STATE OF VERMONT
AGENCY OF TRANPORTATION

Scoping Report

FOR

Barton Village BHF 0286(5)
VT ROUTE 16 (TH 2), Bridge 20 Over Crystal Lake Outlet

December 19, 2012

Table of Contents

I. Site Information

Bridge 20 is located in the Village of Barton on a straight segment of VT Route 16 approximately 0.1 miles south of the junction with Elm Street and Water Street. There are houses located on both sides of the bridge along VT 16. The Barton United Church and Barton Grade School are located in the northeast quadrant of the project and The Parsons Restaurant is located in the northwest quadrant of the project. Additionally, there is an old gas station or garage located in the southeast quadrant of the project. 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	Village Major Collector (Class 1 Town Highway)
Bridge Type	2 Span Granite Slab on Loose Stone Abutments
Span Length	2 Spans, each 9 feet long
Year Built	Unknown
Ownership	Town of Barton

Need

Glover Road (TH 2), is a significant route into and out of Barton Village. It is a Town Highway that carries VT 16 through the village. Bridge 20 carries TH 2 across the Crystal Lake Outlet. The following is a list of the deficiencies of Bridge 20 and TH 2 in this location.

1. The granite slabs are only in fair condition. It is not known whether the slabs are continuous over the two spans, or are two single spans. There is a crack in one slab that has been mentioned in Inspection Reports going back to the early 90's. The bridge has an overall Federal Sufficiency Rating of 67.6.

2. The existing aluminum bridge railing is substandard. The approach and transition rails are also substandard.

3. The existing bridge does not meet the hydraulic standard. Scour conditions are unknown.

4. The structural capacity of the granite slabs are unknown.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2015 and 2035.

TRAFFIC DATA	2015	2035
AADT	4100	4300
DHV	540	560
ADTT	340	500
%T	6.5	9.3
%D	51	51

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on an ADT > 2000 and a design speed of 30 mph for Major Collectors.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 5.3	12'/3' (30')	11'/3' (28')	
Bridge Lane and Shoulder Widths	VSS Table 5.3	12'/3' (30')	11'/3' (28')	
Clear Zone Distance	VSS Table 5.5		14' fill / 12' cut	
Banking	VSS Section 5.13	Normal Crown	8% (max)	
Speed		30 mph (Posted)	30 mph (Design)	
Horizontal Alignment	AASHTO 2011Green Book Table 3-10b	R = ∞, Bridge located on a straight segment.	R_{min}=3240'	
Vertical Grade	VSS Table 5.6	Bridge located in transition from (-)1.7972% grade to (-)0.5306% grade	7% (max) for level terrain	
K Values for Vertical Curves	VSS Table 5.1	Bridge located on sag (K = 118)	30 crest / 40 sag	
Vertical Clearance Issues	VSS Section 5.8	None noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 5.1	565'	200'	
Bicycle/Pedestrian Criteria	VSS Table 5.8		2' Shoulder	Table 5.3 governs (3')
Bridge Railing	SM, Ch. 13	Aluminum three rail	TL-2	substandard

Inspection Report Summary

Deck Rating	5 Fair
Superstructure Rating	5 Fair
Substructure Rating	5 Fair
Channel Rating	6 Satisfactory

5/26/2011 – The abutments and piers should be repointed. And the voids between the granite slab units should also be repointed. ~ DCP/FRE

5/18/2009 – Consider pouring a reinforced concrete slab/overlay atop the bridge along with upgraded bridge and approach rail. ~ MJ/DS

Hydraulics

According to the Preliminary Hydraulics Report, the bridge does not meet the hydraulic standard. It is subject to backwater effects from the Barton River, which is approximately 300 ft. downstream of the bridge, so that under flood conditions at or greater than the 10 year storm (Q_{10}), the bridge is subject to complete inundation. However, the waterway was also modeled assuming that it is possible for an isolated storm event to affect the Crystal Lake watershed and not the Barton River watershed, or for a peak runoff to pass Bridge 20 prior to the peak backwater from the Barton River occurring. Based on this assumption, a waterway that would not constrict bank full width would be approximately 45 ft. with a low beam elevation of 853.6.

Utilities

There are overhead utility lines along the east side of the road and bridge. Some lines cross diagonally over the bridge. There is an 8" plastic public water main on the west side, which crosses the stream independently of the bridge. A public gravity sewer line runs along the east side of the bridge and road, and crosses the stream independently of the bridge. There are buried drainage lines in all four quadrants of the bridge site, which carry stormwater from catch basins to the Crystal Lake Outlet.

Right Of Way

The existing 4 rod Right-of-Way is shown on the Layout sheet.

Environmental Resources

The environmental resources present at this project are shown on the layout sheets.

Agricultural:

No areas at the site have been identified as containing agricultural soils.

Archaeological:

No Archaeological Resources have been identified at the site.

Biological:

The only regulated resource identified in this area is the watercourse itself, which provides fish and wildlife habitat. There are no wetlands at the site, nor are there mapped rare, threatened, or endangered species or deer wintering habitat.

Hazardous Materials:

The existing bridge is within a hazardous waste site; identified as Site 20053433 – Redington's Garage. The site is listed as medium priority without any land use restrictions. More investigation into the nature and disposition of the waste site may be warranted. There are a large number of monitoring wells in the area.

Historic:

There are historic properties along Glover Road near the project site, including adjacent historic properties at the SE and NW quadrants. The bridge itself is not historic.

Stormwater:

There are no stormwater related concerns in the project.

II. Maintenance of Traffic

The Vermont Agency of Transportation is in the process of finalizing an Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right of Way, as well as faster construction of projects in the field. One practice that 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 early. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. 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 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 1 Town Highway, it would be the responsibility of the State of Vermont to choose the preferred detour route, and to sign it according to the MUTCD manual.

There is only one route that would be appropriate for a detour at this site. This route has an end-to-end distance of 1.2 miles, and adds approximately 0.4 miles to travel distance. The detour route is as follows:

1. Glover Road (TH 2), to Elm Street (class 2), Park Street (class 3), and Roaring Brook Road (class 2 – over bridge 58), back to Glover Road (TH 2) (1.2 mi end-to-end)

Bridge 58 on Roaring Brook Road is a load restricted bridge. It is assumed that bridge 58 would be repaired or replaced before traffic was detoured onto it. A map of the detour route 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 the project at both the project development phase and the construction phase. This option would not require the need to obtain rights from adjacent property owners for a temporary bridge.

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

Option 2: Temporary Bridge

This is a very small site to attempt to fit in a temporary bridge, and there are difficulties on both sides. On the west side, the temporary bridge would be within a historic property on the north end and would run into the residence on the south end. A downstream temporary bridge would require removal of this residence. If a temporary bridge were constructed upstream of the bridge, a historic property with an active hazardous waste site would be impacted on the south end. The temporary bridge on this side would also land on a church property on the north end.

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 the impacts to historic properties. It is recommended that the hazardous waste area be avoided.

A one-way temporary bridge, with traffic signals, would be appropriate based on the daily traffic volumes. However, because of the village setting and proximity to the intersection to the north, a two lane temporary bridge would be less disruptive. See the Temporary Bridge Layout Sheet in the appendix.

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

Disadvantages: This option would require some Right-of-Way acquisition, which would lengthen the project development phase by a minimum of two years. This option would have adverse impacts to adjacent properties. There would be decreased safety to the workers and to vehicular traffic, because of cars driving near the construction site, and construction vehicles entering and exiting the construction site. This traffic control option would be costly, and time consuming, as construction activities would take a second construction season, in order to set up the temporary bridge.

Option 3: Phased Construction

Phased construction is the maintenance of one lane of two-way traffic on the existing bridge while building one lane at a time of the proposed structure. This allows keeping the road open during construction, while having minimal impacts to adjacent property owners. It also saves the costs associated with a temporary bridge.

The time to develop a project that maintains traffic by phasing is not necessarily any longer than developing a project using an off-site detour, and in fact is shorter than a project using a temporary bridge. However, the construction time can be much longer and more costly due to the need to perform some tasks multiple times. The pace of construction is slower due to a more confined space for the contractor and close proximity of traffic. Safety risks to both construction workers and the public are increased during the increased work duration.

Advantages: Traffic flow can be maintained through the project corridor during construction, with minimum impacts.

Disadvantages: The current traffic volumes for this bridge are quite high, at 4100 AADT. The bridge site is also within a few hundred feet of the intersection of Glover Road with Elm Street and Water Street. In the discussion of temporary bridge, it was noted that a two way temporary would be more appropriate for this site, which is not available with the phasing option. Phased construction would result in a longer, more expensive, and less safe construction project. Due to the horizontal constraints of this project site, phased construction would not be possible at this site without widening the structure, and as such will not be considered further.

III. Alternatives Discussion

The existing roadway and bridge geometry meet the current Vermont State Standards. Deficiencies of the existing bridge include the approach, transition, and bridge rails, the hydraulics through the bridge area, and the unknown structural capacity of the existing structure. The superstructure of this bridge consists of granite planks that span 9-10 ft., between abutments and piers. The geometric properties are known, but the stress limits of the granite are not known and failure modes are not predictable. The condition and pattern of pavement cracking, the voids and gaps in the substructures, the unknowns regarding the superstructure strength, and the steadily increasing loads carried by the bridge, lead to consideration of replacing the superstructure at a minimum.

No Action

This alternative would involve leaving the bridge in its current condition. All bridge components are only in fair condition, so something will have to be done to improve this bridge in the near future. Although the bridge is not in imminent danger of collapse, it will eventually be posted for lower traffic loads. In the interest of safety to the traveling public, the No Action alternative is not recommended.

Superstructure Replacement

This Alternative would include removal of the existing granite planks and intermediate pier, and replacement with a new precast superstructure founded on precast sleeper slabs. A precast superstructure with a relatively low profile, such as voided slabs, would be chosen in order to provide the maximum hydraulic opening possible. The existing laid up stone abutments would remain in place for soil retention, and precast slabs would be placed behind the abutments. The new superstructure would then sit on the slabs. This bridge would have a design life of 30 years.

The existing bridge width meets the current standards, and a superstructure replacement would meet all geometric requirements as set forth in the Vermont State Standards.

Advantages: This alternative would address the structural deficiencies of the existing bridge, with minimum upfront costs.

Disadvantages: There is a constriction of the channel through the existing bridge, which this option does not improve. Additionally, this option would have impacts to the historic properties in the project vicinity.

Maintenance of Traffic: The preferred option here would be an offsite detour.

Full Bridge Replacement

Any new structure will be placed on the existing alignment. The current roadway is on a straight alignment, and as such is the best alignment for the roadway. This alternative would replace the existing bridge with a new precast superstructure as well as a new substructure at the existing location. If a new structure is constructed, the bridge span can be lengthened to match the existing channel width. Hydraulics has recommended an opening of 45 feet, which would result in a bridge that is 28 feet longer than the existing structure. The various considerations under this option include: the bridge width and length, skew, superstructure type and substructure type.

a. Bridge Width

The current rail to rail width is 30 feet. This exceeds the minimum standard of 28 feet. Since a new 80+ year bridge is being proposed, the bridge geometry should meet the minimum standards at the very least. A 30 foot width bridge will be proposed, to match the existing approaches.

b. Bridge Length and Skew

The existing bridge is 23 feet long, and an intermediate pier, and with no skew. This does not match the existing channel. Hydraulics has recommended that the bridge have a minimum clear span of 45 feet. The proposed bridge will have a span of 43 feet; the driveway retaining wall in the southeast quadrant of the project protrudes into the river, and lengthening the bridge past this wall on the south end does not offer any value. The bridge will have no skew to match the natural skew of the channel.

c. Superstructure Type

A precast structure will be the preferred choice, due to decreased construction time. The possible 43' span length bridge types that are most commonly used in Vermont, are voided slabs, steel and composite concrete deck, and NEXT beams. The superstructure should have a maximum depth of 26 inches in order to meet the required low beam elevation for hydraulics. The superstructure type shall be determined at a later time.

d. Substructure Type

There is no visible bedrock in the location of the project. Available information on nearby water wells indicates that the site may be comprised of a mixture of sand and clay, with the possibility of gravel and boulders and bedrock around 20 feet. Borings should be taken at the project site, to determine if the subsurface is conducive for an integral abutment at this location. If it is determined that shallow bedrock is indeed present, and driving piles will be difficult, then the substructure should be reinforced concrete abutments on spread footings. Any rapid construction alternative should have sufficient subsurface information to verify the in-situ conditions.

e. Maintenance of Traffic

An off-site detour would be the only appropriate measure for traffic control at this site.

Advantages: This alternative would be a new structure with an estimated life span of 80 years.

Disadvantages: This alternative would have the highest upfront costs. Additionally, this option would have impacts to the historic properties in the project vicinity.

IV. Alternatives Summary

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

Alternative 1: Superstructure Replacement with Traffic Maintained on Offsite Detour
Alternative 2: New Structure with Traffic Maintained on Offsite Detour

V. Cost Matrix[1]

Barton Village BHF 0286(5)		Do Nothing	Alt 1 Superstructure Replacement Offsite Detour	Alt 2 Full Bridge Replacement Offsite Detour
COST	Bridge Cost	$0	$320,805	$650,438
	Removal of Structure	$0	$45,000	$80,000
	Roadway	$0	$130,373	$213,996
	Maintenance of Traffic	$0	$36,000	$62,500
	Construction Costs	$0	$532,178	$1,006,934
	Construction Engineering + Contingencies	$0	$159,653	$302,080
	Total Construction Costs w CEC	**$0**	**$691,831**	**$1,309,014**
	Preliminary Engineering[2]	**$0**	**$159,653**	**$201,387**
	Right of Way	**$0**	**$0**	**$0**
	Total Project Costs	$0	$851,485	$1,510,400
	Annualized Costs	$0	$28,383	$18,880
TOWN SHARE			$42,574 (5%)	$75,520 (5%)
SCHEDULING	Project Development Duration[3]		3 years	3 years
	Construction Duration		2 months	6 months
	Closure Duration (If Applicable)		2 weeks	4 weeks
ENGINEERING	Typical Section - Roadway (feet)	30'	30'	30'
	Typical Section - Bridge (feet)	3-12-12-3	3-12-12-3	3-12-12-3
	Geometric Design Criteria	No Change	Meets Criteria	Meets Criteria
	Traffic Safety	No Change	Improved	Improved
	Alignment Change	No	No	No
	Bicycle Access	No Change	No Change	No Change
	Hydraulic Performance	No Change	Improved	Improved
	Pedestrian Access	No Change	No Change	No Change
	Utility	No Change	Relocation	Relocation
OTHER	ROW Acquisition	No	No	No
	Road Closure	No	Yes	Yes
	Design Life	<10 years	30 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.

VI. Conclusion

We recommend **Alternative 2**; a full bridge replacement while maintaining traffic on an offsite detour.

Structure:

The annualized cost for a full bridge replacement is less expensive than the superstructure replacement option. Additionally, with a new structure, the bridge span can be lengthened to better match the existing channel width.

A new precast superstructure with a span of 43 feet is recommended. In-situ soil conditions will need to be determined before selecting a substructure type, as shallow bedrock may be present. The design life for this structure is 80 years. Right-of-Way will not need to be obtained for this option.

Care should be taken not to disturb the hazardous waste site more than necessary for the project scope. Disturbance to the site is unavoidable, as the replacement of the abutments is necessary within the next 30 years. The retaining wall in the southeast quadrant will be partially replaced. Care should be taken not to disturb test pits when replacing this wall.

Utilities:

Overhead utilities will need to be relocated. There are stormwater drainage inlets in all four quadrants of the project, which will need to be replaced. Coordination will have to be made regarding the hazardous waste test pits, to ensure minimum disturbance.

Traffic Control:

The recommended method of traffic control is to close the bridge for four weeks, and maintain traffic on an offsite detour. The detour for this project location would add approximately 0.4 miles to the through route, and have an end-to-end distance of 1.2 miles. This detour is dependent on Bridge 58, located on Roaring Brook Road, being replaced or rehabilitated prior to this project.

The option to close the road will have smaller impacts to adjacent properties compared to other traffic maintenance options. Additionally the option to close the road is the least expensive and the safest option.

Project Development duration is typically 2 years when Right-of-Way acquisition is not necessary, however, the Project Development stage for this project will be 3 years. The development stage has been extended in order to advance the replacement of Bridge 58 ahead of this project, and to coordinate possible hazardous waste removal.

VII. Appendices

- Site Pictures
- Town Map
- Bridge Inspection Report
- Hydraulics Memo
- Preliminary Geotechnical Information
- Natural Resources Memo
- Archaeology Memo
- Hazardous Site Information
- Historic Memo
- Stormwater Memo
- Resource ID Completion Memo
- Detour Information
- Plans
  - Proposal
    - Existing Conditions
    - Typical Sections
    - Full Bridge Replacement Layout and Profile
    - Superstructure Replacement Layout and Profile
    - Temporary Bridge Layout Sheets

Northbound Approach

Southbound Approach

Looking South at Bridge Location

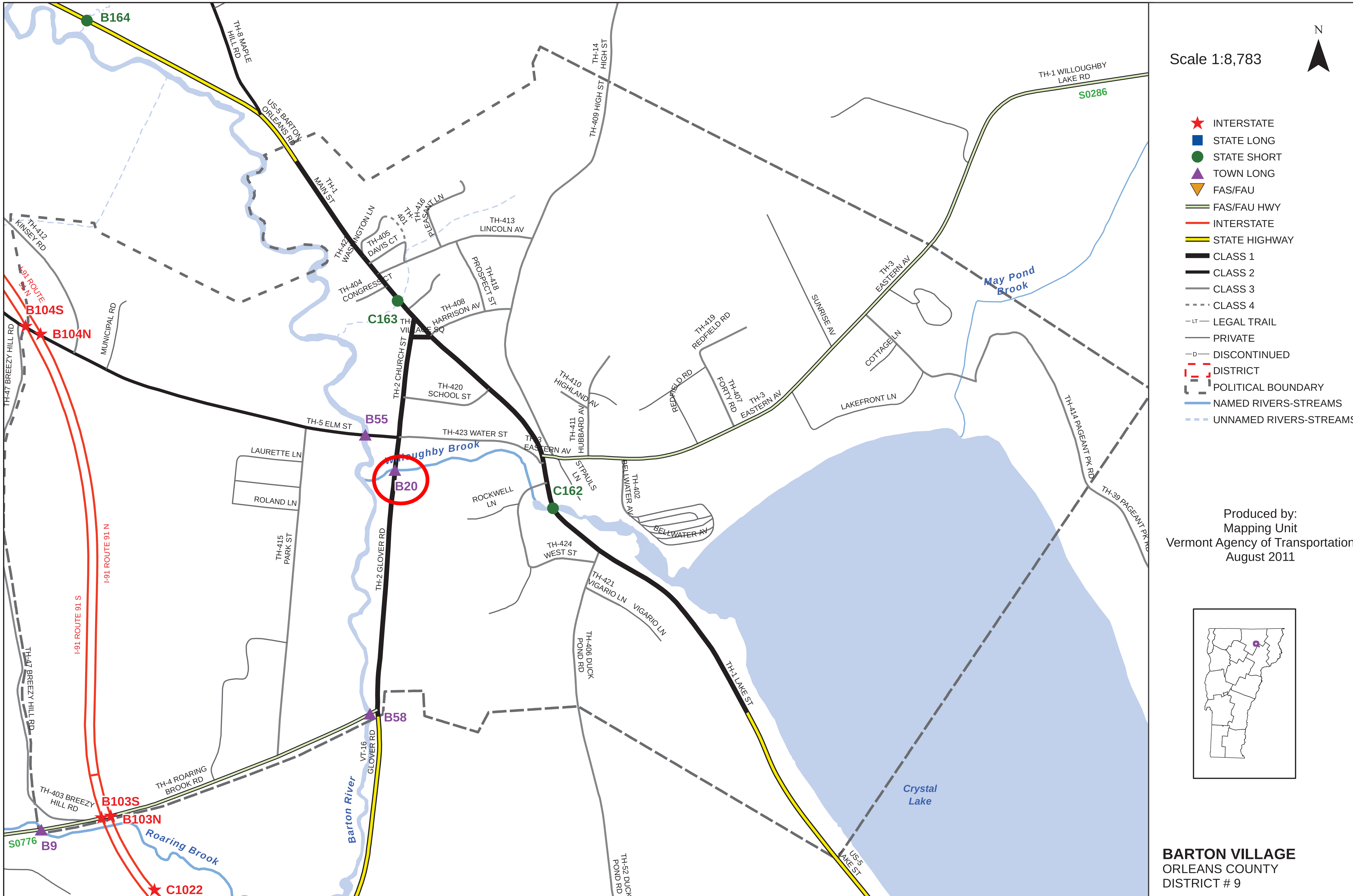
Looking North at Bridge Location

Looking Downstream

Looking Upstream

Pavement Cracking at Bridge Location


Laid-up Stone Abutment



Scale 1:8,783
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
BARTON VILLAGE
ORLEANS COUNTY
DISTRICT # 9
B164
C163
B104S
B104N
B55
B20
C162
B58
B103S
B103N
B9
S0776
C1022
S0286
Willoughby Brook
May Pond Brook
Barton River
Roaring Brook
Crystal Lake

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for BARTON VILLAGE   **bridge no.:** 00020   **District:** 9

Located on: VT 00016 ML   **over** CRYSTAL LAKE OUTL   **approximately** 0.2 MI S JCT. US5   **Owner:** 03 TOWN-OWNED

CONDITION

Deck Rating: 5 FAIR

Superstructure Rating: 5 FAIR

Substructure Rating: 5 FAIR

Channel Rating: 6 SATISFACTORY

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200037002010022

Federal Sufficiency Rating: 67.6

Deficiency Status of Structure: ND

AGE and SERVICE

Year Built: 1919 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): 10

ADT: 003280 % Truck ADT: 10

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0009

Structure Length (ft): 000024

Lt Curb/Sidewalk Width (ft): 0.5

Rt Curb/Sidewalk Width (ft): 0.5

Bridge Rdwy Width Curb-to-Curb (ft): 30.9

Deck Width Out-to-Out (ft): 32.5

Appr. Roadway Width (ft): 030

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 GRANITE SLAB

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

Kind of Material and/or Design: 8 MASONRY

Deck Structure Type: 9 OTHER

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane 8 UNKNOWN

Deck Protection: 8 UNKNOWN

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: 5 BETTER THAN MINIMUM TOLERABLE CRITERIA

Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal: N NOT APPLICABLE

Waterway Adequacy: 6 OCCASIONAL OVERTOPPING OF ROADWAY WITH INSIGNIFICANT TRAFFIC DELAYS

Approach Roadway Alignment: 8 EQUAL TO DESIRABLE CRITERIA

Scour Critical Bridges: U UNKNOWN FOUNDATION

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): 5 NO RATING ANALYSIS PERFORMED

Posting Status: A OPEN, NO RESTRICTION

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 01 NO LOAD POSTING SIGNS EXIST NEAR BRIDGE

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

5/26/2011 The abutments and piers should be repointed. And the voids between the granite slab units shuld also be repointed. ~DCP/FRE

05/18/2009 - Consider pouring a reinforced concrete slab/overlay atop the bridge along with upgraded bridge and approach rail. - MJ/DS

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Chris Williams, Structures Project Manager

FROM: Brian Bennett, Hydraulics Project Engineer (McFarland Johnson)
via Nick Wark, VTrans Hydraulic Engineer

DATE: October 25, 2012

SUBJECT: BARTON – BHF-0286(5) – VT 16 Bridge 20 over Outlet to Crystal Lake

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

Existing Bridge Information

The original bridge was constructed in 1919 based on available information. The bridge is owned by the Town, but on a State designated route. The bridge is a 2-lane 2-span granite-slab bridge having a center pier constructed of dry-laid stone masonry with an asphalt pavement surface on the deck. The total width of bridge is approximately 32.5 feet normal to the roadway. The total span for the structure between the abutment faces is approximately 20.5 feet with the center pier having a width of approximately 4 feet which creates a clear span between the center pier and abutment faces of approximately 8.75 feet for each span. The existing bridge is normal to the river at this location. The total existing superstructure depth is approximately 2.5 feet based field measurements. The existing abutments are also constructed of dry laid stone masonry with unknown foundations. These abutments are basically parallel with the stream channel at this location. The approximate maximum height to the bottom of the superstructure to the streambed varies but is approximately 7 feet on the upstream side. The structure is located on an incised channel having a sandy-gravelly streambed with some small stones. The bridge is located on the Outlet to Crystal Lake at approximately 300 feet upstream of its confluence of the Barton River. The bridge site is located in the floodplain of the Barton River and its backwater effects during flooding events. Thus, the flood stages at this bridge site are governed by the Barton River hydraulics. Based on this condition, the bridge will be completely inundated for the Q_{10} storm event and all larger events based on published FEMA data. The existing bridge does not meet the hydraulic standard. Therefore, it will be impractical to anticipate any replacement bridge will be able to meet the hydraulic standard for the Q_{50} design storm event when considering the Barton River under flood conditions.

However for analysis purposes of a replacement bridge, a hydraulic condition was considered if the watershed for the Outlet to Crystal Lake experienced hydrologic conditions which were isolated and acted independently from the watershed upstream of the confluence of the Outlet to Crystal Lake to the Barton River. Although this condition is not highly probable, it is not impossible to have an isolated storm event within the Outlet to Crystal Lake watershed and not in upstream Barton River watershed. Also it could also be possible to have the peak flow from the Outlet to Crystal Lake watershed pass through the bridge site prior to the flood stages of the Barton River being at the bridge site. As such, this assumption was used for this hydraulic study. Also, we did not evaluate the scour for the existing conditions or any proposed bridge configurations as part of the preliminary design. Scour calculations will be performed during final hydraulics.

Recommendations

The bridge option selection criteria should be to provide a bridge opening that does not restrict the bank full width, nor provide an unrealistic widening, of the existing channel, or create any worse backwater flooding conditions than the existing conditions. The VANR Bank Full Width (BFW) Equation estimates the width to be approximately 53 feet, but the actual field conditions have varying bank full stream widths within the study reach between 30 to 40 feet.

It has been assumed a replacement structure will be located in the existing roadway alignment having the same basic geometry based on the site constraints. For a replacement structure, we have anticipated that the proposed abutments will be vertical face concrete abutments with 3H:2V sloped stone fill scour protection placed in front of the abutments up approximately 5 feet above the streambed elevation.

Based on our analysis, the recommendation will be to use a replacement bridge having a 45-foot clear span normal to the stream channel (between the abutment faces) with a low beam elevation at or above 853.6 feet with the stone fill protection in front of the abutments. The proposed wider structure will not constrict the stream channel's bank full width from the current BFW conditions. To allow for the wider structure, it is anticipated that the retaining wall on the upstream Left (South) Bank will need to be removed to the existing building and realigned with the new abutment location. This proposed structure will also provide approximately 1.2 feet of freeboard at the Q_{50} design storm event and meet the hydraulic design standard using the Independent Watershed assumption. However as noted above, the proposed structure will not meet the hydraulic standard when the Barton River is under flooding conditions.

As noted above, scour was not reviewed during the preliminary design. However based on the velocities from the analyses, it is anticipated that Type 2 Stone Fill will be necessary for armoring the abutments and disturbed channel banks near the replacement structure. Although stone fill sizing will be verified during final hydraulic design.

Temporary Bridge/Detour

Based on pre-scoping information from the Structures Group, it appears that a temporary bridge will not be used due to the site constraints and there is a short detour option available.

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

BMB

cc: Hydraulics Project File via NJW

Hydraulics Chrono File

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Chris Williams, Project Manager, Structures

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

Date: May 30, 2012

Subject: Barton Village BHF 0286(5) VT 16, Bridge 20 Geotechnical Scoping Report

1.0 Introduction

In an effort to assist the Structures Section with their bridge type study, the Soils and Foundations Unit within the Materials and Research Section has completed a review of available geological data for Bridge 20 on VT 16. Bridge 20, see Figure 1, is a two span structure that crosses over the Barton River in Barton, Vermont. This scoping report includes a review of VTrans record plans and bridge boring files, USDA Natural Resources Conservation soil survey records, surficial geology and bedrock maps of the State and the Agency of Natural Resources' water well logs.

Figure 1: VT 16, Bridge 20 over the Barton River

2.0 Surficial and Bedrock Geology

The Agency of Natural Resources (ANR) documents and publishes all water wells that are drilled for residential or commercial purposes. Published online, the logs can be used to determine general characteristics of soil strata in the area. The soil description given on the logs is performed by field personnel with unknown qualifications, and as such, should only be used as an approximation. Three surrounding well logs were examined for depths to bedrock and soil strata. Well locations are shown in Figure 2 and a summary of the specific wells used to gain information on the subsurface conditions are presented in Table 1. The three closest wells, wells No. 275, 138 and 115 are approximately 1100 ft from the project location while a previous construction project Barton TH2 8924, built in 1992, was approximately 350 ft from the project site. After researching the Agency's Onbase system, VTrans Digital Print Room and Soil & Foundations' project files the boring information for Barton TH2-8924 could not be found Therefore the wells may be interpreted to develop the best estimate of the depth to bedrock and types of soils likely to be encountered on this project.

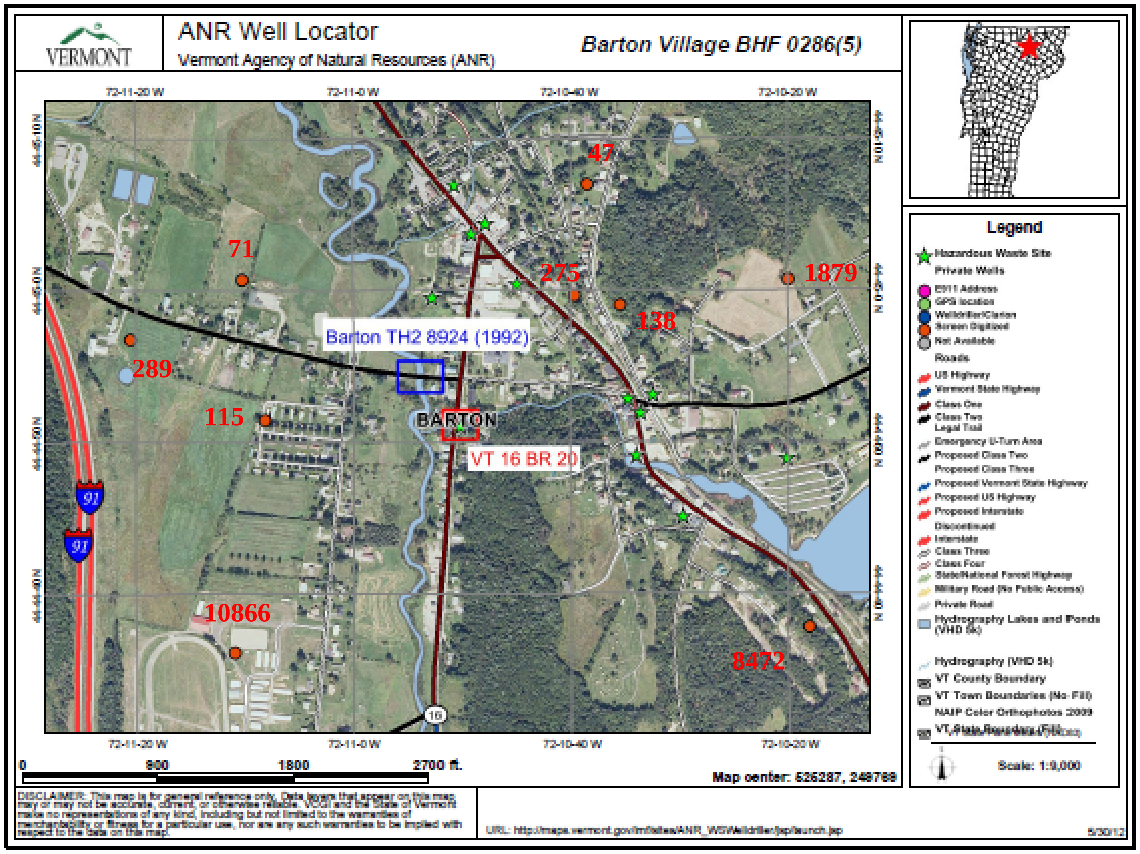

Figure 2: ANR Well Log Locations near Bridge 20, VT 16 in Barton, VT

Well	Overburden Description	Overburden Thickness
47	Sand to 40 ft followed by sandy-clay to depth	114
71	Sand	39
115	Gravel and boulders	13
138	Sand	12
275	Sand and clay	30
289	Sand	25
1879	0-15' Sand : 15'-60' Clay : 60-74' Silt	74
8472	No overburden, drilled hole in rock	0
10866	Glacial till	50

Table 1: Summary of ANR Well Log Data & Well Driller Soil Stratigraphy Notes

Surficial mapping conducted for the 1970 Surficial Geologic Map of Vermont indicates that the subject area is classified as Urban-land-Adams-Nicholville complex 0 to 8% slopes where the landform is likely either an outwash plain or a lake terrace. The surficial soils may be underlain by sandy glaciofluvial deposits.

Although there was no exposed bedrock evident in the area, based on a review of the ANR well logs the project site is bordered by well locations that encountered bedrock within 40 feet of the surface indicating shallow borings and pile lengths if deep foundations are required. Surficial bedrock maps of the area indicate the bedrock is of the Waits River or Gile Mountain formation and likely consists of a combination of phyllite and limestone with some localized deposits of granite (New Hampshire Plutonic Suite) interspersed.

3.0 Hazardous Waste Site

The existing bridge is within a hazardous waste site; identified as Site 20053433 – Redington's Garage. The site is listed as medium priority without any land use restrictions. More investigation into the nature and disposition of the waste site may be warranted. There were a large number of monitoring wells in the area, see Figures 3 and 4.


Figures 3 and 4: Location of Existing Monitoring Wells

4.0 Utility / Traffic Considerations

Power lines exist on the east side of VT 16 and cross the road to service local residents. This bridge is in an urban setting and there are storm drains and outlets in the roadway and adjacent to wingwalls. There are also several monitoring well locations in service to monitor the hazardous waste site.

Figure 5: Roadway Profile / Overhead Utility Locations at BR 20

5.0 Construction Considerations

Advanced or rapid bridge construction methods involving a complete road closure over a shortened time period may be applicable here as there appears to be multiple detour routes around this structure. While access is tight at this location there may be some opportunities for a temporary on the east side of the structure but would necessitate the relocation of the overhead utilities.

6.0 Recommendations

The subsurface investigation should include, but not be limited to, a determination of the soil and bedrock properties (strength, material composition, RQD, etc), ground water conditions and the depth of bedrock. Two borings are recommended to be drilled to completely assess the subsurface conditions at this site. One boring should be located in the ROW at the NW corner behind the wingwall. The second boring should be located 10 to 15 feet behind the abutment and a minimum of 10 feet away from overhead utilities; this will likely place it in the vicinity of the middle of the north bound travel lane. Final recommendations for borings can be provided once an alignment and preliminary structure type have been selected.

There does not appear to be any drilling equipment and/or access limitations, except for the overhead wires and subsurface monitoring wells, at this site. Temporary traffic control, including flaggers, is anticipated to be utilized at this site to maintain a safe work zone.

Although the required superstructure depth may be controlled by hydraulic limitations, consideration should be given to replacing the current two span bridge with a single span structure.

Based on this information, possible foundation options for a bridge replacement include the following:

- Reinforced concrete abutments on spread footings, or
- Precast arch supported on spread footings (may be a good site for the "Bridge in a Backpack structure http://www.maine.gov/mdot/tr/bridgebackpack.htm), or a
- Pile caps on a single row of H-Piles (integral abutment or pinned superstructure).

If you have any questions, please feel free to contact us at (802) 828-2561.

cc: WEA/Read File
CCB/Project File

Ramsey, Jeff

From: Lepore, John
Sent: Friday, April 06, 2012 2:38 PM
To: Ramsey, Jeff; Williams, Chris
Cc: Lepore, John
Subject: Barton Village 0286 (5) - Natural Resource ID

Jeff / Chris,

Per my review of the mapping and a site visit, I've concluded that the only regulated resource in this area is the watercourse itself. If a temporary bridge is constructed, I ask that it span the brook entirely. Better yet would be to close the road and divert traffic around the site using the Fairgrounds Road.

Although the current structure has a center pier, it is desirable to eliminate that and have a simple span which is less likely have debris and scour concerns.

If you have any questions, come see me…

~ John ~

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: Jeff Ramsey, VTrans Environmental Specialist

From: Jeannine Russell, VTrans Archaeology Officer
via Brennan Gauthier, VTrans Assistant Archaeologist

Date: 6/18/2012

Subject: Barton Village BHF 0286(5) – Archaeological Resource ID

I have completed my initial resource identification for Barton Village BHF 0286(5). A field visit conducted on 6/8/2012 as part of the 2012 GPS scoping initiative was adequate to identify potential resources in the project area. There are *no archaeological resources* present in the APE, and likewise no concerns for archaeology.

Please feel free to contact me with any questions or concerns.

~Brennan

Brennan Gauthier
VTrans Assistant Archaeologist
tel. 802-828-3965
Brennan.Gauthier@state.vt.us

VTrans Working to Get You There
Vermont Agency of Transportation

VERMONT Agency of Natural Resources - Environmental Research Tool

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Waste Managem
Hazardous Site
Brownfield Site
Spills
UST
Hazardous Wa
Solid Waste
Water Quality
Stormwater

VT DEC

Hazardous Site List

Help & Definitions

Enter the search criteria below and click the [Search] button when done. (Search will display a maximum of

Site# 20053433

Site Name

Site Town List Towns

Address

Primary Consultant List Consultants

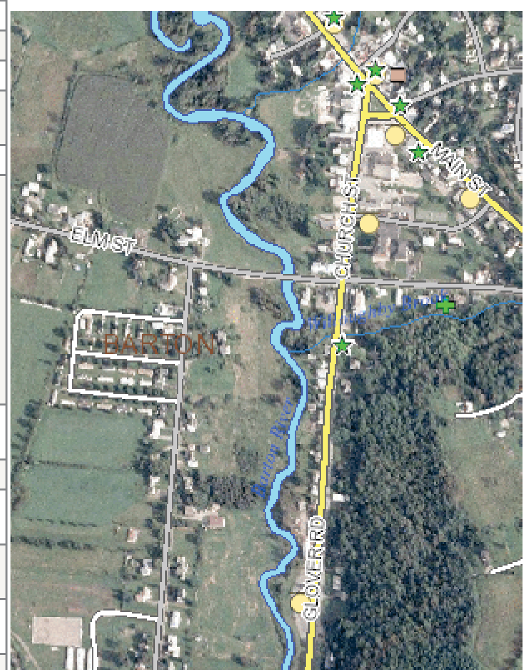
All Sites / Active Sites / Inactive

Priority All

Search

Search Tips

Site Name	Redington Garage
Address	63 Glover Rd
Town	Barton
Site Use	Residential
Site Number	20053433
DEC Manager	Ashley Desmond
Priority	MED - Site with sensitive receptors that are threatened by contamination
Site Status	
Project Status	3 underground storage tanks removed. Contamination found. Ross conducted isi via Expressway. Some groundwater contamination found on neighboring property across Route 16 initially, but this has since receded. Peizometers in the adjacent stream show detectable concentrations of VOCs intermittently (below standards). Semi annual monitoring being conducted to track contaminant levels.
Source of Contamination	UST-Gasoline
Contaminant	Gasoline
Institutional Control	
Site Closure Date	
DEC Contact Email Address	Ashley.Desmond@state.vt.us
View Map	Click to view interactive map
Record Last Updated	04-25-2011
Direct URL	http://www.anr.state.vt.us/wmid/Hazsites.aspx?site=20053433



Online Site Reports

Report
20053433.first.pdf

The documents listed above do not represent a comprehensive list of available site reports. To view additional site files, please schedule a file review by calling 802-241-3888.

Ramsey, Jeff

From: O'Shea, Kaitlin
Sent: Tuesday, June 26, 2012 2:23 PM
To: Ramsey, Jeff; Brady, James; Goldstein, Lee; Gingras, Glenn
Cc: Newman, Scott
Subject: Pilot Scoping Projects - 2012

Hi Jeff, James and Lee,

The historic resource IDs for the remaining pilot scoping projects have been completed, and added to the Historic Preservation geodatabase (in the same manner which Scott and I sent the reclaim resource ID information). I've bookmarked the following projects by "project name – historic." Let me know if there is a better way for me to pass on this information to you.

Barton Village BHF 0286(5)
Calais BHF 037-2(11)
Chelsea BHF 0169(9)
Chelsea BHF 0169(10)
St. Johnsbury BHO 1447(30)

This should complete the historic resource ID for the Chris Williams scoping projects.

Thanks,
Kaitlin

Ramsey, Jeff

From: Armstrong, Jon
Sent: Wednesday, May 23, 2012 10:33 AM
To: Ramsey, Jeff
Subject: RE: Environmental Request NOTIFICATION: BARTON VILLAGE BHF 0286(5)

Jeff,
I have no regulatory stormwater related concerns for this project to offer.

Jonathan B. Armstrong, PE
VTrans Stormwater Management Engineer
(802) 828-1332

"*We forget that the water cycle and the life cycle are one.*"
- Jacques Cousteau

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·.¸·,·.·´`·.. ><((((º>`·.¸¸.·´`·.¸.·´¯`·...><((((º>

From: Ramsey, Jeff
Sent: Tuesday, March 27, 2012 4:51 PM
To: Armstrong, Jon; Gingras, Glenn; Gauthier, Brennan; O'Shea, Kaitlin
Cc: Williams, Chris
Subject: FW: Environmental Request NOTIFICATION: BARTON VILLAGE BHF 0286(5)

Hi all,
This project is one of the Chris Williams Pilot Projects. The entire pilot group will go out to visit a site to work through the process so they all know how to do it and what to look for. That visit will happen in the very near future.

Comments: The resource ID will be conducted by a pilot group under PDWP GIS/GPS work plan. This group is part of the GIS Experimental work plan and is researching innovative ways to streamline the ID process.

Folder Link:
Z:\Projects-Engineering\BartonVillageBHF0286(5)12j172\Environmental\ResourceIDandClearances\ResourceID

Please let me know if you have any questions.
Thanks,
Jeff

Jeff Ramsey
Environmental Specialist - North Region
Vermont Agency of Transportation
Program Development Division
Environmental Section
1 National Life Drive
Montpelier, VT 05633
tel. 802-828-1278
jeff.ramsey@state.vt.us

OFFICE MEMORANDUM

AOT - PROGRAM DEVELOPMENT DIVISION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Chris Williams, Project Manager
FROM: Jeff Ramsey, Environmental Specialist
DATE: June 27, 2012

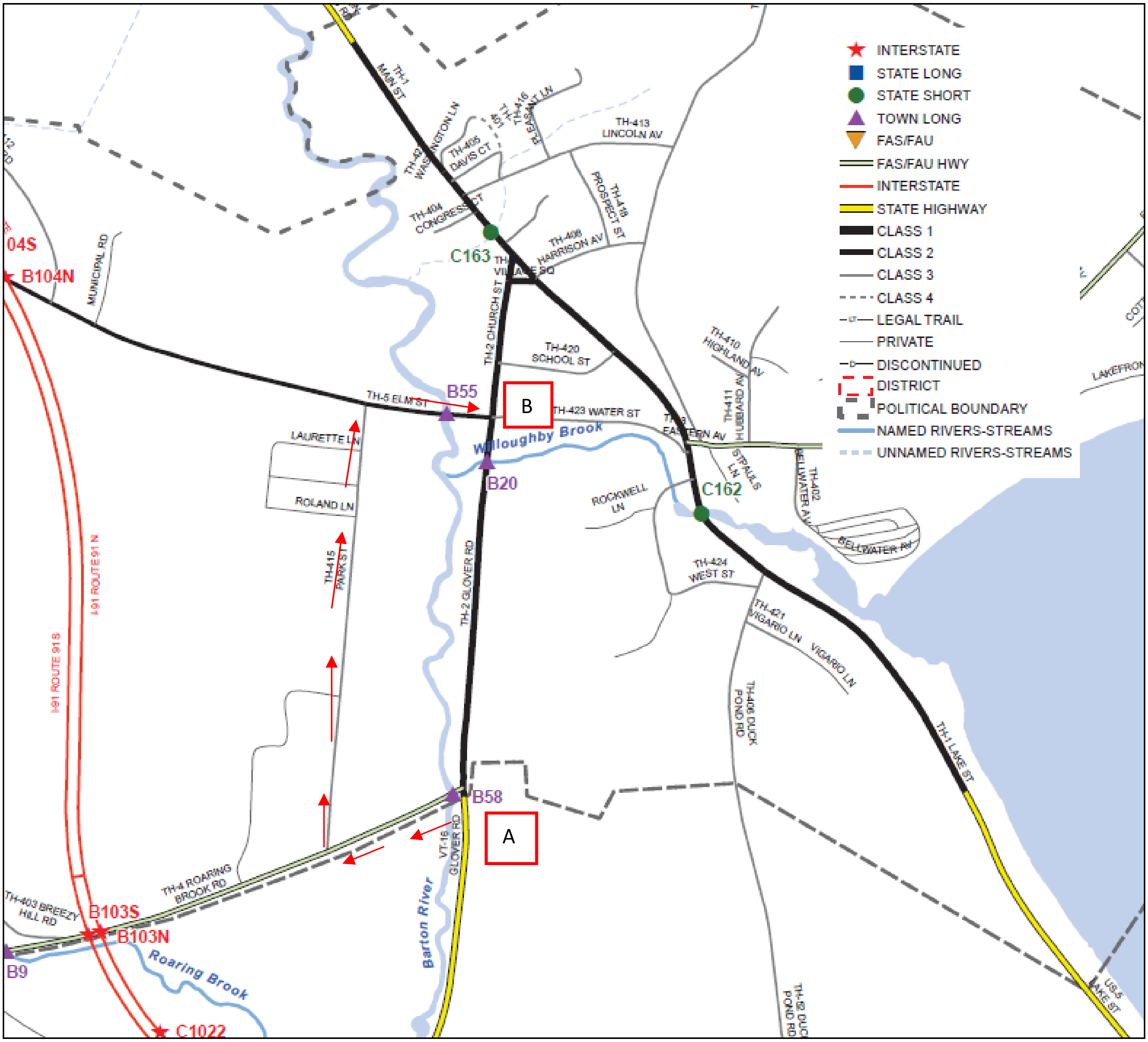
Project: Barton Village BHF 0286 (5)

ENVIRONMENTAL RESOURCES:

Wetlands:	____ Yes	_X_ No	
Historic/Historic District:	_X_ Yes	____ No	see Historic Resource ID
Archaeological Site:	____ Yes	_X_ No	
4(f) Property:	_X_ Yes	____ No	see Historic Resource ID
6(f) Property:	____ Yes	_X_ No	
Agricultural Land:	____ Yes	_X_ No	
Fish & Wildlife Habitat:	_X_ Yes	____ No	See Resource ID Lepore; only the waterway
Endangered Species:	____ Yes	_X_ No	
Hazardous Waste:	_X_ Yes	____ No	Redington Garage, 63 Glover Road – "3 underground storage tanks removed. Contamination found. Ross conducted isi via Expressway. Some groundwater contamination found on neighboring property across Route 16 initially, but this has since receded. Peizometers in the adjacent stream show detectable concentrations of VOCs intermittently (below standards). Semi annual monitoring being conducted to track contaminant levels": Site Number 20053433 [-72.18, 44.748]; Redington Garage Hazardous Site and Redington Garage Location Map
Stormwater:	____ Yes	_X_ No	
USDA-Forest Service Lands:	____ Yes	_X_ No	
Wildlife Habitat Connectivity:	____ Yes	_X_ No	
Scenic Highway/ Byway:	____ Yes	_X_ No	
Act 250 Permits:	____ Yes	_X_ No	

If you have any questions or need additional information please let me know.
Thanks,
Jeff

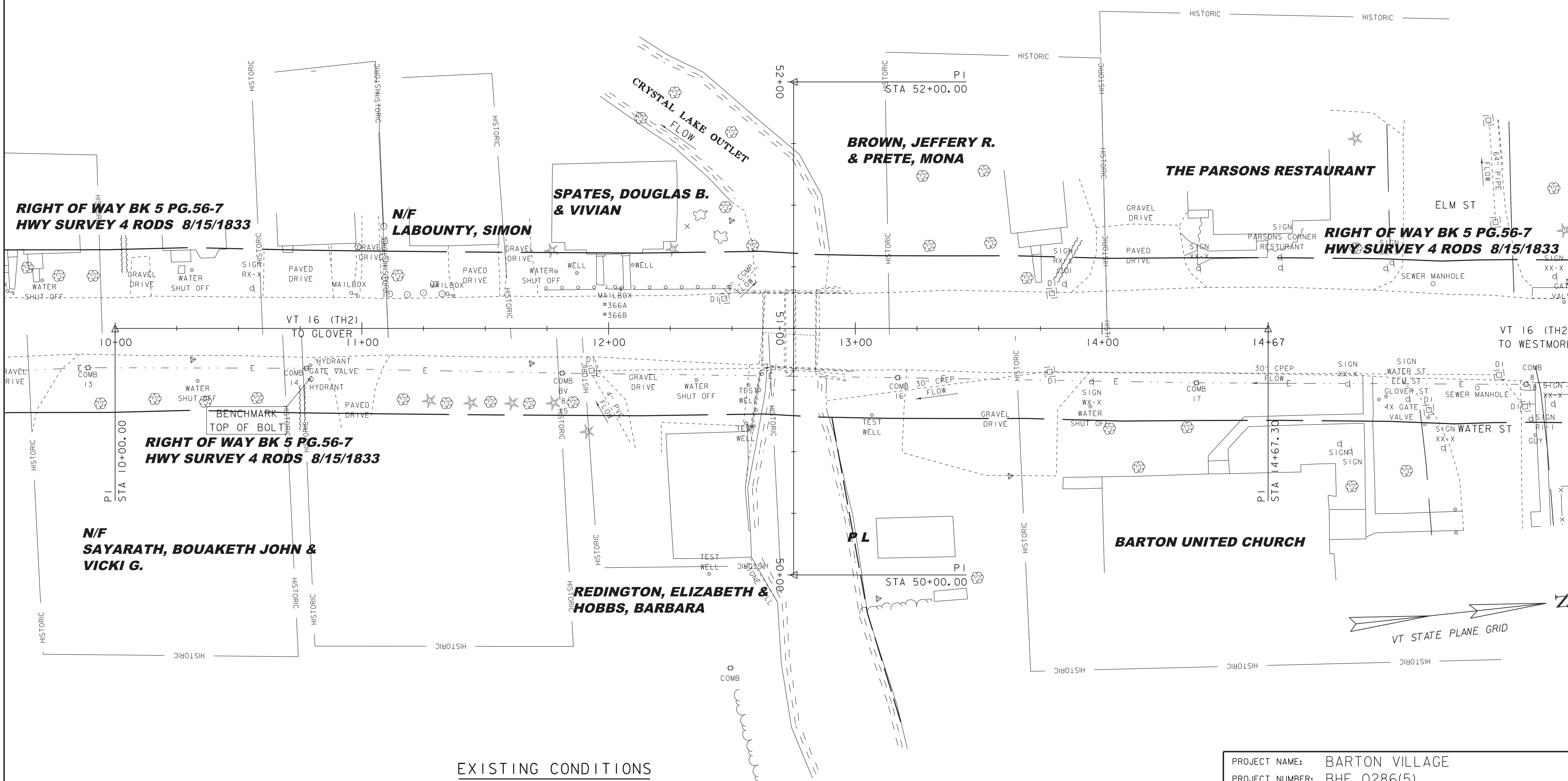
cc:
Project File



Detour Route

Glover Road (TH2), to Elm Street, Park Street, and Roaring Brook Road, back to Glover Road (TH 2)

A – B Through Route: 0.4 Miles
A – B Detour Route: 0.8 Miles
Added Miles: 0.4 Miles
End-End Distance: 1.2 Miles

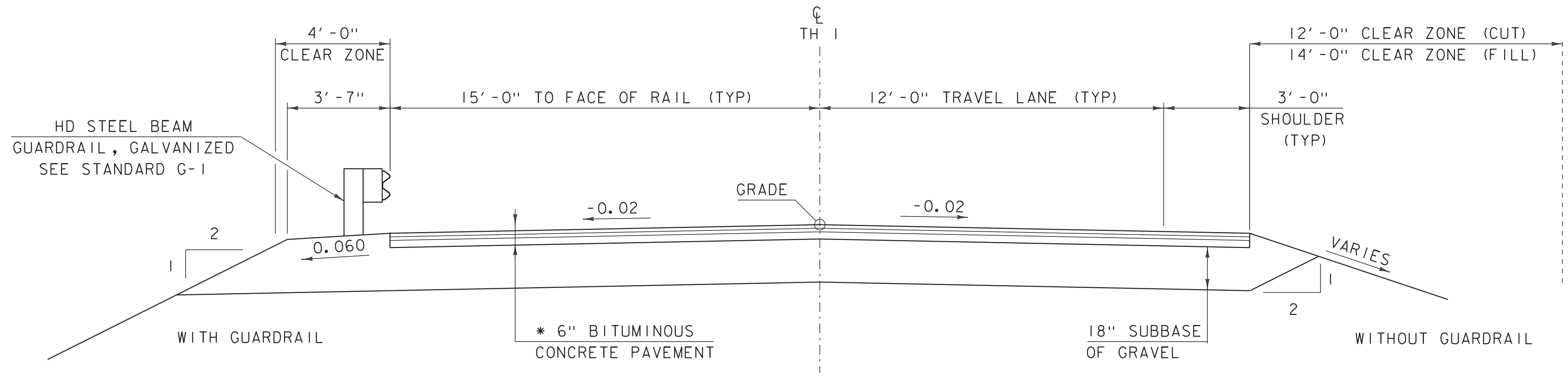


EXISTING CONDITIONS

SCALE 1" = 20'-0"

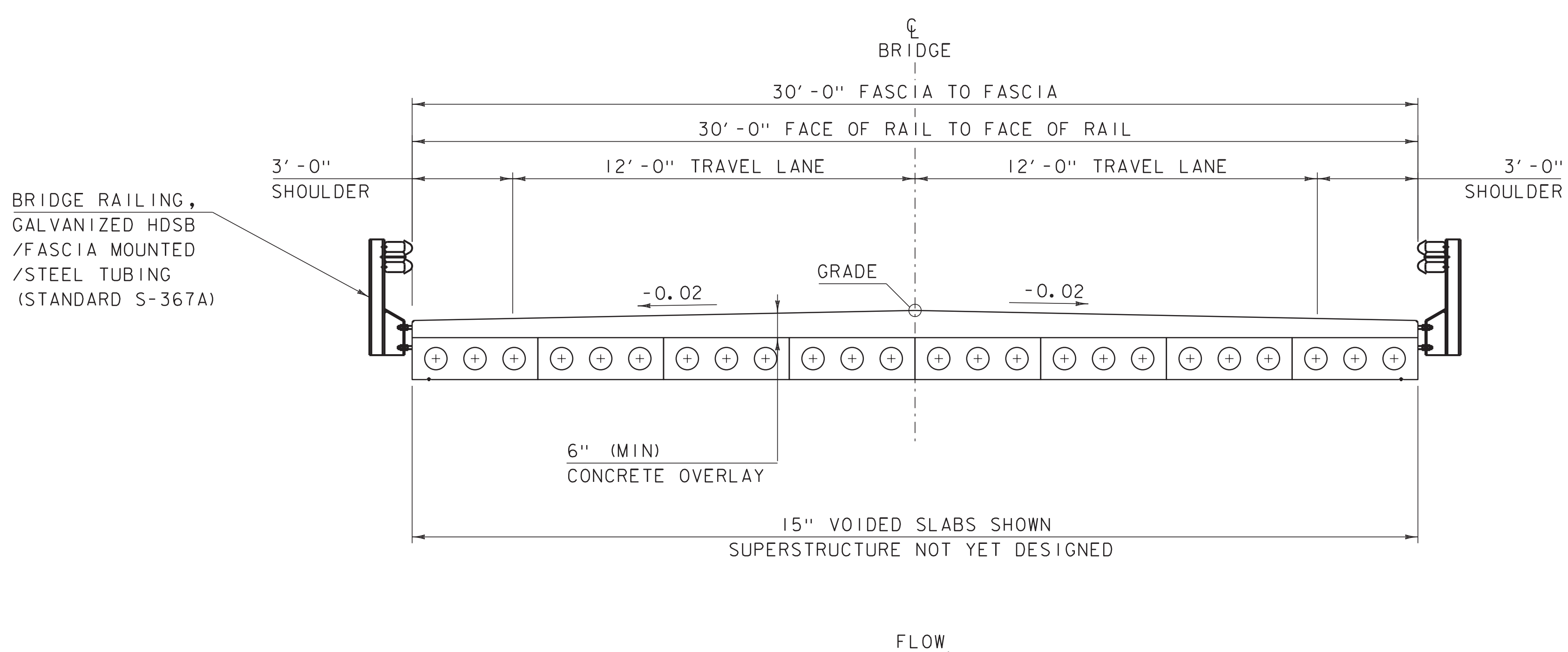
20 0 20

PROJECT NAME: BARTON VILLAGE	
PROJECT NUMBER: BHF 0286(5)	
FILE NAME: 12j172\s12j172bdr.dgn	PLOT DATE: 17-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 1 OF 8



TH 1 TYPICAL ROADWAY SECTION

SCALE 3/8" = 1'-0"



PROPOSED BRIDGE TYPICAL SECTION

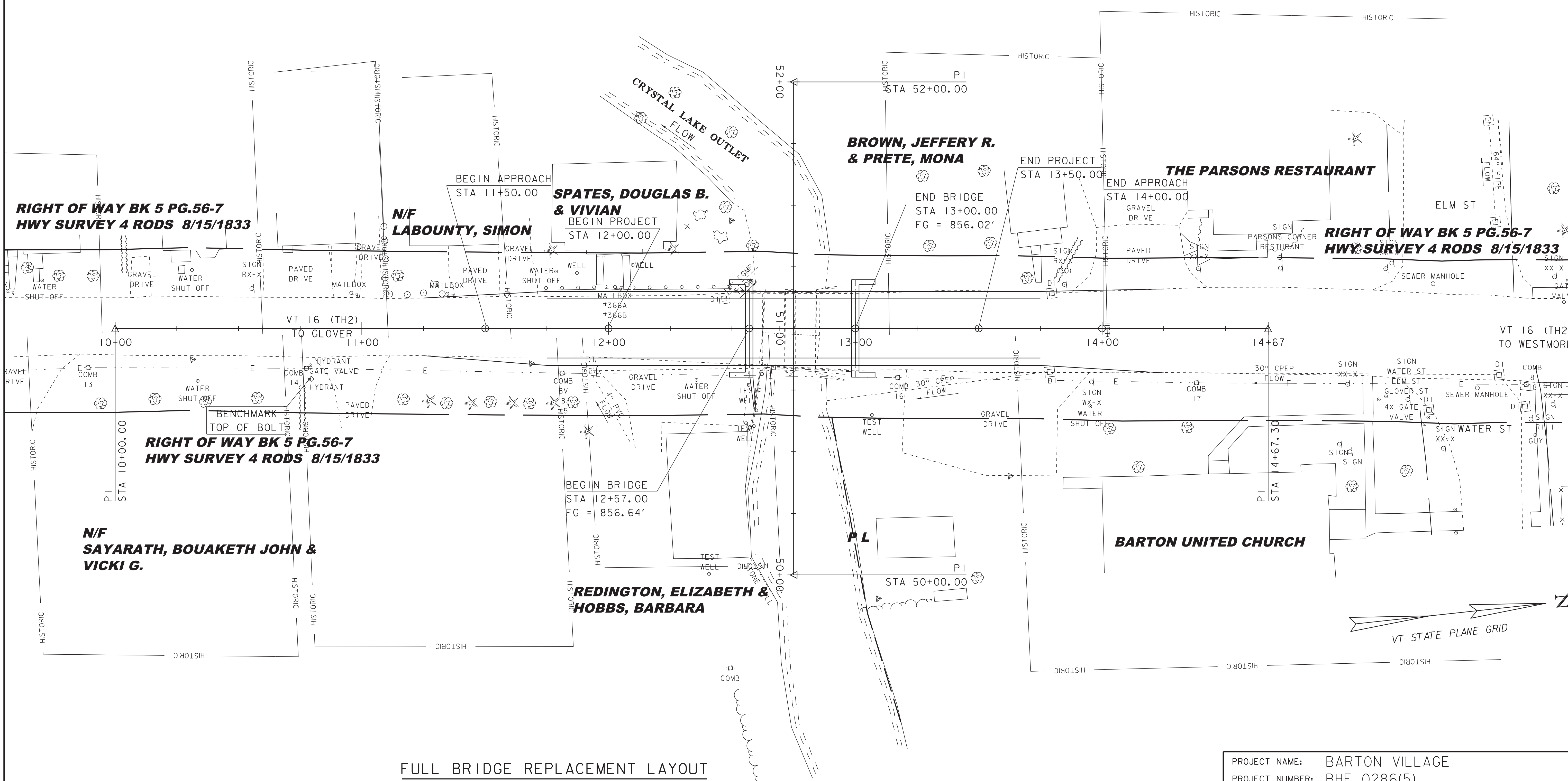
SCALE 3/8" = 1'-0"

MATERIAL TOLERANCES

(IF USED ON PROJECT)

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

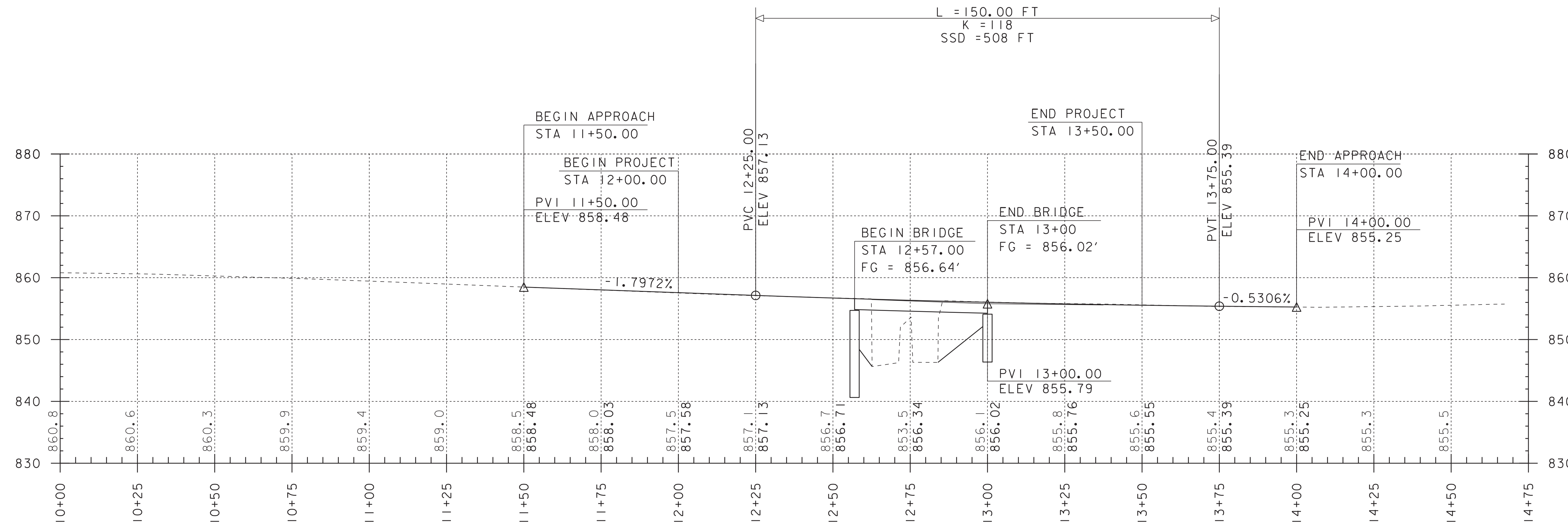
PROJECT NAME: BARTON VILLAGE	
PROJECT NUMBER: BHF 0286(5)	
FILE NAME: 12j172\s12j172typ.dgn	PLOT DATE: 17-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: L.J.STONE	CHECKED BY: ------
TYPICAL SECTIONS	SHEET 2 OF 8



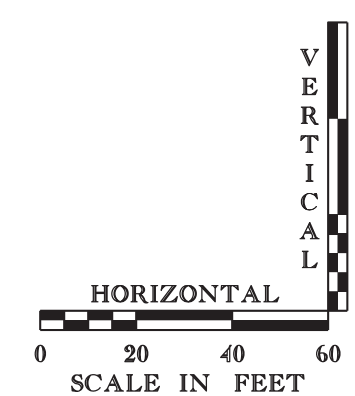
FULL BRIDGE REPLACEMENT LAYOUT

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

PROJECT NAME:	BARTON VILLAGE
PROJECT NUMBER:	BHF 0286(5)
FILE NAME: l2jl72\sl2jl72bdr.dgn	PLOT DATE: 17-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 3 OF 8



VT RT 16 PROFILE FOR FULL BRIDGE REPLACEMENT

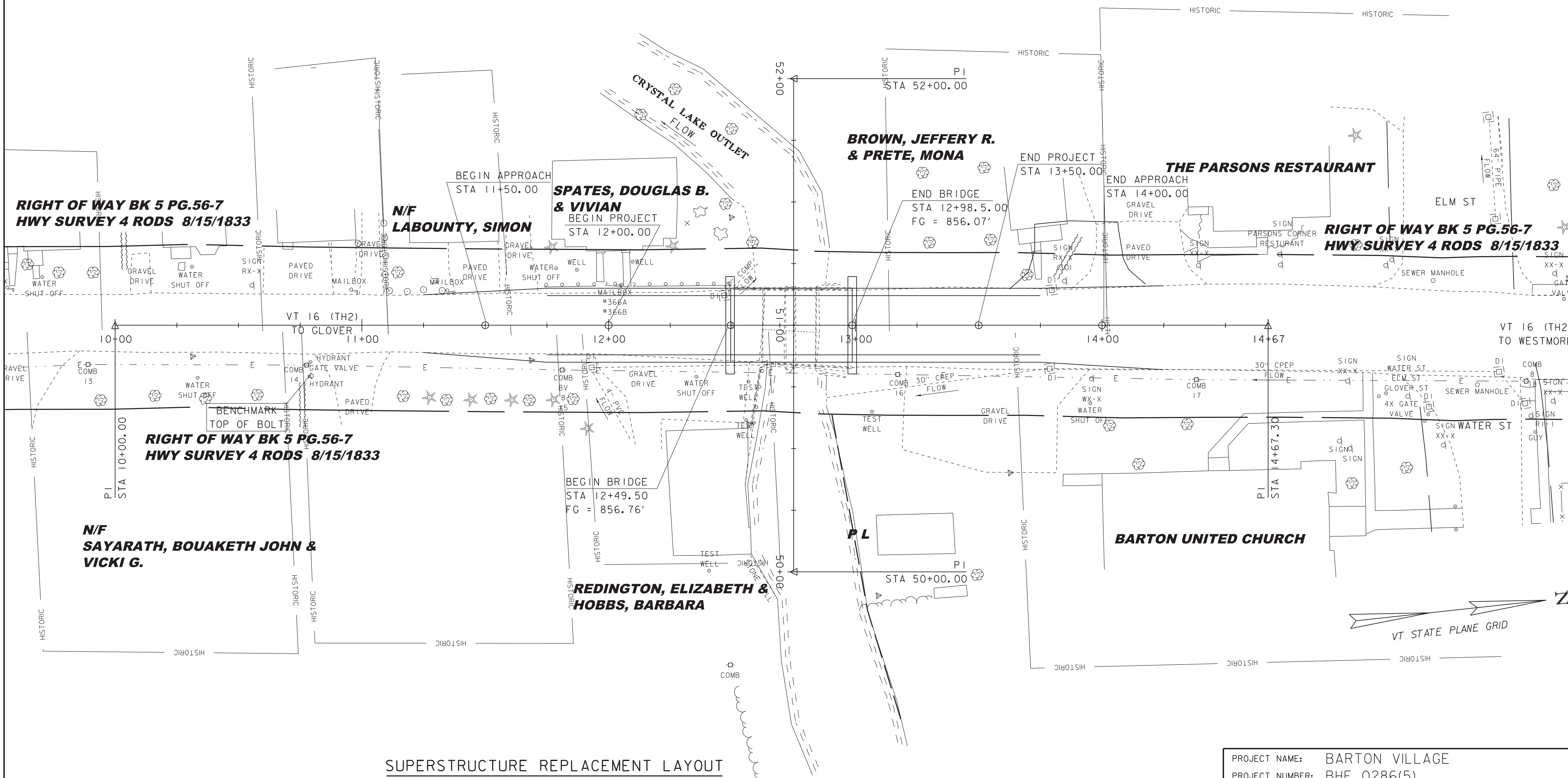


NOTE:

GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: BARTON VILLAGE	
PROJECT NUMBER: BHF 0286(5)	
FILE NAME: 12j172/s12j172profile.dgn	PLOT DATE: 17-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: ------	CHECKED BY: ------
PROFILE SHEET	SHEET 4 OF 8

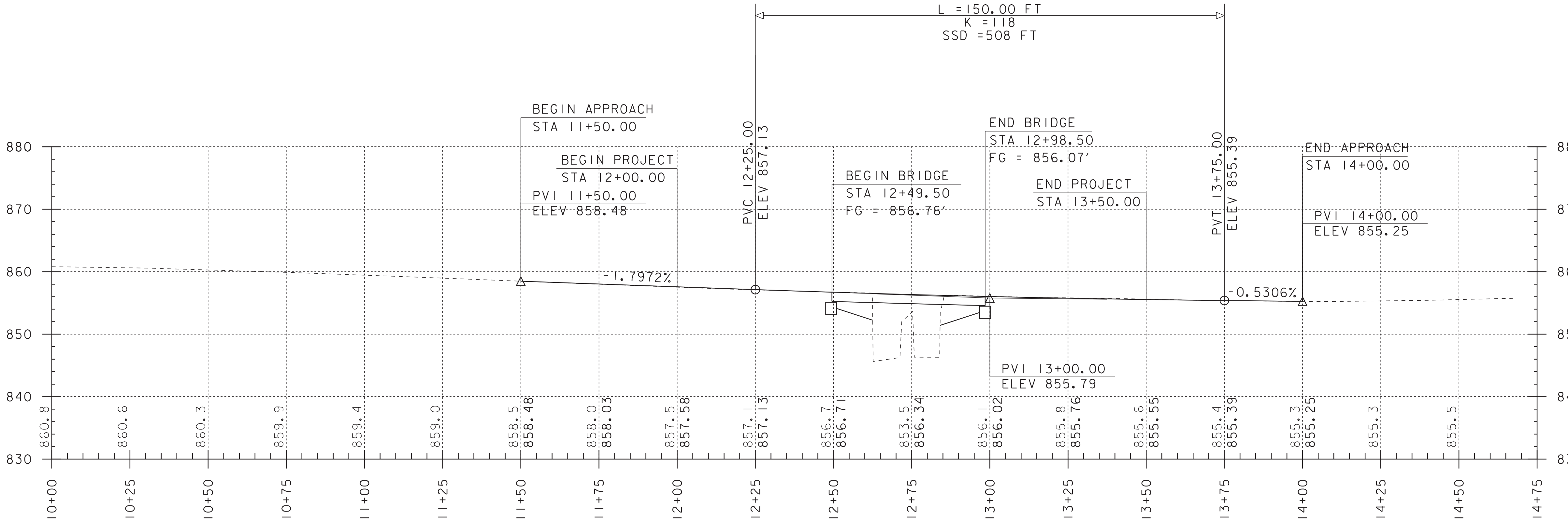


SUPERSTRUCTURE REPLACEMENT LAYOUT

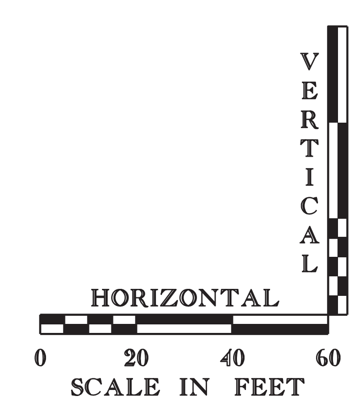
SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: BARTON VILLAGE	
PROJECT NUMBER: BHF 0286(5)	
FILE NAME: 12j172\s12j172bdr.dgn	PLOT DATE: 17-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 5 OF 8



VT RT 16 PROFILE FOR SUPERSTRUCTURE REPLACEMENT

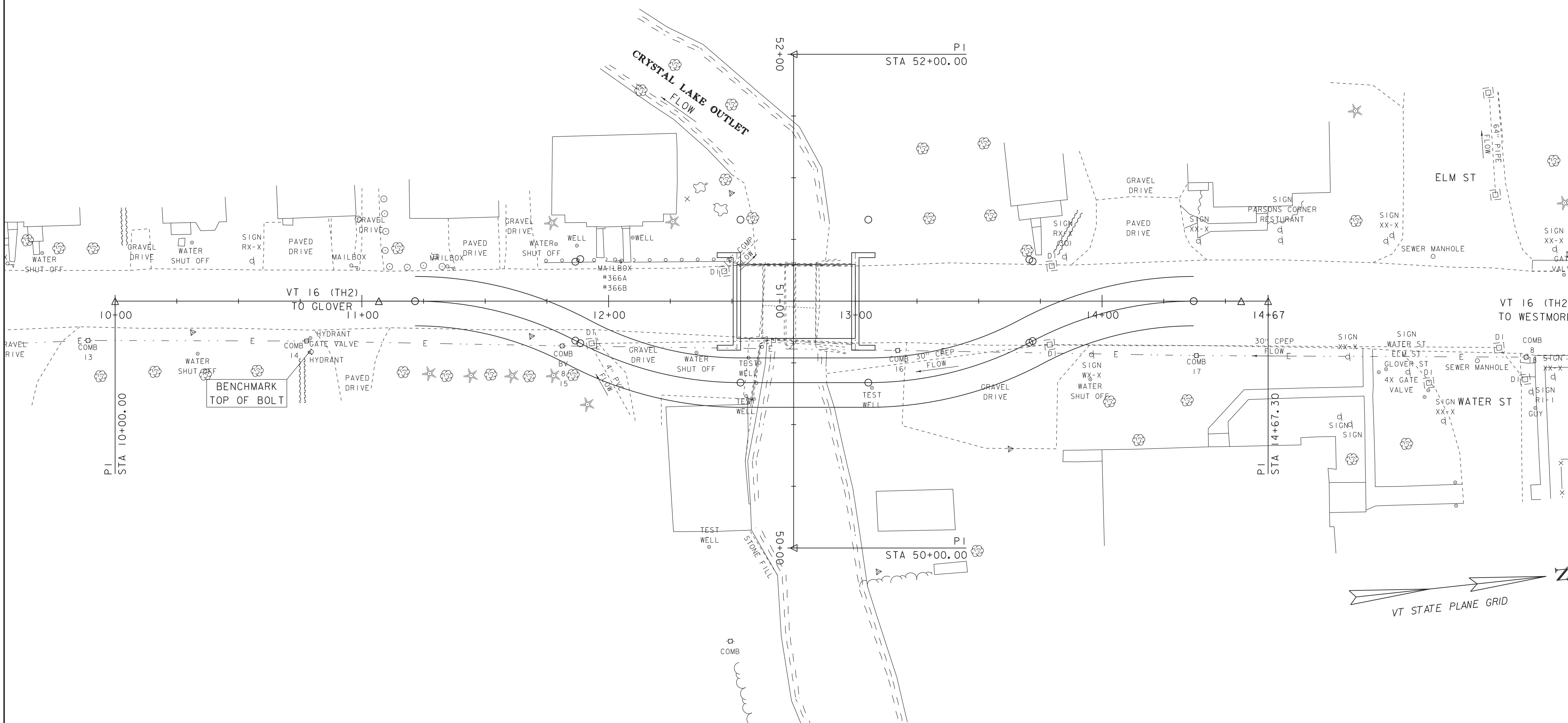


NOTE:

GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: BARTON VILLAGE	
PROJECT NUMBER: BHF 0286(5)	
FILE NAME: 12j172/s12j172profile.dgn	PLOT DATE: 17-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: ------	CHECKED BY: ------
PROFILE SHEET	SHEET 6 OF 8



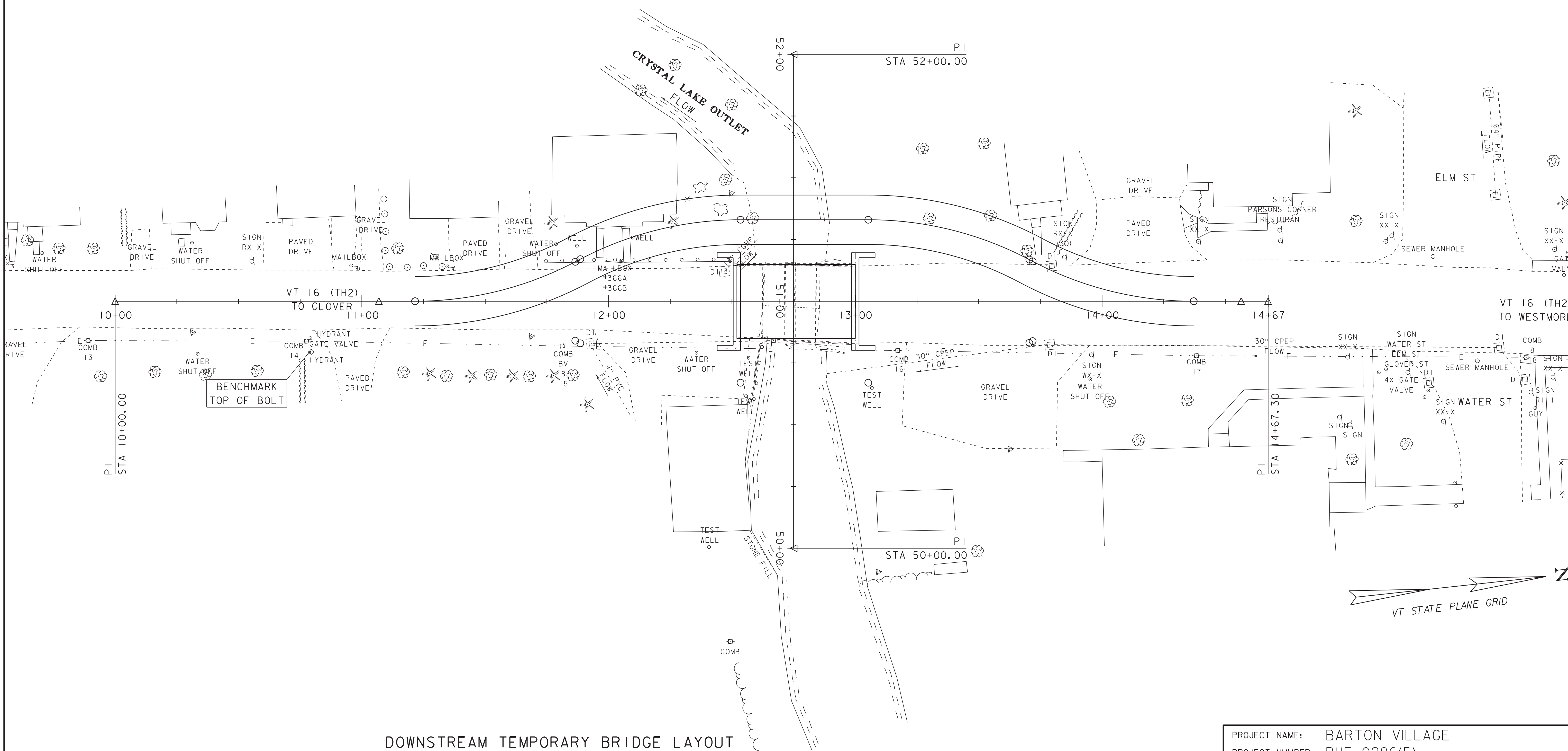
UPSTREAM TEMPORARY BRIDGE LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	BARTON VILLAGE
PROJECT NUMBER:	BHF 0286(5)

FILE NAME: 12j172\s12j172tempbridge.dgn	PLOT DATE: 17-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: ------	CHECKED BY: ------
TEMPORARY BRIDGE LAYOUT SHEET	SHEET 7 OF 8



DOWNSTREAM TEMPORARY BRIDGE LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	BARTON VILLAGE
PROJECT NUMBER:	BHF 0286(5)

FILE NAME: 12j172\s12j172tempbridge.dgn	PLOT DATE: 17-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: ------	CHECKED BY: ------
TEMPORARY BRIDGE LAYOUT SHEET	SHEET 8 OF 8