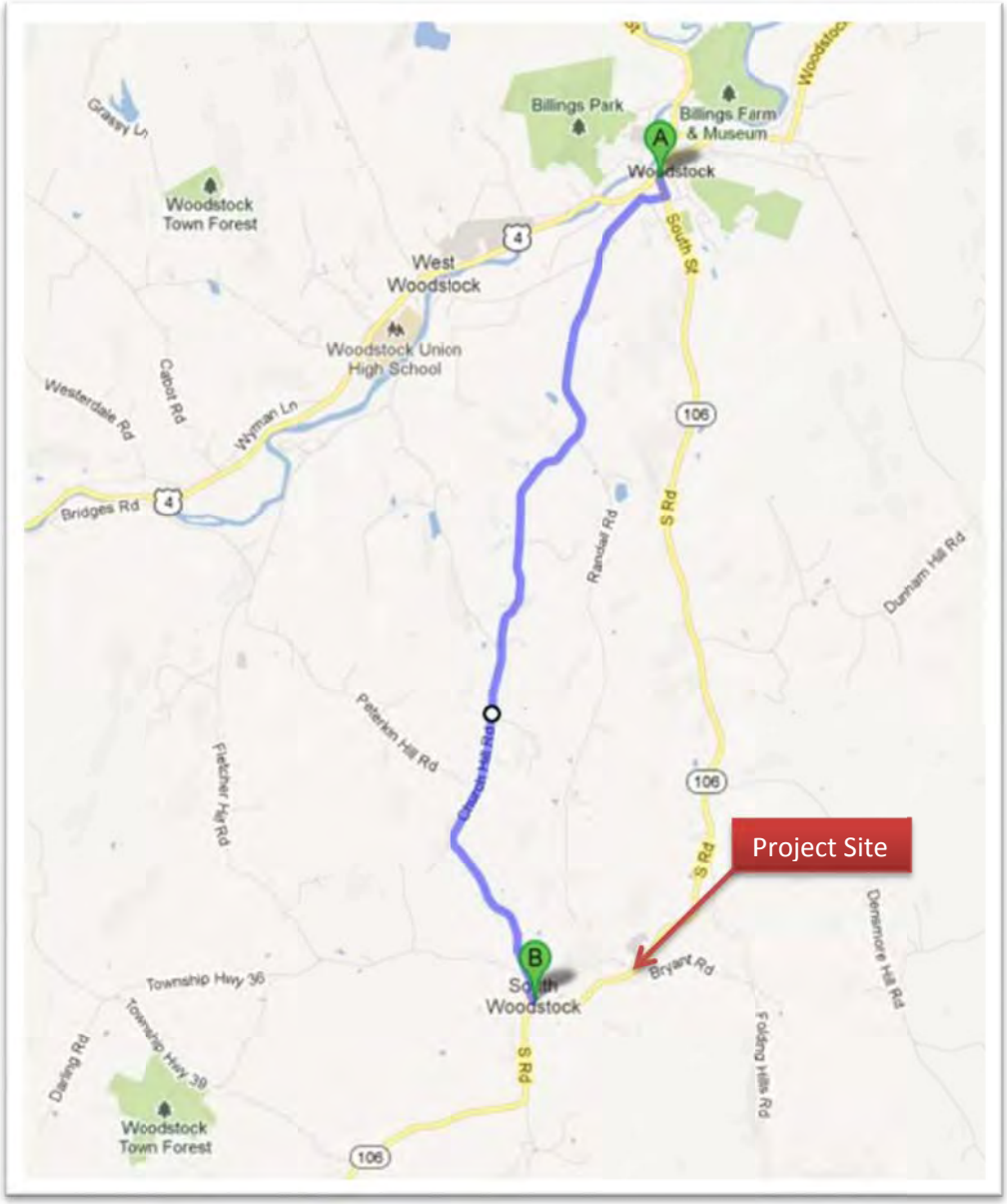


Figure 3 – Local bypass Route (clipped form Maps.Google.com)

Benefits of using the local bypass and regional detour include reduced construction duration and reduced construction costs. In addition, the right-of-way and wetland impacts associated with a

temporary bridge will be eliminated. Drawbacks of this alternative include increased end-to-end distance and, because of slower speed limits than those on VT 106, a longer travel time for motorists utilizing the local bypass. The impact to the integrity of the class 2 Town highways due to diversion of traffic is expected to be mitigated by money the Town of Woodstock will receive to manage the local bypass.

Conclusion

Following is a matrix comparing the costs associated with a four week maximum road closure and a two-way temporary bridge. It is assumed that local traffic can be detoured on existing roads. The length of time that the bridge needs to be closed will be very short, possibly less than two weeks, so the inconvenience experienced by local motorists should be generally acceptable. While the local bypass will be managed by the Town of Woodstock, it is believed that local traffic can use Church Hill Road during construction.

Costs

	Road Closed	One-lane Temporary Bridge Off-Alignment
Bridge Cost	$650,000	$650,000
Removal of Structure	$35,000	$35,000
Channel Work	$20,000	$20,000
Roadway	$300,000	$300,000
Erosion Control	$20,000	$60,000
Temporary Bridge	$0	$250,000
Construction Costs	$1,025,000	$1,315,000
Construction Duration	3 months	18 months
Preliminary Engineering	$205,000	$265,000
Right of Way	$0	$100,000
Construction Engineering	$345,000	$440,000
Engineering Costs	$550, 000	$805,000
Project Development Duration	1 year	3 years
Total Costs	$1,575,000	$2,120,000
Premium		34.6%

Table 2 – Summary Matrix

Recommendation

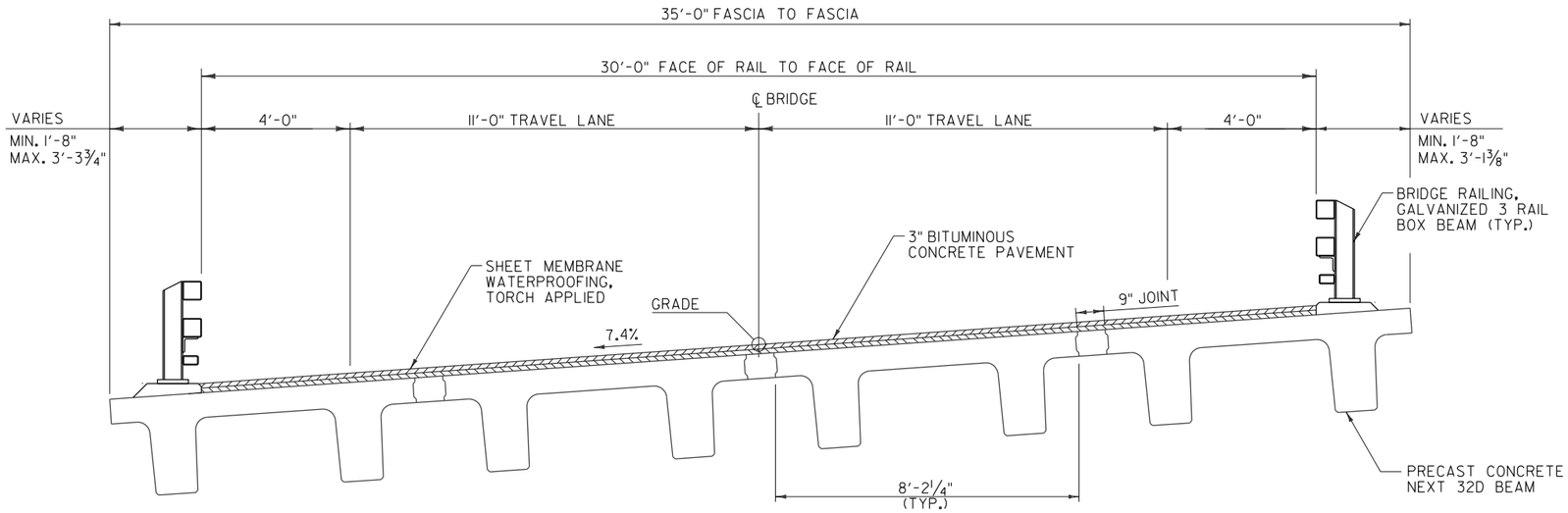
There are several drawbacks associated with using an off-alignment temporary bridge at this location. There would be a nearly 35% increase in total project costs using a temporary bridge. Impacts to sensitive lands would greater. There would also be ROW impacts that could add years to the project delivery process. These ROW impacts can be eliminated entirely if a road closure (four week maximum) is used in place of a temporary bridge. Because no structural or safety benefits exist if using an off-alignment temporary bridge, this option is not recommended. Therefore, Stantec recommends using a regional detour combined with a local bypass for the replacement of Bridge #24. This option eliminates ROW impacts, is the least expensive and will have the shortest project development time.

Appendices

- Pictures
- Plans
    - Typical Sections
    - Layout
    - Profile
- Bridge Inspection Report
- Hydraulics Memo
- Geotechnical Memo
- NEPA Clearance Memo

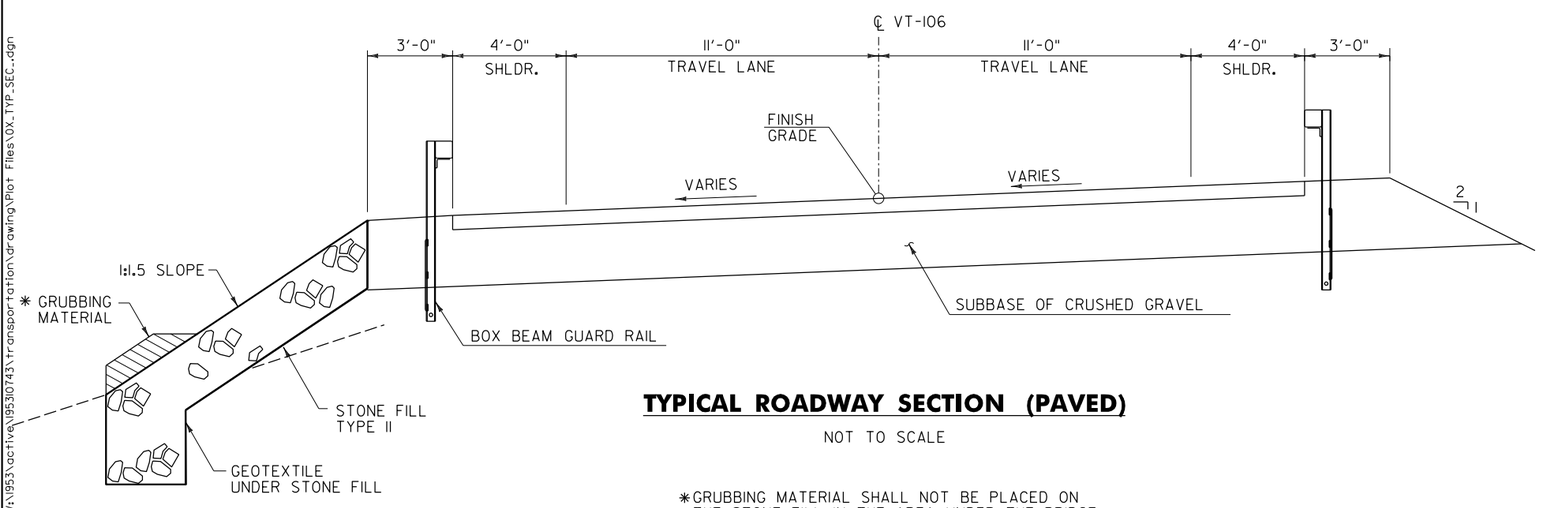
Picture 1: Cracked bridge rail with previously repaired section

Picture 2: Natural resources (trees), deficient shoulder widths and bridge rail in poor condition



TYPICAL BRIDGE SECTION

SCALE: ½" = 1'-0"



TYPICAL ROADWAY SECTION (PAVED)

NOT TO SCALE

*GRUBBING MATERIAL SHALL NOT BE PLACED ON THE STONE FILL IN THE AREA UNDER THE BRIDGE.

1/18/2013 9:37:58 AM V:\1953\active\195310743\transportation\drawing\Plot Files\OX_TYP_SEC_.dgn

Stantec

PROJECT NAME: WOODSTOCK BRIDGE 24	
PROJECT NUMBER:	
FILE NAME: ...\Plot Files\OX_TYP_SEC_.dgn	PLOT DATE: 1/18/2013
PROJECT LEADER: G. BOGUE	DRAWN BY: L. BUXTON
DESIGNED BY: J. HUNGERFORD	CHECKED BY: G. BOGUE
TYPICAL SECTIONS AND DETAILS	SHEET 1 OF 1

NOTE:
NO TEMPORARY OR PERMANENT IMPACTS WILL BE PERMITTED OUTSIDE OF THE EXISTING R.O.W.

N
VT STATE PLANE GRID

EXISTING R.O.W.
HISTORIC
TH 61
PC STA 2+68.23
PT STA 5+27.89
PROJECT DEMARCATION FENCE WILL BE LOCATED INSIDE EXISTING R.O.W.
LOW CHORD ELEV. 979.59
PROPOSED BR24 BRIDGE REPLACEMENT 30 DEG. SKEW, 67 FT SPAN
VT 106 TO SOUTH WOODSTOCK
VT 106 TO WOODSTOCK VILLAGE
3+00
4+00
5+00
67'-0"
55'-4½"
N 67°52'25" E
N 44°30'13" E
LOW CHORD ELEV. 980.87
8'-6" HIGH x 30'-0" LONG CONCRETE BLOCK GRAVITY RETAINING WALL TOW = +/- 984
KEDRON BROOK
FLOW
PI STA 3+99.89

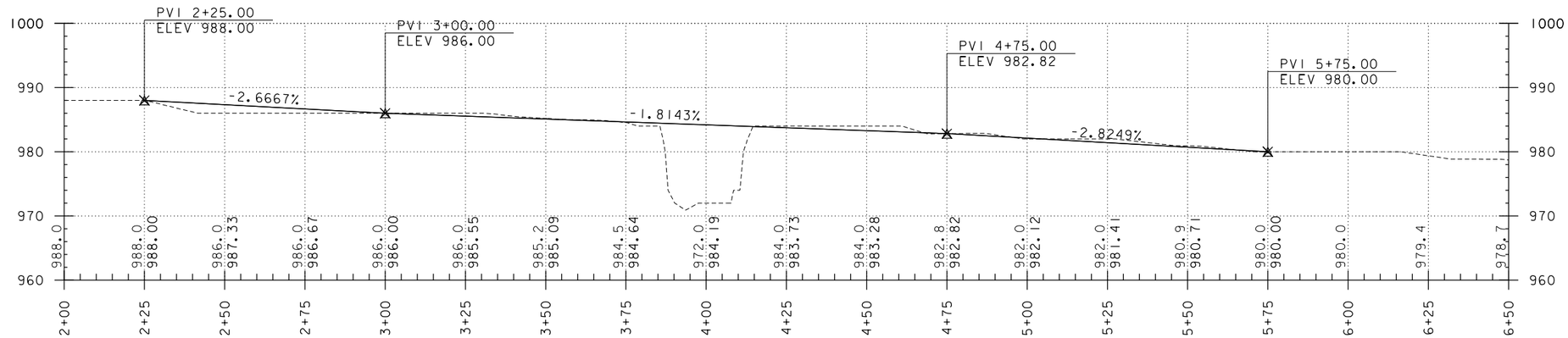
CURVE (1)
DELTA = 23°24'12"
D = 9°00'00"
R = 636.62'
T = 131.66'
L = 259.67'
E = 13.47'

PLAN
SCALE: 1" = 10'-0"
0 10 20

Stantec

PROJECT NAME: WOODSTOCK BRIDGE 24	
PROJECT NUMBER:	
FILE NAME: ...\XX_LAYOUT_PLAN_ROW2.dgn	PLOT DATE: 1/16/2013
PROJECT LEADER: G. BOGUE	DRAWN BY: L. BUXTON
DESIGNED BY: J. HUNGERFORD	CHECKED BY: G. BOGUE
LAYOUT PLAN 2	SHEET 1 OF 1

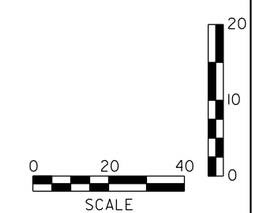
1/16/2013 1:49:04 PM V:\1953\active\195310743\transportation\drawing\Plot Files\XX_LAYOUT_PLAN_ROW2.dgn



PROFILE ALONG VT-106

NOTE:
ELEVATIONS SHOWN TO THE NEAREST TENTHS ARE EXISTING GROUND ALONG PROPOSED CENTERLINE.

ELEVATIONS SHOW TO THE NEAREST HUNDREDTHS ARE FINISHED GRADE ALONG PROPOSED CENTERLINE.



Stantec

PROJECT NAME: WOODSTOCK BRIDGE 24	
PROJECT NUMBER:	
FILE NAME: ...\Plot Files\04_PROFILES.dgn	PLOT DATE: 1/11/2013
PROJECT LEADER: G. BOGUE	DRAWN BY: L. BUXTON
DESIGNED BY: J. HUNGERFORD	CHECKED BY: G. BOGUE
ROADWAY PROFILE	SHEET 1 OF 1

1/11/2013 2:52:46 PM V:\1953\active\195310743\transportation\drawing\Plot Files\04_PROFILES.dgn

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for WOODSTOCK **bridge no.:** 00024 **District:** 4

Located on: VT 00106 ML **ove** KEDRON BROOK **approximately** 4.3 MI S JCT. U.S.4 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 6 SATISFACTORY

Superstructure Rating: 7 GOOD

Substructure Rating: 4 POOR

Channel Rating: 3 SERIOUS

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200151002414242

Federal Sufficiency Rating: 45

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1924 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 14

ADT: 001900 **% Truck ADT:** 06

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0022

Structure Length (ft): 000029

Lt Curb/Sidewalk Width (ft): 0

Rt Curb/Sidewalk Width (ft): 0

Bridge Rdwy Width Curb-to-Curb (ft): 21

Deck Width Out-to-Out (ft): 24

Appr. Roadway Width (ft): 026

Skew: 50

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: CONCRETE T-BEAM

Number of Approach Spans 0000 **Number of Main Spans:** 001

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: 0 DOES NOT MEET 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: 2 INTOLERABLE, REPLACEMENT NEEDED

Underclearances Vertical and Horizontal: N NOT APPLICABLE

Waterway Adequacy: 3 FREQUENT OVERTOPPING OF BRIDGE & ROADWAY WITH SIGNIFICANT TRAFFIC DELAYS

Approach Roadway Alignment: 6 EQUAL TO MINIMUM CRITERIA

Scour Critical Bridges: 7 CORRECTIVE COUNTERMEASURES IN PLACE

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): 2 ALLOWABLE STRESS (AS)

Posting Status: A OPEN, NO RESTRICTION

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 10 NO LOAD POSTING SIGNS ARE NEEDED

Posted Vehicle: POSTING NOT REQUIRED

Posted Weight (tons):

Design Load: 2 H 15

INSPECTION and CROSS REFERENCE

X-Ref. Route:

Insp. Date: 052011 **Insp. Freq. (months)** 24 **X-Ref. BrNum:**

INSPECTION SUMMARY and NEEDS

09/21/2011 - Very shallow undermining (~ 2") below the upstream half of abutment #2. Scour is nearly full depth of the footing at 2.5' to 3' deep along the entire length of the abutment, though noted as similar to this during past inspections. No indication of settlement at abutment 2. Channel has history of chronic scour issues (contraction type) and has been repaired with grout bags below abutment #1 a few years ago. Bridge built circa '24 and is satisfactory but scour should be addressed with stone or preferably check dam and or invert installation. ~ MJ/DK

05/11/2011 A wooden post along the right side of approach No.1 is in need of replacement. Anti-scour protection is needed along both abutment footing areas. Anti-erosion protection needs to be added along the left bank area of approach No.2. PLB

VT AGENCY OF TRANSPORTATION **PROGRAM DEVELOPMENT DIVISION**

HYDRAULICS UNIT

TO: Chris Williams, Structures Project Manager

FROM: David Willey, Hydraulics Project Supervisor

DATE: August 4, 2011

SUBJECT: Woodstock BRF 0151(21), VT 106 Br. 24 over Kedron Brook

---

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

As you are aware, a new bridge was previously designed for this site under project BRS 0151(8). That project was in metric units. The project has now been converted to English units. We completed final hydraulics for that bridge in May 2003. That final hydraulics was based on a new concrete slab bridge with a 9.0 m (29.5') clear span length. The bridge had a 2.8 m (9.2') clear height with average bottom of beams at elev. 299.1 m (981.1') and 20.3 sq. m (218.5 sq. ft.) of waterway area. That bridge would be a significant hydraulic improvement over the existing bridge. However it does not meet the current design standards, as it would not provide 1.0' of vertical clearance above the design Q50. If you use the previous new bridge design, with no changes that would affect hydraulics, we can convert the 2003 final hydraulics report to English units. All the information in that report is still valid, including the recommended size for a temporary bridge to be removed before winter.

To meet the standards, the previously designed bridge, with a 29.5' clear span, would need to have the average bottom of beams raised to at least elevation 982.0', as noted in our 2003 final hydraulics memo.

If it is not practical to raise the bridge that much, the bridge could be lengthened to increase its waterway area and allow it to meet the standards. A bridge with a 35' clear span would need the average bottom of beams to be at least elevation 981.5', to meet the standards. To maintain the previously designed bottom of beam elevation of 981.1', the clear span length would have to be increased to at least 42', to meet the standards.

As noted in our 2003 final hydraulics memo, the bottom of abutment footings should be at least six feet below the channel bottom, or to ledge, to prevent undermining.

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.

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

DCW
cc: Hydraulics Project File via NJW
Hydraulics Chrono File

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Martha Evans-Mongeon, Project Manager, Structures

From: Chad A. Allen, Geotechnical Engineer, via Christopher C. Benda, Soils and Foundations Engineer

CAA CCB

VTrans - PDD

Date: March 2, 2005

MAR 0 7 2005

Subject: Woodstock BRS 0151(8)S

Structures Design Section

1.0 INTRODUCTION

We have completed our geological and geotechnical investigation for the replacement of BR. 24 on VT 106 in Woodstock, VT over the Kendron Brook. The proposed project consists of the construction of a single span bridge, and related approach work. This geotechnical report documents our subsurface investigation; including our analyses and recommendations for the proposed project. Contained herein are the results of field sampling and testing, laboratory analyses of soil samples, geological and geotechnical analyses, and geotechnical design recommendations.

2.0 FIELD INVESTIGATION

The field investigation was composed of a total of four (4) standard penetration (SPT) bore holes, drilled to determine the subsurface soil profile for the construction of the abutments and adjacent wingwalls. The field investigation was conducted in two phases; two SPT borings were drilled during each phase. The first phase encompassed borings B1 and B4, which were drilled during the month of July in 1986, while borings B202 and B203, were drilled during the second phase, in November and December of 2004. The borings were located as detailed below in Table 1.

Boring	Station, m	Offset, m	Elevation, m
B1	0 + 248.014	-3.22	300.11
B4	0+270.885	9.67	297.70
B202	0+254.000	3.65	300.23
B203	0+261.000	6.56	299.21

Boring Taken @ ← 0+261.000 , -6.56

Table 1: Boring Location Data for Woodstock BRS 0151(8)S Subsurface Investigation

During the boring operations, split spoon samples and standard penetration tests (SPT) were taken at 1.5 meter intervals. Soil samples were visually classified in the field and SPT blow counts were recorded on the boring logs. Borings were drilled to depths between 8.00 m and 15.06 m below the ground surface. Bedrock was not encountered during the 1986 subsurface investigation for borings B1 and B4, however, bedrock was encountered at an elevation of 288.96 meters and 287.48 meters at borings B202 and B203, respectively.

Where bedrock was encountered, rock cores were drilled in 1.5 meter runs, for a minimum of 3 meters or until the competency of the bedrock was verified. Soil and rock samples were preserved and returned to the Materials and Research Laboratory for testing and further evaluation. Upon

completion of the laboratory testing, the field boring logs were revised to reflect the results of the laboratory classification tests. The attached boring logs display the types of soils and strata encountered and include the laboratory test results, SPT data, summaries of the Geologist's Reports, and any pertinent observations made by the boring crew.

3.0 FIELD AND LABORATORY TESTS

The standard penetration resistance of soil is determined by the number of blows required to drive a 51 mm OD split-barrel sampler into the soil with a 63.5 kg hammer dropped from a height of 0.76 m, in accordance with procedures specified in AASHTO T206. During the standard penetration test (SPT), the sampler is driven for a length of 0.60 m, while counting the number of blows required for each 0.15 m 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. Selected specimens obtained from the standard penetration borings were tested in the laboratory to assess their physical properties. Moisture contents were determined, as well as the percent of each soil type present.

VTrans' Transportation Geologist Tom Eliassen conducted a review of the field data including verification of the length of run, length of core samples, and drilling times (the drilling time taken to complete a core run - B202 only). In addition, Mr. Eliassen conducted laboratory analyses to determine the lithological (material composition) description of the rock, the dip or angle of the bedrock's bedding or jointing plane, and whether or not core breaks were relevant to drilling or a result of naturally occurring jointing planes. Calculations and rock strength parameters were determined for each core sample and included calculations to determine the rock quality designation or RQD and the percent of core recovery.

RQD provides an indication of the integrity of the rock mass and relative extent of seams, jointing, and bedding planes. The calculation of RQD, conducted in accordance with ASTM D6032, is a modified core recovery percentage in which the lengths of all sound rock cores over 100 mm in length are summed and divided by the length of the core run. Core recovery is the sum of the total length of rock core(s) recovered from the core barrel calculated as a percentage of the total length of the core run.

The summary of the field data and laboratory analyses, as well as a digital picture of each core sample and comments regarding the competency of the bedrock are included it the Geologist's Reports. The Geologist's Reports are attached for reference purposes.

4.0 SOIL PROFILE

Due to the cohesionless nature of the subsurface materials a definitive ground water table was not observed, although it is anticipated that the elevation of the brook serves as the defining groundwater elevation. During the 1986 subsurface investigation, no groundwater elevation was reported for either boring B1 or B4. When the drillers extracted their casing, during the most recent phase of the subsurface investigation for both borings B202 and B203, the bore holes caved in preventing a groundwater measurement from being taken. Boring B202 caved in at 3.6 meters below ground (Elev. 296.63 meters), which approximates the bottom of stream elevation.

Review of the SPT results, lab data, geologist reports, and borings revealed the following information pertaining to the subsurface soil strata and underlying bedrock:

Abutment No. 1: The subsurface profile for the foundation design of Abutment No. 1, shown below in Table 2, was developed based on subsurface soil information encountered for SPT borings, B1 and B202. It is noted that the design profile is based on two borings within the zone of influence of the abutment and that actual subsurface profiles may differ, at any point, due to variances in the past geological history and consolidation pressures. The calculated core recoveries ranged from 86% to 100%, while the calculated RQD values ranged from 0% to 80%, and the dip angle was determined to be 10 degrees.

Elevation, m	Soil Type
300.2 – 297.7	Loose silty-sand
297.7 – 294.2	Medium sandy-silt and silty-sand with potential for 1.5 m layer of boulders.
294.2 – 291.2	Very dense sandy-silt
291.2 – 289.2	Very dense gravel with varying levels of sands and silts
~ 289.2	Bedrock identified as quartz-biotite schist was encountered at elevations of 288.96 m (B202), boring B1 was stopped in the layer of very dense sandy-silt at elevation 290.71 m.

Table 2: Abutment No. 1 – Design Subsurface Soil Profile

4.1 Abutment No. 2 - The subsurface profile for the foundation design of Abutment No. 2, shown below in Table 3, was developed based on subsurface soil information encountered for SPT borings, B4 and B203. It is noted that the design profile is based on two borings within the zone of influence of the abutment and that actual subsurface profiles may differ, at any point, due to variances in the past geological history and consolidation pressures. The calculated core recoveries ranged from 55% to 94%, while the calculated RQD values ranged from 0% to 69%, and the dip angle was determined to be 20 degrees.

Elevation, m	Soil Type
298.45 – 297.0	Medium dense silty-sand
297.0 – 287.5	Very dense layers of sandy-silt with multiple 0.4 meter thick layers of boulders sandwiched in between the silt layers.
~ 287.5	Bedrock identified as phyllitic quartz-biotite schist was encountered at elevations of 288.96 m (B202), boring B1 was stopped in the layer of very dense sandy-silt at elevation 290.71 m.

Table 3: Abutment No. 2 – Design Subsurface Soil Profile

5.0 RESULTS

5.1 Foundation Analyses:

5.1.1 Shallow Foundation Design: The subsurface profiles at each abutment were relatively similar; therefore the following bearing capacity and settlement analyses govern for both Abutments 1 and 2.

5.1.1.1 Bearing Capacity Analyses: A bottom of footing elevation of 294.50 meters, for each abutment, was given on the plans. The soil encountered at the bottom of footing elevation was documented to be very dense sandy-silt with the possibility of discontinuous layers of gravel and boulders. The groundwater elevation was assumed to be at the bottom of footing elevation. The bearing capacity analyses were based upon a design friction angle of 35°, a unit weight of 20.4 kN/m^3 and a factor of safety of 3.0. In addition, the analyses were based on an estimated footing length of 28 meters and a depth of embedment of 1.83 meters. Based on the aforementioned assumptions, the maximum allowable bearing capacities for six different footing widths are summarized below in Table 4.

Footing Widths, m	q_{ult}, kPa
1.83	202
2.44	228
3.05	253
3.66	279
4.27	305
4.88	331

Table 4: Maximum Allowable Bearing Capacities, kPa for Variable Footing Widths, m

5.1.1.2 Settlement Analyses: Each abutment is bearing on very dense layers of cohesionless material, predominately sandy silts and silty sands with some gravel and boulder layers interspersed. Settlement values, shaded in gray, were calculated for each assumed footing width's maximum allowable bearing capacity. In addition, allowable bearing capacities were calculated for settlement values of 6, 13, and 19 mm. The designer may use the Settlement Table, Table 5, or the Settlement Graph in Figure 1 below to interpolate an allowable bearing capacity based on the abutment's specific geometry or settlement criteria. Settlement is expected to occur during and immediately following construction.

		Vertical Displacement (Settlement), mm		
		6	13	19
Footing Width, m	1.83	122 kPa	202 kPa = 9 mm	
	2.44	105 kPa	228 kPa = 11 mm	
	3.05	96 kPa	253 kPa	
	3.66	91 kPa	244 kPa	279 kPa = 14 mm
	4.27	86 kPa	230 kPa	305 kPa = 15 mm
	4.88	84 kPa	220 kPa	331 kPa = 16 mm

Table 5: Settlement Table, Vertical Displacement under Varying Loads for Footings of Various Widths

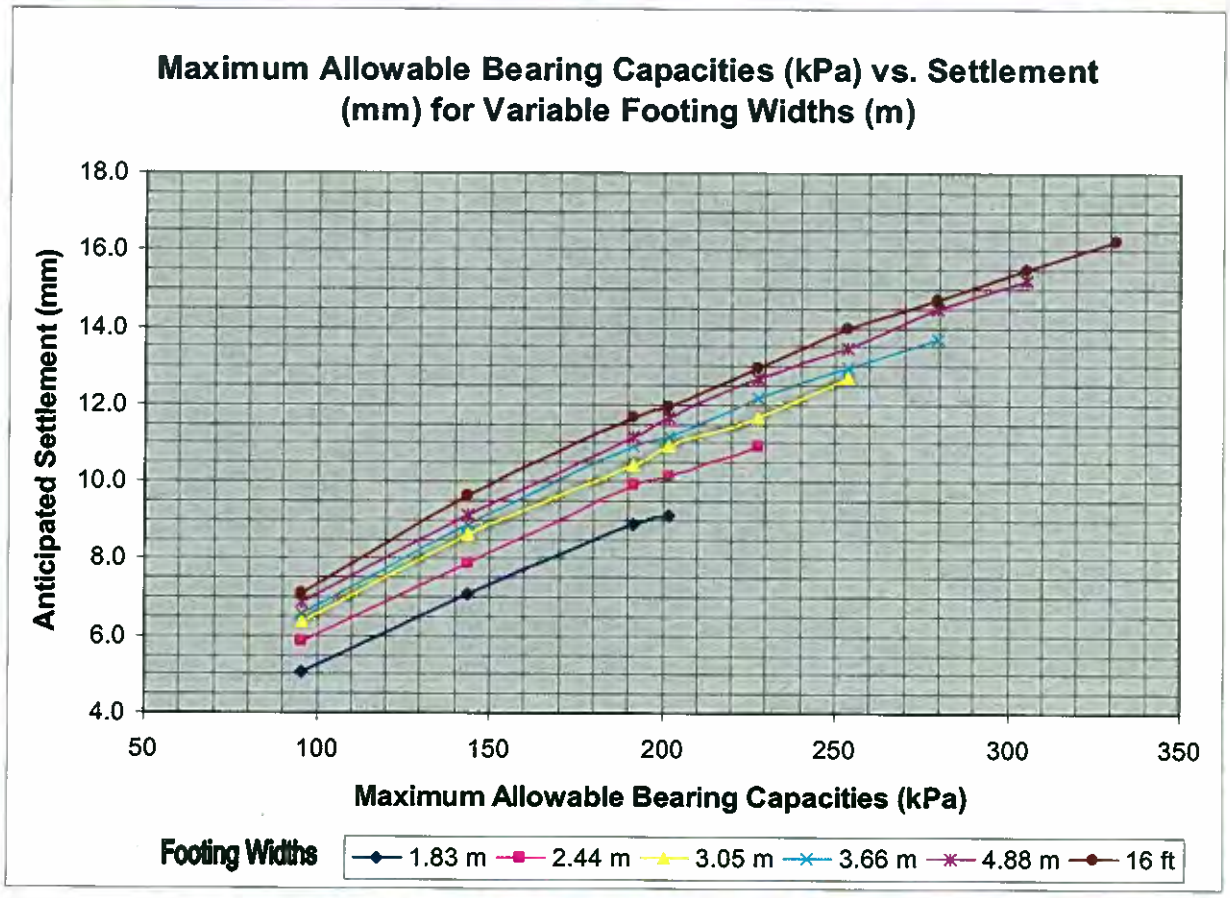


Figure 1: Maximum Allowable Bearing Capacities (kPa) vs. Settlement (mm) for Variable Footing Widths (m)

5.1.2 Deep Foundation Design: A deep foundation utilizing the driving of H-piles at this location is not considered to be an economic design option given the highly competent subsurface soils. In addition, driven piles can be disregarded due to the presence of very thick layers of dense boulders encountered below the anticipated footing elevation, within the driven pile zone.

5.2 Roadway/Embankment Design: The existing profile of VT 106 is not anticipated to change, therefore, no geotechnical issues are anticipated, assuming standard Agency construction practices are utilized.

5.3 Construction Considerations:

5.3.1 Cofferdams/Temporary Earthwork Support: Steel H-piles were not considered to be an acceptable design alternative at this location due to the competent soils and presence of very dense layers of boulders at each abutment. A layer of boulders, approximately 2 meters thick, was encountered at Abutment No. 1. At Abutment No. 2 the boulders were encountered throughout the entire depth sandwiched between very dense layers of hard pan, sandy-silt. The presence of boulders at each abutment may preclude the use of cantilevered sheet pile for use in cofferdam construction.

The project's bid documents should alert prospective Contractors that the very dense layers of silt interspersed among the boulders will likely be difficult to penetrate with sheeting. The use of heavy duty sheets with driving shoes and the use of vibratory hammers may be necessary to achieve a sufficient depth of embedment. In addition, prospective Contractors should be reminded that Section 204.07 of VTrans' *2001 Standard Specifications for Construction* states that "The Contractor shall prepare detailed plans and a schedule of its operation for each cofferdam specified in the Contract. The design and structural details of the cofferdam shall be signed, stamped, and dated by a Professional Engineer (Structural or Civil)."

5.3.2 Construction Dewatering: The bottom of foundation elevation is estimated to be 294.50 meters and the assumed elevation of the groundwater table is assumed to be the ordinary high water elevation of Kendron Brook. From the profile drawing, the bottom of the channel approximates an elevation of 296.00 meters; therefore, temporary construction dewatering may be required to construct the foundations for each abutment in the dry. Temporary dewatering may also be necessary to limit disturbance to and maintain the integrity of the bearing surface.

Temporary dewatering can likely be accomplished by open pumping from shallow sumps or wells, and temporary ditches and trenches within and around the excavation limits. Wells and sumps should be provided with filters suitable to prevent pumping of fine-grained soil particles. The water trapped by the temporary dewatering controls should be discharged to settling basins or an approved filter "sock" so that the fine particles suspended in the discharge have adequate time to "settle out" prior to discharge. All effluent, or discharge, should comply with all applicable permits and regulations.

Sumps, wells, and trenches should lie outside a 1V:1H line extending downward and outward from the edge of the footing. Installation and operation of the Contractor's dewatering system should be integrated with other earthwork operations and foundation construction.

5.3.3 Subgrade Preparation: The subgrade shall be proofrolled with a minimum 4536 kg (10,000 lb), self-propelled, vibratory roller to compact soils disturbed by excavation, and provide a firm, stable subgrade. Wet subgrade soils shall be proofrolled without vibration. Areas exhibiting excessive weaving, soft, or unstable soils should be excavated and replaced with compacted Granular Backfill for Structures (VTrans' pay item 704.08) in the area of the abutments and Granular Borrow (VTrans' pay item 703.04A) in the embankments. In areas of steep terrain, the subgrade should be stripped, benched, and proofrolled to provide a level surface on which to proofroll and place fill.

5.3.4 Placement and Compaction of Soils: Fills should be placed systematically in horizontal layers not more than 300 mm in thickness, prior to compaction. Cobbles larger than 200 mm should be removed from the fill prior to placement. Compaction equipment should preferably consist of large, self-propelled vibratory rollers. Where hand-guided equipment (such as a small vibratory plate compactor) is used, the loose lift thickness shall not exceed 150 mm. Cobbles larger than 102 mm should be removed from the fill prior to placement.

General embankment fills should be compacted to a dry density of at least 90% of the maximum dry density determined in accordance with AASHTO T 99. Granular Backfill for Structures, or other select materials placed within the roadway base section shall be compacted to a dry density of 95% of the maximum dry density determined in accordance with AASHTO T-99.

6.0 RECOMMENDATIONS:

6.1 Shallow Foundation Design: The maximum allowable bearing capacities for footing widths 1.83, 2.44, 3.05, 3.66, 4.27, and 4.88 meters were calculated to be 202, 228, 253, 279, 305, and 331 kPa, respectively. Based on the maximum allowable bearing capacities, the total expected settlement was calculated to be 9, 11, 13, 14, 15, and 16 mm for footing widths of 1.83, 2.44, 3.05, 3.66, 4.27, and 4.88 meters, respectively. These calculations are based on the geometric and geotechnical assumptions outlined in Section 5.1.1.1. Settlement is expected to occur during and immediately after construction.

It is recommended that the Soils and Foundations Unit be called to inspect the bearing surface prior to setting the footings to ensure that the surface has been satisfactorily compacted, stable, dry, and free of voids.

6.2 Design Parameters: Table 6 highlights the geotechnical design parameters of the foundation bearing soil as well as regularly specified aggregates. These values should be used when designing the substructure units. It is recommended that values of K_o be used for calculating earth pressures where the structure is not allowed to deflect longitudinally, away from or into the retained soil mass. Values for K_a should be utilized for an active earth pressure condition where the structure is moving away from the soil mass and K_p where the structure is moving toward the soil mass.

Engineering Properties of Construction Materials	703.03A - Sand Borrow	704.08 - Granular Backfill for Structures	Very Dense Sandy Silt
Density, kN/m^3 :	20.4	22	20.4
Internal Friction Angle, φ, in degrees:	32	35	35
Coefficient of Friction, f,			
- concrete cast against soil:	0.35	0.55	0.30
- soil against formed concrete:	0.3	0.4	0.25
Active Earth Pressure Coefficient, K_a:	0.31	0.27	0.27
Passive Earth Pressure Coefficient, K_p:	3.25	3.69	3.69
At-Rest Earth Pressure Coefficient, K_o:	0.47	0.43	0.43

Table 6: Engineering Properties of Construction Materials

7.0 CONCLUSION: This report has been prepared for specific application to the replacement of Bridge 24 on VT 106 over Kendron Brook in Woodstock, VT.

If you would like to discuss this report or have any other questions, please contact me at (802) 828-6924. Typed boring logs are attached and are available in the CADD design file:

Projectwise/Woodstock BRS 0151(8)/Materials and Research/b1.dgn
Projectwise/Woodstock BRS 0151(8)/Materials and Research/b4.dgn
Projectwise/Woodstock BRS 0151(8)/Materials and Research/b202.dgn
Projectwise/Woodstock BRS 0151(8)/Materials and Research/b203.dgn

Enclosures: Boring Logs – 2 pages
Geologist's Reports – 2 pages

CAA/CCB/caa

cc: Read File/DHL
Project File/CCB
CAA
C.F.

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

BORING NUMBER: B-1
SHEET 1 of 1
DATE STARTED: 7/18/86
DATE COMPLETED:

PROJECT NAME: WOODSTOCK
SITE NAME: BR 24
STATION: 0+248.014
OFFSET: -3.22

PROJECT NUMBER: BRS 0151(8)S
SITE NUMBER: VT 106
GROUND ELEVATION: 300.11 m
GROUNDWATER DEPTH:

BORING CREW
CREW CHIEF: WILLIS
DRILLER: WILLIS
LOGGER: UNKNOWN

BORING RIG: UNKNOWN
BORING TYPE: WASH BORE
SAMPLE TYPE: SPLIT BARREL
CHECKED BY: CAA

DEPTH (m)	SYMBOL	CLASSIFICATION OF MATERIALS (Description)	BLOWS PER 300mm	M.C. (%)	GRAVEL (%)	SAND (%)	FINES (%)
1							
		No Sample, 1.50 m - 2.10 m					
2							
3		A-2-4, SiSa, brn, Moist	R				
4							
		A-4, Si HP, gry, Moist	R	8.7			
5							
6		A-4, SaSi, gry, Moist	R	8.7			
7							
		A-4, SaSi, gry, Moist	R	10.6			
8							
9		A-4, SaSi, gry, Moist	R	10.1			
		Hole stopped @ 9.40 m					
10		DRILLER'S NOTES: Hole stopped in Sandy Silt, HP.					
11							

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

BORING NUMBER: B-4
SHEET 1 of 1
DATE STARTED: 7/16/86
DATE COMPLETED:

PROJECT NAME: WOODSTOCK
SITE NAME: BR 24
STATION: 0+270.885
OFFSET: 9.67

PROJECT NUMBER: BRS 0151(8)S
SITE NUMBER: VT 106
GROUND ELEVATION: 297.70 m
GROUNDWATER DEPTH:

BORING CREW
CREW CHIEF: WILLIS
DRILLER: WILLIS
LOGGER: UNKNOWN

BORING RIG: UNKNOWN
BORING TYPE: WASH BORE
SAMPLE TYPE: SPLIT BARREL
CHECKED BY: CAA

DEPTH (m)	SYMBOL	CLASSIFICATION OF MATERIALS (Description)	BLOWS PER 300mm	M.C. (%)	GRAVEL (%)	SAND (%)	FINES (%)
1							
		A-2-4, SiGr HP, gry, Moist	R	11.1			
2							
3		A-4, SaSi HP, gry, Moist, Hit Boulder	R	10.2			
4		AXMDC, HP & Boulder, 3.80 m - 5.30 m					
5							
6		A-4, SaSi HP, gry, Moist	R	5.7			
		BX, Boulder, 6.20 m - 6.50 m					
		AXMDC, HP & Boulder, 6.50 m - 8.00 m					
7							
8		Hole stopped @ 8.00 m					
9		DRILLER'S NOTES: Hole stopped in HP & Boulders.					
10							
11							

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

BORING NUMBER: B-203
SHEET 1 of 1
DATE STARTED: 12/07/04
DATE COMPLETED: 12/13/04

PROJECT NAME: WOODSTOCK
SITE NAME: BR 24
STATION: 0+261.000
OFFSET: -6.56

PROJECT NUMBER: BRS 0151(8)S
SITE NUMBER: VT 106
GROUND ELEVATION: 299.21 m
GROUNDWATER DEPTH:

BORING CREW
CREW CHIEF: GARROW
DRILLER: GARROW
LOGGER: PUALWAN

BORING RIG: SMALL SKID RIG
BORING TYPE: WASH BORE
SAMPLE TYPE: SPLIT BARREL
CHECKED BY: CAA

DEPTH (m)	SYMBOL	CLASSIFICATION OF MATERIALS (Description)	BLOWS PER 300mm / RUN	M.C (%) / REC (%)	GRAVEL (%) / RQD (%)	SAND (%) / Dip (deg)	FINES (%) / Drill Rate (min/0.3m)
1							
2		A-2-4, SiSa, gry-brn, Moist, Rec. = 0.15 m	16	17.7	17.7	54.8	27.5
		2.10 m - 3.00 m, BXDC, Cleaned out casing					
3		A-2-4, SiSaGr HP, gry, Moist, Rec. = 0.13 m	R	7.2	36.8	33.8	29.4
4		4.11 m - 4.50 m, BXDC, Cleaned out casing					
5		A-4, GrSaSi HP, gry, Moist, Rec. = 0.30 m	R	8.6	24.6	30.5	44.9
6		5.70 m - 6.00 m, BXDC, Cleaned out casing					
		A-4, SaSi HP, gry, Moist, Rec. = 0.43 m	R	9.6	16.4	39.9	43.7
7		7.14 m - 7.50 m, BXDC, Cleaned out casing					
8		A-4, SaSi HP, gry, Moist, Rec. = 0.54 m	R	9.3	14.3	34.4	51.3
9		8.64 m - 9.00 m, BXDC, Cleaned out casing					
		A-4, SaSi HP, gry, Moist, Rec. = 0.15 m	R	9.4	14.5	35.9	49.6
10		10.11 m - 10.53 m, BXDC, Cored ahead & broke through					
11		A-4, SaSi HP, gry, Moist, Rec. = 0.45 m	R	9.3	12.3	35.2	52.5
				Top of Bedrock @ 11.73 m			
12		Gray, Phyllitic quartz-biotite schist, Competency fair, Moderately hard, Slightly weathered, BXDC, 11.73 m - 12.33 m, Rec. = 0.33 m	1	55	0	20	12 13
13		Gray, Phyllitic quartz-biotite schist, Competent., Moderately hard, Unweathered, BXMDC, 12.33 m - 13.83 m, Rec. = 1.41 m	2	94	46	20	5 6 9 7 8
14		Gray, Phyllitic quartz-biotite schist, Competent., Moderately hard, Unweathered, BXMDC, 13.83 m - 15.06 m, Rec. = 0.90 m	3	73	69	20	12 11 15 22
15		Hole stopped @ 15.06 m					
16		DRILLER'S NOTES: Hole was moved 3.50m left, because of power pole obstruction. No Groundwater Depth. Hole caved in.					

LOG OF BORING WOODSTOCK BRS0151(8)S.GPJ VT AOT GDT 1/21/05

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

BORING NUMBER: B-202
SHEET 1 of 1
DATE STARTED: 11/23/04
DATE COMPLETED: 11/30/04

PROJECT NAME: WOODSTOCK
SITE NAME: BR 24
STATION: 0+254.000
OFFSET: 3.65

PROJECT NUMBER: BRS 0151(8)S
SITE NUMBER: VT 106
GROUND ELEVATION: 300.23 m
GROUNDWATER DEPTH:

BORING CREW
CREW CHIEF: GARROW
DRILLER: GARROW
LOGGER: PUALWAN

BORING RIG: SMALL SKID RIG
BORING TYPE: WASH BORE
SAMPLE TYPE: SPLIT BARREL
CHECKED BY: CAA

DEPTH (m)	SYMBOL	CLASSIFICATION OF MATERIALS (Description)	BLOWS PER 300mm / RUN	M.C. (%) / REC (%)	GRAVEL (%) / RQD (%)	SAND (%) / Dip (deg)	FINES (%) / Drill Rate (min/0.3m)
1							
2		A-2-4, SiSa, Dk/brn, Moist, Rec. = 0.21 m	3	22.7	15.8	51.5	32.7
3		A-4, SaSi, gry-brn, Moist, Rec. = 0.10 m	19	13.3	17.1	36.6	46.3
		A-1-b, SaGr, gry-brn, Moist, Rec. = 0.24 m		22.0	48.3	41.9	9.8
4		4.20 m - 5.00 m, BXDC, Boulder, Cleaned out casing.					
5		5.00 m - 6.00 m, BXMDC, Boulder, Cored ahead & advanced casing.					
6		A-4, GrSaSi HP, gry, Moist, Rec. = 0.26 m	R	8.6	27.8	31.6	40.6
7							
8		A-4, SaSi HP, gry, Moist, Rec. = 0.27 m	R	9.3	16.5	32.4	51.1
9		A-2-4, SaSiGr, gry, Moist, Rec. = 0.15 m	R	8.1	43.3	24.2	32.5
10							
11		A-1-b, SiSaGr, gry, Moist, Rec. = 0.11 m	R	10.9	44.8	31.0	24.2
				Top of Bedrock @ 11.27 m			
12		Gray, Quartz-biotite schist, Competent, RQD value may be affected by mechanical breakage during drilling., Moderately hard, Unweathered, BXDC, 11.27 m - 12.03 m, Rec. = 0.65 m	1	86	0	10	
13		Gray, Quartz-biotite schist, Competent., Moderately hard, Unweathered, BXMDC, 12.03 m - 13.55 m, Rec. = 1.52 m	2	100	80	10	
14		Gray, Quartz-biotite schist, Competent., Moderately hard, Unweathered, BXMDC, 13.55 m - 14.49 m, Rec. = 0.94 m	3	100	80	10	
15		Hole stopped @ 14.49 m					
16		DRILLER'S NOTES: No Groundwater Depth. Hole caved in @ 3.60m.					

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

BORING NUMBER: B-4
SHEET 1 of 1
DATE STARTED: 7/16/86
DATE COMPLETED:

PROJECT NAME: WOODSTOCK
SITE NAME: BR 24
STATION: 0+270.885
OFFSET: 9.67

PROJECT NUMBER: BRS 0151(8)S
SITE NUMBER: VT 106
GROUND ELEVATION: 297.70 m
GROUNDWATER DEPTH:

BORING CREW
CREW CHIEF: WILLIS
DRILLER: WILLIS
LOGGER: UNKNOWN

BORING RIG: UNKNOWN
BORING TYPE: WASH BORE
SAMPLE TYPE: SPLIT BARREL
CHECKED BY: CAA

DEPTH (m)	SYMBOL	CLASSIFICATION OF MATERIALS (Description)	BLOWS PER 300mm	M.C. (%)	GRAVEL (%)	SAND (%)	FINES (%)
1							
		A-2-4, SiGr HP, gry, Moist	R	11.1			
2							
3		A-4, SaSi HP, gry, Moist, Hit Boulder	R	10.2			
4		AXMDC, HP & Boulder, 3.80 m - 5.30 m					
5							
6		A-4, SaSi HP, gry, Moist	R	5.7			
		BX, Boulder, 6.20 m - 6.50 m					
		AXMDC, HP & Boulder, 6.50 m - 8.00 m					
7							
8		Hole stopped @ 8.00 m					
9		DRILLER'S NOTES: Hole stopped in HP & Boulders.					
10							
11							

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

BORING NUMBER: B-1
SHEET 1 of 1
DATE STARTED: 7/18/86
DATE COMPLETED:

PROJECT NAME: WOODSTOCK
SITE NAME: BR 24
STATION: 0+248.014
OFFSET: -3.22

PROJECT NUMBER: BRS 0151(8)S
SITE NUMBER: VT 106
GROUND ELEVATION: 300.11 m
GROUNDWATER DEPTH:

BORING CREW
CREW CHIEF: WILLIS
DRILLER: WILLIS
LOGGER: UNKNOWN

BORING RIG: UNKNOWN
BORING TYPE: WASH BORE
SAMPLE TYPE: SPLIT BARREL
CHECKED BY: CAA

DEPTH (m)	SYMBOL	CLASSIFICATION OF MATERIALS (Description)	BLOWS PER 300mm	M.C. (%)	GRAVEL (%)	SAND (%)	FINES (%)
1							
2		No Sample, 1.50 m - 2.10 m					
3		A-2-4, SiSa, brn, Moist	R				
4							
5		A-4, Si HP, gry, Moist	R	8.7			
6		A-4, SaSi, gry, Moist	R	8.7			
7							
8		A-4, SaSi, gry, Moist	R	10.6			
9		A-4, SaSi, gry, Moist	R	10.1			
		Hole stopped @ 9.40 m					
10		DRILLER'S NOTES: Hole stopped in Sandy Silt, HP.					
11							

CORE BOX: 04-010 DRILLER: GARROW LOGGER: T. Eliassen	STATE OF VERMONT AGENCY OF TRANSPORTATION MATERIALS & RESEARCH ROCK CORE LOG (METRIC)	SHEET 1 of 2 DATE STARTED: DATE COMPLETED: 12/01/04 DATE LOGGED: 12/16/04

PROJECT WOODSTOCK BRS 0151(8)S — BORING NO. B-202

STATION: 0+254 — OFFSET: 5 RT — ELEVATION: _____ — CORE SIZE: BXMDC

TOTAL DEPTH: 14.49 — INTERVAL FROM: 11.27 TO 14.49

DEPTH	RUN	RECOVERY %	RQD %	DIP	SECTION	LITHOLOGIC DESCRIPTION	COMMENTS
11.27							
	1	86	0	10		GRAY QUARTZ-BIOTITE SCHIST. MODERATELY HARD. UNWEATHERED.	COMPETENT RQD VALUE MAY BE AFFECTED BY MECHANICAL BREAKAGE DURING DRILLING
12.03							
	2	100	80	10		GRAY QUARTZ-BIOTITE SCHIST. MODERATELY HARD. UNWEATHERED.	COMPETENT
13.55							
	3	100	80	10		GRAY QUARTZ-BIOTITE SCHIST. MODERATELY HARD. UNWEATHERED.	COMPETENT

RUN 3 CONTINUED ON SHEET 2

CORE BOX: 04-010 DRILLER: GARROW LOGGER: T. Eliassen	STATE OF VERMONT AGENCY OF TRANSPORTATION MATERIALS & RESEARCH ROCK CORE LOG (METRIC)	SHEET 2 of 2 DATE STARTED: DATE COMPLETED: 12/01/04 DATE LOGGED: 12/16/04

PROJECT WOODSTOCK BRS 0151(8)S — BORING NO. B-202

STATION: 0+254 — OFFSET: 5 RT — ELEVATION: _____ — CORE SIZE: BXMDC

TOTAL DEPTH: 14.49 — INTERVAL FROM: 11.27 TO 14.49

DEPTH	RUN	RECOVERY %	RQD %	DIP	SECTION	LITHOLOGIC DESCRIPTION	COMMENTS
14.25							
	3	100	80	10		GRAY QUARTZ-BIOTITE SCHIST. MODERATELY HARD. UNWEATHERED.	COMPETENT
12.03							

CORE BOX: 04-010 DRILLER: GARROW LOGGER: T. Eliassen	STATE OF VERMONT AGENCY OF TRANSPORTATION MATERIALS & RESEARCH ROCK CORE LOG (METRIC)	SHEET 1 of ~~4~~ 1 DATE STARTED: DATE COMPLETED: 12/14/04 DATE LOGGED: 12/16/04

PROJECT WOODSTOCK BRS 0151(8)S — BORING NO. B-203

STATION: 0+261 — OFFSET: 9 LT — ELEVATION: _____ — CORE SIZE: BXMDC

TOTAL DEPTH: 15.06 — INTERVAL FROM: 11.73 TO 15.06

DEPTH	RUN	RECOVERY %	RQD %	DIP	SECTION	LITHOLOGIC DESCRIPTION	COMMENTS
11.73							
12.33	1	55	0	20		GRAY PHYLLITIC QUARTZ-BIOTITE SCHIST. MODERATELY HARD. SLIGHTLY WEATHERED.	COMPETENCY FAIR
13.85	2	~~95~~ 94	46	20		GRAY PHYLLITIC QUARTZ-BIOTITE SCHIST. MODERATELY HARD. UNWEATHERED.	COMPETENT
15.06	3	~~74~~ 73	69	20		GRAY PHYLLITIC QUARTZ-BIOTITE SCHIST. MODERATELY HARD. UNWEATHERED.	COMPETENT

State of Vermont
Agency of Transportation
National Life Building
Drawer 33
Montpelier, VT
05633-5001

VTrans Working to Get You There

Charles Basner, Division Administrator
Federal Highway Administration
P.O. Box 568, Montpelier, Vermont 05601

March 11, 2005

Attn: Mike Canavan, Design & Structures Engineer

Re: Woodstock BRS 0151(8)S CE RE-Evaluation

Dear Mr. Basner:

A Categorical Exclusion (CE) for the above-mentioned program, per 23 CFR 771.117(b)(9), was issued on September 17, 1986 (copy attached). Construction will consist of replacement of Bridge No. 24 and related necessary approach and channel work. The project is located on VT Rte. 106 over Kedron Brook in Woodstock, Vermont.

There have been minor changes in the scope of work and design of this project since the issuance of the original CE. The alignment which was being proposed in 1986 included a typical section consisting of four foot paved shoulders and eleven foot wide lanes. At that time the alignment was being moved slightly to the east of the existing alignment. On March 12, 1986 a 222 hearing was held (transcript attached). The property owners were concerned about the property to be taken, and the widening of the road, but Secretary of Transportation backed continuing with this design. The typical section was later changed to include six foot shoulders so that a two foot part of the shoulder could be left unpaved for horses.

The project got to Preliminary plans in 1990 and a property owners meeting was held on November 16, 1990 followed up by another 502 public hearing on October 3, 1991 (transcript attached). Because of a sight distance problem near one property, an alternative alignment was being considered which would move the line away from that property. The project manager at the time also wanted to consider taking the property in question, but the Right of Way Agent disagreed. The adjacent property owner objected and asked that alignment be moved away from their house. The alignment was changed and in June 4, 1996 another public informational meeting was held (Selectboard Minutes attached). The project at that time included replacement of Bridge 24 and widening of Bridge 25 (due to the line changing significantly from existing, and still not being back on-line by the time it reached Bridge 25). A nearby project was under construction with the same typical and the local residents did not like the width. Local residents demanded that the project be scaled back.

www.aot.state.vt.us
Telecommunications Relay Service 1-800-253-0191

Vermont is an Equal Opportunity Employer

In 1997 our design standards changed from AASHTO Guide for Geometric Design to the Vermont State Standards. In January of 1999 we completed a re-survey, using more modern techniques and metric units. In December 2001, the alignment was moved back close to existing alignment, and the typical section was reduced to include 3.3 meter lanes and 1.2 meter shoulders. The sight distance problem was eliminated because the Vermont State Standards have less stringent requirements for sight distance than do the AASHTO standards and widening of Bridge 25 was also eliminated from the project scope. Another public hearing was held on December 11, 2001. The town and the property owners are happy with the current alignment and work has progressed from there.

After this lengthy public input and numerous scope revisions, the project currently proposed with public support is very close to that originally approved under the 1986 CE. I have enclosed a January 14, 2002 letter from the VAOT Historic Preservation Officer confirming that the Section 106 Clearance issued in 1986 is still valid and is sufficient to clear this project, along with other supporting documents to bring your file up to date on this project.

We request your concurrence that the NEPA determination for the project (CE) remains valid pursuant to 23 CFR 771.117(d)(3) "Bridge Rehabilitation, Reconstruction, Replacement". Please contact Craig DiGiammarino, Environmental Specialist @ 828-3962 if you have any questions or require additional information.

Respectfully,

Richard Tetreault
Director of Program Development

Endorsement to the Vermont Agency of Transportation

Concur: Michael Cannon March 17, 2005
Date

Attachments
cc: Martha Evans-Mongeon, Project Manager
Bill Morse, Chief ROW
Contract Administration
Central Files via JTN
Project File