STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Woodford BF 010-1(52)
VT ROUTE 9, BRIDGE 18 over UNNAMED BROOK

February 26, 2016

I. Contents

I. Site Information

The culvert is located in a rural area along VT 9 in the Town of Woodford, Bennington County, approximately 2.4 miles west of the intersection with VT 8. The approximate mile point is 8.997. The culvert is located on a curved segment of VT 9. There are no residences or driveways near the project site. The average depth of cover over the top of the culvert is approximately 6’. 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	Rural Principal Arterial
Culvert Type	Corrugated Galvanized Metal Plate Pipe (CGMPP)
Culvert Span	7 feet
Culvert Length	92 ft.
Year Built	1919, Reconstructed 1965
Ownership	State of Vermont

Need

The following is a list of the deficiencies of Bridge 18 and VT 9 in this location.

1. This culvert has a rating of 3 “Serious”. Corrosion is ongoing and there are holes in the culvert.

2. Bridge Inspector’s report suggests replacement soon.

Traffic

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

TRAFFIC DATA	2017	2037
AADT	3,200	3,400
DHV	490	520
ADTT	540	750
%T	15.2	19.9
%D	54	54

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on an ADT > 2000 and a design speed of 50 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 3.3	12'/8' (40')	12'/8' (40')	Substandard[1]
Bridge Lane and Shoulder Widths	VSS Table 3.3	12'/8' (40')	12'/8' (40')	Substandard[1]
Clear Zone Distance	VSS Table 3.4	Project area is shielded	20' fill / 12' cut (1:3), 14' cut (1:4)	
Banking	VSS Section 3.13	Approximately 1.5%	8% (max - rolling), 6% at side roads	substandard
Speed	VSS Section 3.3	50 mph (Posted)	50 mph (Design)	
Horizontal Alignment	AASHTO 2011 Green Book Table 3-10b	Bridge located on a horizontal curve, R=3820'	R_{min}=758' @ e=8% R_{min}=3820' @ e=3.0%	
Vertical Grade	VSS Table 3.5	Bridge located in sag vertical curve. Nearby grades are approximately 0.5%.	5% (max) for rolling terrain	
K Values for Vertical Curves	VSS Table 3.1	Bridge located on sag (K = 199)	110 crest / 90 sag	
Vertical Clearance Issues	VSS Section 3.8	None noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 3.1	798'	400'	
Bicycle/Pedestrian Criteria	VSS Table 3.7	8' Shoulder	4' Shoulder	
Bridge Railing	Structures Manual Section 13	Steel Beam Guardrail	Steel Beam Guardrail	
Hydraulics	VTrans Hydraulics Section	Passes Q_{50} storm event with headwater/depth ratio < 1.2, no roadway overtopping at Q_{100}.	Pass Q_{50} storm event with headwater/depth ratio < 1.2, no roadway overtopping at Q_{100}.	
Structural Capacity	SM, Ch. 3.4.1	Unknown	Design Live Load: HL-93	

[1] Table 3.3 in the Vermont State Standards requires a lane/shoulder width of 12/8 for the current configuration. However, footnote (a) to this table allows the lane width to be 11' on reconstructed highways where alignment and safety records indicate a satisfactory condition, which is believed to be the case here. Footnote (b) directs us to add 2' to the shoulder width in guardrail areas on principal arterials where the DHV is over 400 vph. Taking both notes together would allow an 11/10 configuration totaling 42', which is 2' wider than the current condition.

Inspection Report Summary

Culvert Rating 3 Serious
Channel Rating 6 Satisfactory

10/16/2013 – Large hole at mid-span has caused 2-4" of settlement at mid-span, the upper section of the pipe has settled past the connection pit about 2". Due to the poor integrity of the pipe it should be replaced. JM JW

10/18/2012 This is a 12 month inspection. This structure is in need of full replacement in the not too distant future. PLB

Hydraulics

The existing 7' diameter culvert configuration meets the hydraulic standard. Headwater to depth ratios are less than 1.0; within allowable limits, and there is no overtopping of the roadway up to Q_{100}. Bank Full Width is not currently part of the hydraulics standard, but is important to some regulatory bodies in that it is related to stream stability. Bank Full Width is not given in this report, and thus will probably be identified at a later time in this project. In the near future, Bank Full Width will likely be part of the hydraulic standard.

Recommendations: The Preliminary Hydraulics Report makes recommendations for the configuration and size of structures for both rehabilitation and replacement actions.

A 6' diameter liner could be considered and would meet the hydraulic standard. If a liner is used, it is recommended that a beveled headwall be installed to maximize hydraulic efficiency. A 6' diameter liner would raise the headwater elevation but the headwater/depth ratio would still be within the standard. Since the invert of a liner would be slightly higher than the present invert, further study would be required to determine if the upstream water levels would be increased to an unacceptable degree. If upstream water levels are increased, approval from the Vermont Agency of Natural Resources and the US Army Corps of Engineers would be recommended before proceeding with design of a liner or other rehabilitation alternative.

If the structure is replaced, an 8' diameter culvert with the invert buried 1' below the streambed or an 8' wide by 6' high concrete box with the invert buried 1' below the streambed was recommended. Natural streambed material may be required by natural resources permit specialists. To maintain existing upstream water levels, the invert of a new structure should match the existing invert on the inlet end. The appropriate headwalls and wingwalls are encouraged to protect the roadway embankment and provide maximum hydraulic efficiency. Scour and erosion control should be considered.

Utilities

<u>Underground:</u>

There are no known buried utilities at the bridge site.

<u>Aerial:</u>

There are several overhead utility lines passing over the culvert. Relocation may be required, depending on the alternative chosen.

Right Of Way

The existing Right-of-Way varies in width, and seems to be on the order of 11 or 12 rods. Temporary Right-of-Way may be needed to accomplish the project.

There is a snowmobile trail running parallel to the roadway on the south side within the Right-of-Way. There is also a snowmobile bridge that spans the water course at the inlet end which is positioned at about the centerline of the culvert.

Resources

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

Biological:

The unnamed brook is a cold water fishery which should be maintained.

Wetlands

There is a large Class II wetlands complex on either side of VT 9 in the project area. Impacts to this resource will require both a State Wetland Permit and a Section 404 permit.

Wildlife Habitat

Although there is wildlife and habitat in the project vicinity, enhanced by the connection with the Green Mountain National Forest, Aquatic Organism Passage (AOP) is not requested by the environmental staff for this project.

Rare, Threatened and Endangered Species

There is a plant species of special concern known to occur in nearby wetlands. Any wetland impacts will require further coordination with the Agency of Natural Resources.

Agricultural

There are no prime agricultural soils known to be in the project area.

Archaeological:
No archaeological resources have been identified at the site.

Historic:
No historically significant resources have been identified at the site.

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

Stormwater:
There are no stormwater concerns for this project.

II. Safety

VT 9 is not a High Crash Location in the area of the project. Crash data can be seen in the Appendix. There are a couple of geometric standards at the project location and approaches that are not met; banking and shoulder width. Since there does not seem to be an excessive number of crashes, it is proposed that these substandard geometric features not be corrected as part of this project.

III. Alternatives Discussion

The alternatives presented here are based on improvement of the condition of the culvert and channel if needed.

No Action

This alternative would involve leaving the culvert in its current condition. A good rule of thumb for the "No Action" alternative is to determine whether the existing structure can stay in place without any work being performed on it during the next 10 years. Given the serious rating on this culvert, it will require work within the next 10 years. It is also the policy of VTrans to remove all elements rated 4 or lower from the State system. In the interest of safety to the traveling public, the No Action alternative is not recommended.

Alternative 1: Rehabilitation

Common rehabilitation options include:

- a: Invert Repair
- b: Pipe Liner
- c: Cured In Place Pipe
- d: Grout Lining

All rehabilitation options would employ the use of hydroblasting or hydrodemolition to appropriately clean the existing pipe interior prior to rehabilitation. In addition to cleaning, some grouting would be needed to plug holes in the pipe and fill all voids on the outside of the pipe. Curing in dry conditions would be required in most cases, necessitating a re-routing of the flow during the work and for a prescribed curing period (usually 24 hours). A new concrete headwall with mitered inlets would be required for all rehabilitation alternatives. In general, a service life of approximately 40 years can be expected if the pipes are rehabilitated. No geometric roadway improvements are proposed to accompany any of the rehabilitation alternatives discussed.

a. Invert Repair

In many cases, invert repair is used to rehabilitate reinforced concrete pipes where the invert has eroded. Invert repair can be utilized on corrugated steel pipe, but typically consists of paving the invert, which is most effective where no structural capacity needs to be replaced. The culvert on this project is rated 3 (Serious), and the inspection reports mention holes that are beginning to form, suggesting that structural integrity needs to be enhanced if the existing culvert is to remain. Therefore, a solution including some structural enhancement is desired, in addition to measures restoring the invert. Invert Repair alone will not be evaluated further in this report.

b. Pipe Liner

Adding a pipe liner, also called sliplining, consists of pulling a complete new pipe into the existing culvert, then grouting the space between the two. Sliplining can be done using several different types of pipe material including corrugated steel, reinforced concrete, and polyethylene, and can restore the structural integrity of the culvert. There are two drawbacks to sliplining: One is that the waterway area is always reduced when sliplining is done; and two, it can be difficult to get the new liner installed, especially if there is distortion of the original host pipe as would be possible on this project. The Preliminary Hydraulics Report indicates that a 6' inside diameter liner would be adequate to meet the hydraulic standard on this project. Crucial to the success of this method would be surveying the interior of the existing CMP to insure that a rigid liner can be installed in the pipes. Temporary Right-of-Way may be needed to provide a staging area at each end to accomplish this alternative.

c. CIPP (Cured In Place Pipe)

CIPP is another way of providing a new lining to the interior of an existing pipe. A resin-saturated felt or fiber tube is inserted into the pipe in a folded configuration, and is then expanded to be in contact with the entire interior surface of the existing culvert. Curing takes place by heating the resin using hot water, steam, or UV light. There have been concerns over the use of this method, because some of the materials and techniques have adverse impacts on water quality. The most common resins used in the past have been styrene-based or vinyl-based, both of which are toxic to aquatic species when cured using improperly handled hot water or steam. However, based on a study sponsored by the Virginia DOT, good water quality results have been achieved either using UV curing methods, or by capturing the process water used in curing and disposing of it at an appropriate publicly-owned wastewater treatment facility. VTrans currently has a committee in place with highway, structures and environmental expertise considering the advancement of this pipe repair method and more effective means of protecting water quality and habitat. By the time this project begins preliminary design, it is hoped that a comfort level will have been reached that allows all repair options to be considered with confidence.

It has been determined that the size limit for UV cured CIPP is 54". Although this method of curing may have promise for the future, environmental permitting concerns and the size limitation may inhibit further consideration of UV curing for this project. Temporary Right-of-Way would need to be acquired to provide a staging area at each end to accomplish this alternative.

d. Spray-On Liners

Spray-On liners provide a new rigid interior surface for the pipe and use either cementitious materials (polymer-enhanced cement mortar) or polyurea. These liners are spray applied either by hand or machine, although some users have had better quality control with hand-applied methods. Cementitious liners installed by these methods can provide full structural support, depending on thickness applied. Proper curing is essential to using spray-on liners to avoid bond failures. There are water quality impacts associated with the application of these liners, their degree of impact related to selection of materials. Literature indicates that the State of California has effectively banned the use of spray-on products using polyurea due to the toxic effects of isocyanate materials on the environment and on workers installing the material. Temporary Right-of-Way may be needed to provide a staging area at each end to accomplish this alternative.

Advantages: A repair alternative would address the structural deficiencies of the existing culvert pipes without affecting traffic flow, with minimum upfront costs. It would have minimal impacts on resources. Very minimal impacts on traffic flow would be expected.

Disadvantages: A remaining service life of approximately 40 years would be gained, and slight temporary water quality impacts may be seen. Wildlife connectivity would not be improved.

Alternative 2: Structure Replacement Using Trenchless Methods

A replacement of the existing culvert adjacent to the current location could be accomplished. Conventional jack-and-bore methods would be likely to succeed on this project. An 8' diameter jack and bore would be proposed, so that enough waterway is provided along with room to build a natural stream bed inside the pipe. Some redirection of the stream would be required at each end to direct water flow into and out of the pipe, which would have some minor temporary impacts to the stream habitat. New headwalls or wingwalls would be required for hydraulic efficiency. This solution would provide for a typical service life for culverts of at least 60 years, depending on material selection. It is assumed that temporary Right-of-Way will be necessary for the jack-and-bore equipment. No roadway reconstruction is proposed with this alternative.

Traffic for this alternative would be maintained as normal flow through the work zone with minor impacts due to construction vehicles entering and leaving the site.

Advantages: This alternative would be a new structure with an estimated life span of 60 years. Traffic would be maintained through the work area with minor impacts.

Disadvantages: The location of the culvert and a small length of the stream on each end would be slightly modified, to avoid the existing pipe. This alternative has higher initial costs than pipe rehabilitation and slightly higher temporary impacts to resources.

Alternative 3: Structure Replacement Using Open Cut

Culvert replacement using an open cut was considered. The new culvert would either be an 8' diameter round section, an 8' wide by 6' high precast concrete box with the bottom buried 1' below the stream invert, or any other shape providing an 8' clear width and at least 40 sf of waterway area. It would be approximately 105' long at a skew of about 5 degrees. If a 3-sided box is used, it would be founded at least 6' below the channel bottom or on bedrock, and would have full headwalls. A 4-sided box could be used as well. Traffic could be maintained by off-site detour, phased construction, or temporary bridge. AOP and wildlife connectivity are recommended by Vtrans environmental biologists. It is recommended that the inlet elevation of the new structure be maintained at the same elevation as the existing, to maintain water levels in the wetlands. No roadway reconstruction is proposed with this alternative.

IV. Maintenance of Traffic

The Vermont Agency of Transportation has created an Accelerated Bridge Program in 2012, which focuses on expedited delivery of construction plans, permitting, and Right-of-Way, as well as accelerated 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 traffic impacts with accelerated construction techniques and incentives to contractors to complete projects early. The Agency will consider the closure option on projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements and systems for new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Bridge 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 VT 8 in the Town of Readsboro, continuing on VT8/VT 100 south, which becomes MA 8 in Massachusetts. The route turns onto MA 2 near North Adams, MA, then west on MA Route 2 to Williamstown, MA, and then follows US 7 north through the Town of Pownal, VT and Bennington, then back to VT 9 east as shown in the Appendix. This detour features the following:

Thru distance:	13.8 miles	19 min.
Detour distance:	36.5 miles	56 min.
Added distance for Thru Traffic:	22.7 miles	37 min.
End to end distance:	50.3 miles	75 min.

There are no local bypass routes available. Woodford is a very rural location and there are no through State or local routes that could be considered for a bypass, other than the State route described above.

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

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

Option 2: Temporary Bridge

A temporary bridge could be engineered to be located upstream or downstream of the existing structure. The roadway, however, is in a fill section and impacts to wetlands begin to occur as soon as disturbances reach the intersection of the roadway embankment and the current wetland environment. Because it appears that there is plenty of Right-of-Way south of the roadway (upstream), and not enough on the north side, this report only considers a temporary bridge on the south side.

A one lane temporary bridge with traffic signals would be appropriate based on the daily traffic volumes. Overhead utilities would have to be relocated. A temporary bridge on the south side of the roadway would not require temporary Right-of-Way acquisition. See the Temporary Bridge Layout Sheet in the Appendix.

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

Disadvantages: This option would have direct impacts on a large wetlands complex, and would be relatively high in cost. There would be some delays and disruption to traffic, since the road would be reduced to one-way traffic, and the speed limit reduced.

Option 3: Phased Construction

Phased construction is the maintenance of one lane of alternating traffic on the existing bridge while building one lane at a time of the proposed structure. This keeps the road open during construction, while having minimal impacts to resources and adjacent property owners.

Based on traffic volumes and the existing roadway width, it would be reasonable to close one lane of traffic, and maintain one lane of alternating traffic, with traffic signals. The excavation to replace the culvert would be approximately 12' deep. Phasing would require a fairly deep braced excavation immediately adjacent to a live traffic lane while the work was performed. There are no current subsurface borings available for the vicinity. The Preliminary Geotechnical Report shows well driller logs from projects in the vicinity, but they are some 1,600 to 2,000 ft. away from the project. The sense is that the subsurface soils in the project area will consist of marsh deposits overlying glacial till with sand, gravel, and boulders overlying bedrock. It is advised that subsurface conditions are well defined early in the design process, especially if phased construction is contemplated, since sheet pile excavation bracing will be needed to support fairly deep cuts adjacent to live traffic. Shallow bedrock or boulders interfering with sheet pile installation will make braced excavations more difficult.

V. Alternatives Summary

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

Alternative 1a: Culvert Rehabilitation Using pipe Liner with Traffic Maintained with Minor, Occasional Interruption.
Alternative 1b: Culvert Rehabilitation Using Spray-On Liner with Traffic Maintained with Minor, Occasional Interruption.
Alternative 1c: Culvert Rehabilitation Using Cured-In-Place-Pipe with Traffic Maintained with Minor, Occasional Interruption.
Alternative 2: Culvert Replacement Using Trenchless Technology with Traffic Maintained with Minor, Occasional Interruption.
Alternative 3a: Culvert Replacement with Traffic Maintained on Offsite Detour.
Alternative 3b: Culvert Replacement with Traffic Maintained on Temporary Bridge.
Alternative 3c: Culvert Replacement with Traffic Maintained by Phasing Construction.

VI. Cost Matrix[1]

Woodford BF 010-1(52)		Do Nothing	Alt 1a Culvert Rehab using New Liner No/Minor Traffic Impact	Alt 1b Culvert Rehab using Spray-On Liner No/Minor Traffic Impact	Alt 1c Culvert Rehab Using Cured-In-Place-Pipe No/Minor Traffic Impact	Alt 2 Culvert Replacement using Jack & Bore No/Minor Traffic Impact	Alt 3a Culvert Replacement Offsite Detour	Alt 3b Culvert Replacement Temporary Bridge	Alt 3c Culvert Replacement Phased Construction
COST	Bridge Cost	$0	$176,000	$198,000	$333,000	$398,000	$321,000	$321,000	$321,000
	Removal of Structure	$0	$0	$0	$0	$20,000	$5,000	$5,000	$8,000
	Roadway	$0	$92,000	$92,000	$92,000	$101,000	$129,000	$129,000	$154,000
	Maintenance of Traffic	$0	$10,000	$10,000	$10,000	$10,000	$16,000	$150,000	$60,000
	Construction Costs	$0	$278,000	$300,000	$435,000	$529,000	$471,000	$605,000	$543,000
	Construction Engineering + Contingencies	$0	$81,000	$87,000	$126,000	$153,000	$137,000	$175,000	$157,000
	Total Construction Costs w CEC	**$0**	**$359,000**	**$387,000**	**$561,000**	**$682,000**	**$608,000**	**$780,000**	**$700,000**
	Preliminary Engineering[2]	**$0**	**$97,000**	**$105,000**	**$152,000**	**$185,000**	**$165,000**	**$212,000**	**$190,000**
	Right of Way	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Total Project Costs	$0	$456,000	$492,000	$713,000	$867,000	$773,000	$992,000	$890,000
SCHEDULING	Project Development Duration[3]	NA	2 years	2 years	2 years	2 years	2 years	2 years	2 years
	Construction Duration	NA	2 months	2 months	2 months	2 months	3 months	5 months	5 months
	Closure Duration (If Applicable)	NA	NA	NA	NA	NA	5 days	NA	NA
ENGINEERING	Typical Section - Roadway (feet)	40’	40’	40’	40’	40’	40’	40’	40’
	Typical Section - Bridge (feet)	8-12-12-8	8-12-12-8	8-12-12-8	8-12-12-8	8-12-12-8	8-12-12-8	8-12-12-8	8-12-12-8
	Geometric Design Criteria	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Traffic Safety	No Change	Improved	Improved	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No	No	No	No	No	No	No	No
	Bicycle Access	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Hydraulic Performance	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Pedestrian Access	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Utility	No Change	No Change	No Change	No Change	No Change	No Change	Relocation	Relocation
OTHER	ROW Acquisition	No	No	No	No	No	No	No	No
	Road Closure	No	No	No	No	No	Yes	No	No
	Design Life	<10 years	30 years	30 years	30 years	60 years	80 years	80 years	80 years

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

VII. Conclusion

Alternative 1a is recommended; rehabilitate the existing culvert with a new liner.

Structure:

Rehabilitation of this culvert gives the lowest initial construction cost, and offers a solution that will have an estimated service life of approximately 40 years. The VTrans environmental staff has not requested AOP for this site and will accept a slight rise in the upstream pool elevation caused by the installation of a liner.

The details of modifying the snowmobile trail and bridge are not known at this time, but discussions are ongoing.

Traffic Control:

Traffic impacts will be minimal for this project. Periodic short term delays are expected as construction equipment enters and leaves the site at any time during work hours.

VIII. Appendices

- A. Site Pictures
- B. Town Map
- C. Bridge Inspection Report
- D. Preliminary Hydraulics Memo
- E. Preliminary Geotechnical Report
- F. Natural Resources Memo and Map
- G. Archaeology Memo
- H. Historic Memo
- I. Crash Data
- J. Local Input
- K. Detour and Thru Routes
- L. Plans
    - Existing Conditions
        - Profile
    - Alternatives Proposed
        - Typical Sections
        - Layouts
        - Temporary Bridge Layouts

A. Site Pictures

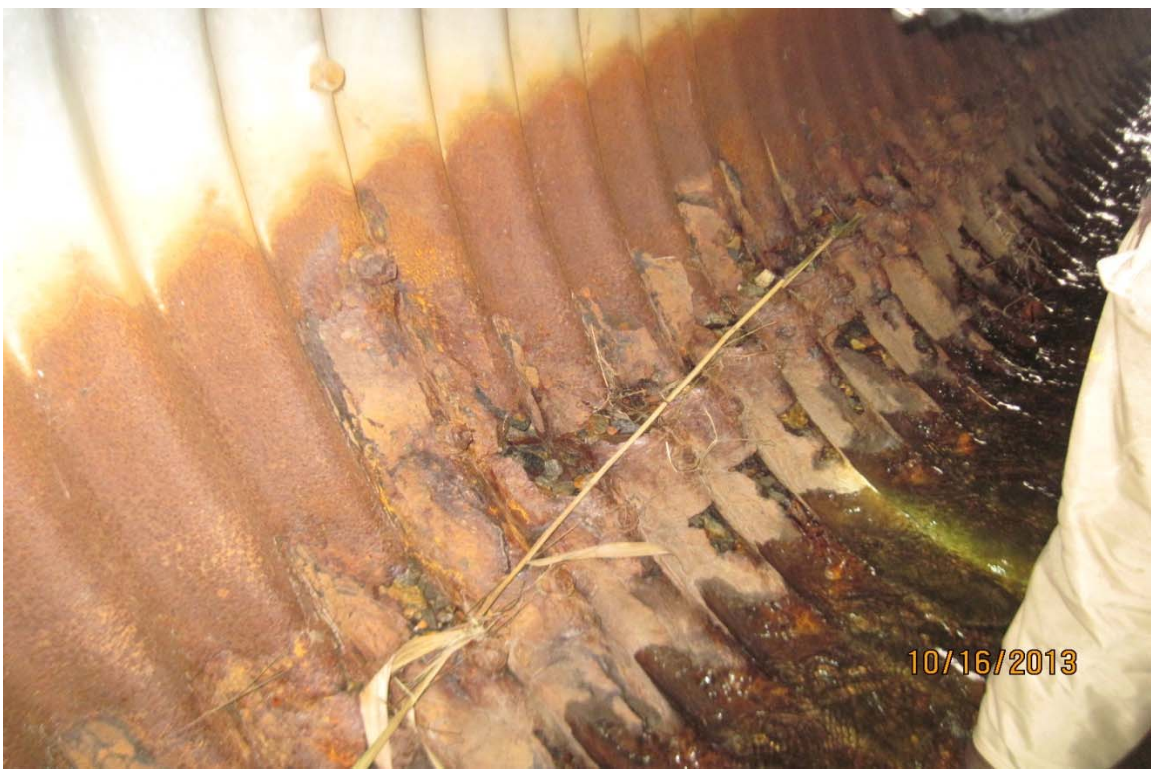
VT Route 9, Looking West

VT Route 9, Looking East

Looking north (downstream)

Looking South (upstream)

Interior of Pipe Looking at Snowmobile Bridge

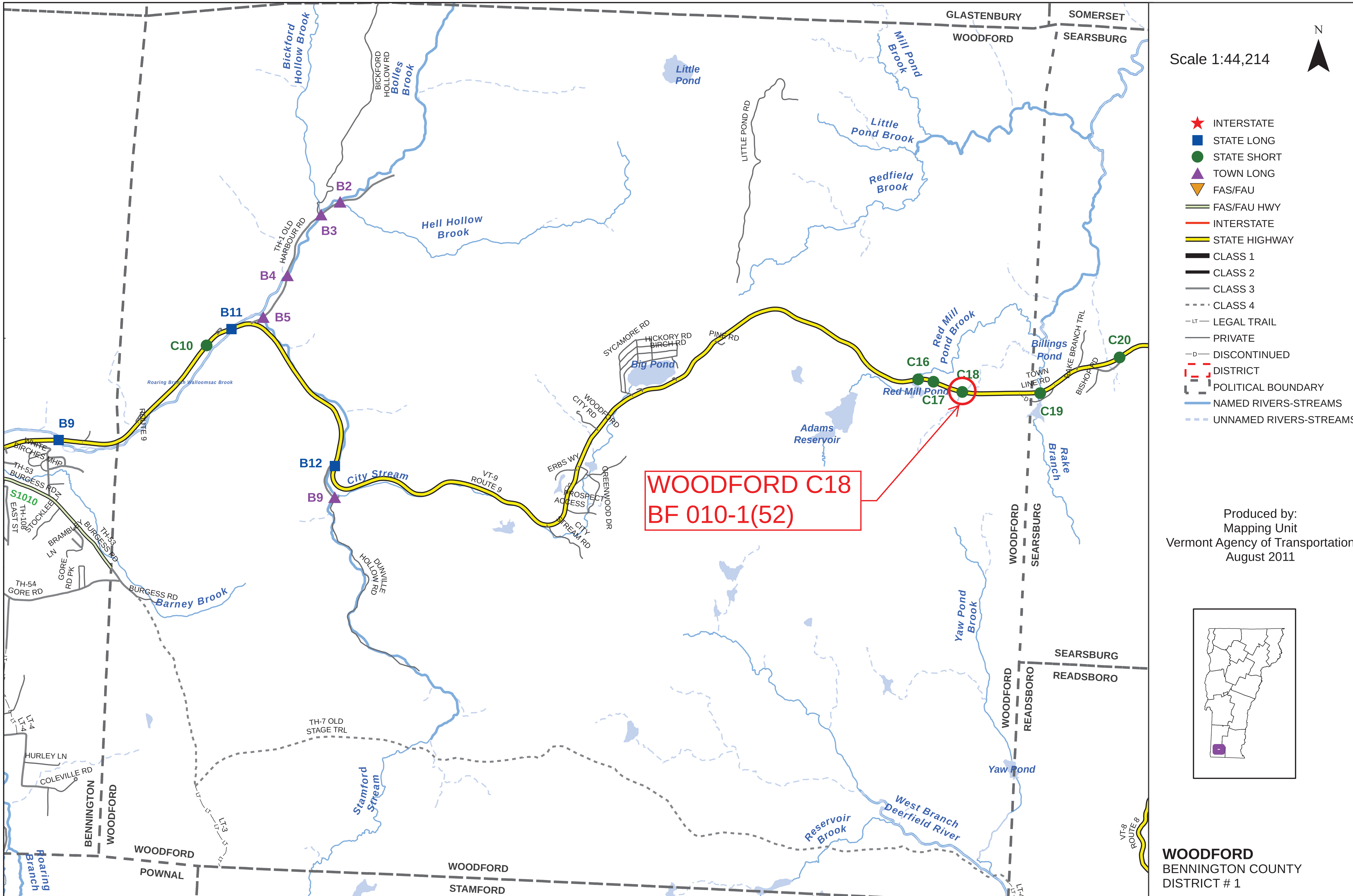


Interior of Pipe

Interior of Pipe

Looking Southwest at Snowmobile Bridge

Appendix B: Town Map



WOODFORD C18
BF 010-1(52)
Scale 1:44,214
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
WOODFORD
BENNINGTON COUNTY
DISTRICT # 1
GLASTENBURY
SOMERSET
SEARSBURG
READSBORO
STAMFORD
POWNAL
BENNINGTON
B2
B3
B4
B5
B9
B11
B12
C10
C16
C17
C18
C19
C20
Bickford Hollow Brook
Bolles Brook
Hell Hollow Brook
Little Pond
Mill Pond Brook
Little Pond Brook
Redfield Brook
Red Mill Pond Brook
Red Mill Pond
Billings Pond
Adams Reservoir
Big Pond
City Stream
Barney Brook
Rake Branch
Yaw Pond Brook
Yaw Pond
West Branch Deerfield River
Reservoir Brook
Stamford Stream
Mud Pond
Roaring Branch
VT-9 ROUTE 9
TH-7 OLD STAGE TRL
DUNVILLE HOLLOW RD
BURGESS RD
HURLEY LN
COLEVILLE RD
LITTLE POND RD
SYCAMORE RD
HICKORY RD
BIRCH RD
PINE RD
WOODFORD RD
CITY RD
ERBS WY
PROSPECT ACCESS
GREENWOOD DR
CITY STREAM RD
TOWN LINE RD
RAKE BRANCH TRL
BISHOP RD
TH-1 OLD HARBOUR RD
BICKFORD HOLLOW RD
S1010
VT-8 ROUTE 8

Appendix C: Bridge Inspection Report

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for WOODFORD **bridge no.:** 0018 **District:** 1

Located on: VT09 **over** BROOK **approximately** 2.4 MI W VT 8 **Maintained By:** STATE

CONDITION

Deck Rating: N NOT APPLICABLE

Superstructure Rating: N NOT APPLICABLE

Substructure Rating: N NOT APPLICABLE

Channel Rating: 6 SATISFACTORY

Culvert Rating: 3 SERIOUS

Federal Str. Number: 300010001802171

AGE and SERVICE

Year Built: 1919 **Year Reconstructed:** 1965

Type of Service On: 1 HIGHWAY

Type of Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 21

ADT: 2500 **Year of ADT:** 1996

GEOMETRIC DATA

Length of Maximum Span (ft): 7

Structure Length (ft): 7

Lt Curb/Sidewalk Width (ft): 0

Rt Curb/Sidewalk Width (ft): 0

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

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

Appr. Roadway Width (ft): 40

Skew: 4

Bridge Median: 0 NO MEDIAN

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 07 FT 06 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: CGMPP

Number of Main Spans: 1

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: N NOT APPLICABLE

Type of Wearing Surface: N NOT APPLICABLE

Type of Membrane: N NOT APPLICABLE

Deck Protection: N NOT APPLICABLE

CULVERT GEOMETRIC DATA and INDICATORS

Culvert Barrel Length (ft): 92

Average Cover Over Culvert (ft): 06

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

Culvert Wing/Header Rating: 6 SATISFACTORY CONDITION

Steel Culvert Corrosion Indicator: 1 BARREL IN CRITICAL CONDITION

Multi Plate Culvert Bolt Line Crack Indicator: 0 NO BOLT LINE CRACKS PRESENT

APPRAISAL

Appr. Rdwy. Alignment: 8 EQUAL TO DESIRABLE CRITERIA

INSPECTION

Inspection Date: 102013 **Inspection Frequency (months):** 12

INSPECTION SUMMARY and NEEDS

16/16/13 Large hole at mid span have cause 2-4" of settlement at mid span. the upper section of the pipe has settled pas the connection pit of the bottom section about 2". due to the poor integrity of the pipe it should be replaced. JM JW

10/18/2012 This is a 12 month inspection. This structure is in need of full replacement in the not too distant future. PLB

07/07/2011 Future sinkholes may develop over time. The invert is in need of repairs or the pipe is need of full replacement. PLB

Appendix D: Preliminary Hydraulics Report

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Chris Williams, Structures Project Manager

FROM: David Willey, Hydraulics Project Supervisor

DATE: September 3, 2014

SUBJECT: Woodford BF 010-1(52), VT 9 BR 18, GPS coordinates: N 42.8893° W 73.0210°

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

Existing Conditions

The existing structure was rebuilt in 1965. It is a 7.0’ CGMPP, providing a waterway opening of 38.5 sq. ft. Inlet invert elevation is 2208.84’ and outlet invert is at 2208.26’. It is 88’ long. The pipe is rusted with holes through it. There are wetlands upstream and downstream, with water often ponded through the structure. There is a snowmobile bridge at the inlet. That bridge may affect the hydraulics of the VT structure as well as be affected by that structure.

The existing structure has adequate capacity to meet the current hydraulic standards. Headwater to depth ratios meet the allowable values for a culvert in the VTrans Hydraulics Manual. There is no roadway overtopping up to Q100. The Q50 headwater elevation is 2214.0’ and the top of the pipe at the inlet is 2215.8’.

Liner Options

Given that the existing pipe has adequate capacity, we checked liner options. Liners as small as 6.0’, providing 28.3 sq. ft. of waterway area, would have adequate capacity to pass the design flows and meet the hydraulic standards. However, a 6.0’ liner would constrict the channel more and thus be more prone to plugging. It would also increase upstream headwater elevations by 0.9’ to 2214.9’ at Q50.

We recommend a full beveled headwall be added to any liner to help offset some of the capacity lost by the reduced waterway area. A 6.0’ liner with a full beveled headwall would result in a Q50 headwater elevation of about 2214.3’, or 0.3’ higher than the existing conditions.

The increase in upstream water levels might be ok. However, another concern is that the normal water level upstream may increase because the new invert will be higher than the existing invert. This depends on what the normal and low water levels are in comparison the pipe invert. As a worst case, normal water levels upstream would increase by the amount the new invert is raised above the existing invert. This would probably be about 0.5’ with a 6.0’ liner. If water is always ponded through the structure, raising the invert may have little or no effect on normal water levels. We do not have enough information to determine normal and low water levels and therefore do not know what effect raising the invert will have on those water levels. Any increase in normal water levels will increase the water depth upstream as well as the area that is covered by the wetlands.

Using a larger liner, such as a 6.8’ cured-in-place or similar liner, would have less affects and would thus be preferable. A 6.8’ liner, providing 36.3 sq. ft. of waterway area, would have adequate capacity to pass the design flows and meet the hydraulic standards. A 6.8’ liner with a full beveled headwall would result in a Q50 headwater elevation of about 2213.6’, or 0.4’ lower than the existing conditions. Any increase in normal water levels upstream would be minor as the invert would only be raised about 0.1’.

Approval from ANR and the COE, should be obtained before a design proceeds that will increase upstream water levels. The upstream snowmobile bridge could also be affected by higher water levels.

Complete Replacement

In sizing a new structure we attempt to select structures that meet both the current VTrans hydraulic standards, state environmental standards with regard to span length and opening height, and allow for roadway grade and other site constraints.

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

1) 8.0’ diameter pipe with the invert buried 1’ below stream bed. This structure will provide about 46.7 sq. ft of waterway area and result in a Q50 headwater elevation of about 2213.2’. ANR may want the pipe filled up to the stream bed level with material graded to match the natural stream bed material.

2) 8’ wide by 6’ high concrete box with the invert buried 1’ below stream bed. ANR may want the box filled up to the stream bed level with material graded to match the natural stream bed material. This structure will provide about 40 sq. ft of waterway area and result in a Q50 headwater elevation of about 2212.8’.

3) Any similar structure with a minimum clear span of 8’ and at least 40-sq. ft. of waterway area, that fits the site conditions, could be considered.

The inlet invert of any new structure should be kept at the same elevation as the existing pipe, to maintain water levels in the upstream wetlands, unless the permitting agencies approve a different elevation.

If the round pipe is installed, concrete headwalls should be constructed at the inlet and outlet. The headwalls may be either half height or full height. The headwalls should extend at least four feet below the channel bottom or to ledge, to prevent undermining of the structure. We recommend a minimum cover of 3’ over all pipe structures. Obtaining the minimum cover of 3’ should be no problem at this site.

If a new box is installed, we recommend it have full headwalls at the inlet and outlet. The headwalls should extend at least four feet below the channel bottom, or to ledge, to act as cutoff walls and prevent undermining.

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

Appendix E: Preliminary Geotechnical Report

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Chris Williams, Project Manager, Structures

From: Thomas D. Eliassen, Transportation Geologist via Christopher C. Benda, Soils and Foundations Engineer

Date: March 10, 2014

Subject: Woodford BF 010-1(52) Preliminary Geotechnical Information Report

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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 near Bridge No. 18 (CGMPP culvert) on Vermont Route 9 which crosses over a marshy area approximately 3.7 miles east of the village of Woodford, Vermont. The location of this project is presented as Figure 1. Figure 2 show a view of the area of the bridge looking east and Figure 3 shows a photograph of the inlet of the subject bridge.

Figure 1 Location of Bridge 18.

Figure 2 View of Bridge 18 looking east.

Figure 3 Photograph of inlet Bridge 18.

This review included observations made during a site visit, the examination of historical in-house bridge boring files, as-built record plans, USDA Natural Resources Conservation soil survey records, published surficial and bedrock geologic maps and water well logs on-file at the Agency of Natural Resources.

A site visit was performed on January 31, 2014 for the purposes of assessing topographic and geologic conditions that may impact the design and/or construction of the proposed bridge. Observations were also made of existing utility locations and logistical site access conditions.

The bridge project site occupies a marshy area which drains toward the north and northeast.
No aboveground or evidence of underground utilities were observed in the area of the culvert. Access for drilling borings appears favorable.

No boring records were found in the Soils & Foundations in-house historical boring log records nor were there any within the historical record plans maintained by the Agency.

Drilling logs from private drinking water wells in the area of a project can be helpful in anticipating what may be encountered in the subsurface. The Agency of Natural Resources Private Well Locator interactive map was reviewed for these purposes. Six water wells are present in the area of the subject project. These well locations and drill log lithologic descriptions are depicted on Figure 4.

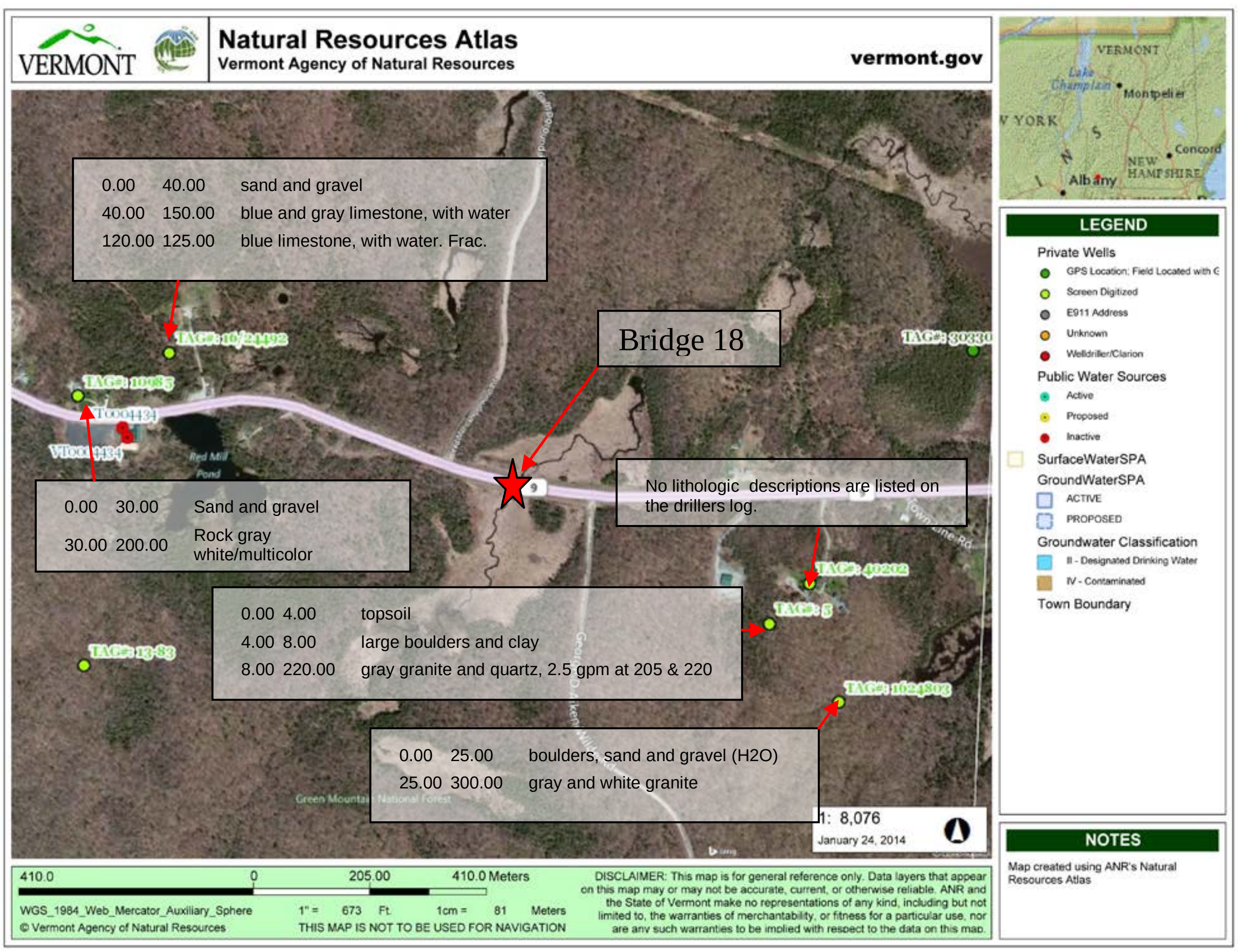


Figure 4 Map showing water well locations in the vicinity of Bridge 18. Also listed on this map are the driller well log notes referencing the stratigraphy encountered.

USDA Natural Resources Conservation soil survey records indicate that surficial soils in the area of the bridge consist of Wilmington-Mundal association, undulating, very stony soil. Figure 5 shows a portion of the NRSC soil survey map in the project area. Wilmington-Mundal deposits are labeled 923B on the map.

Figure 5 USDA Soil Map showing the distribution of soil types at the subject project site.

According to the 2011 bedrock map of Vermont, the project area is underlain by bedrock consisting of Precambrian aged rocks of the Mount Holly Complex described as "A widespread heterogeneous unit of well-layered, predominantly biotite-quartz-plagioclase gneisses containing variable amounts of magnetite, hornblende, and garnet, and little potash feldspar".

Surficial mapping conducted for the 1970 Surficial Geologic Map of Vermont indicates that the subject area is underlain by Pluvial (marsh) deposits resting on glacial till.

Generally, the subsurface can be characterized as marsh deposits overlying glacial till with sand, gravel and boulders overlying bedrock. It should be noted that water wells reviewed are located 1,600 to 2,000 feet from the project on land that is topographically higher than the project.

Because the condition of the subsurface in the area of the culvert is unknown (no previous borings, test pits or nearby water well records are available), we recommend conducting two borings (one located adjacent to each end of the existing culvert). These borings should be performed in the shoulder area between the travel lanes and guardrail. Borings should be drilled to a depth of 25 feet and samples should be collected for characterizing the soil column. Sampling should be performed using Standard Penatration Test (SPT) and undisturbed sampling techniques if soft clayey material is encountered. Because marshy deposits are suspected, testing may include in-situ shear vane and/or laboratory direct shear and organic testing methods. If bedrock is encountered above 25 feet the boring should be extended 10 feet into sound bedrock.

It is expected that the existing culvert will be replaced by a newer one, most likely constructed as round corrugated steel pipe, structural plate pipe, horizontally ellipsed SPCSP or concrete box structure with appropriate headwalls.

If you have any questions, please feel free to contact us at 828-6916.

Attachments:

c: WEA/Read File
CCB/Project File

Appendix F: Natural Resources Memo and Map

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

TO: James Brady, Environmental Specialist

FROM: John Lepore, Transportation Biologist

DATE: May 13, 2014

SUBJECT: Woodford B_F 010-1 (52)
VT 9, Bridge 18 over West Branch of Rake Brook
Natural Resource ID & Comments

The initial resource identification for this project was conducted on 5-MAY-2015. Based on that site visit, I have concluded that the following:

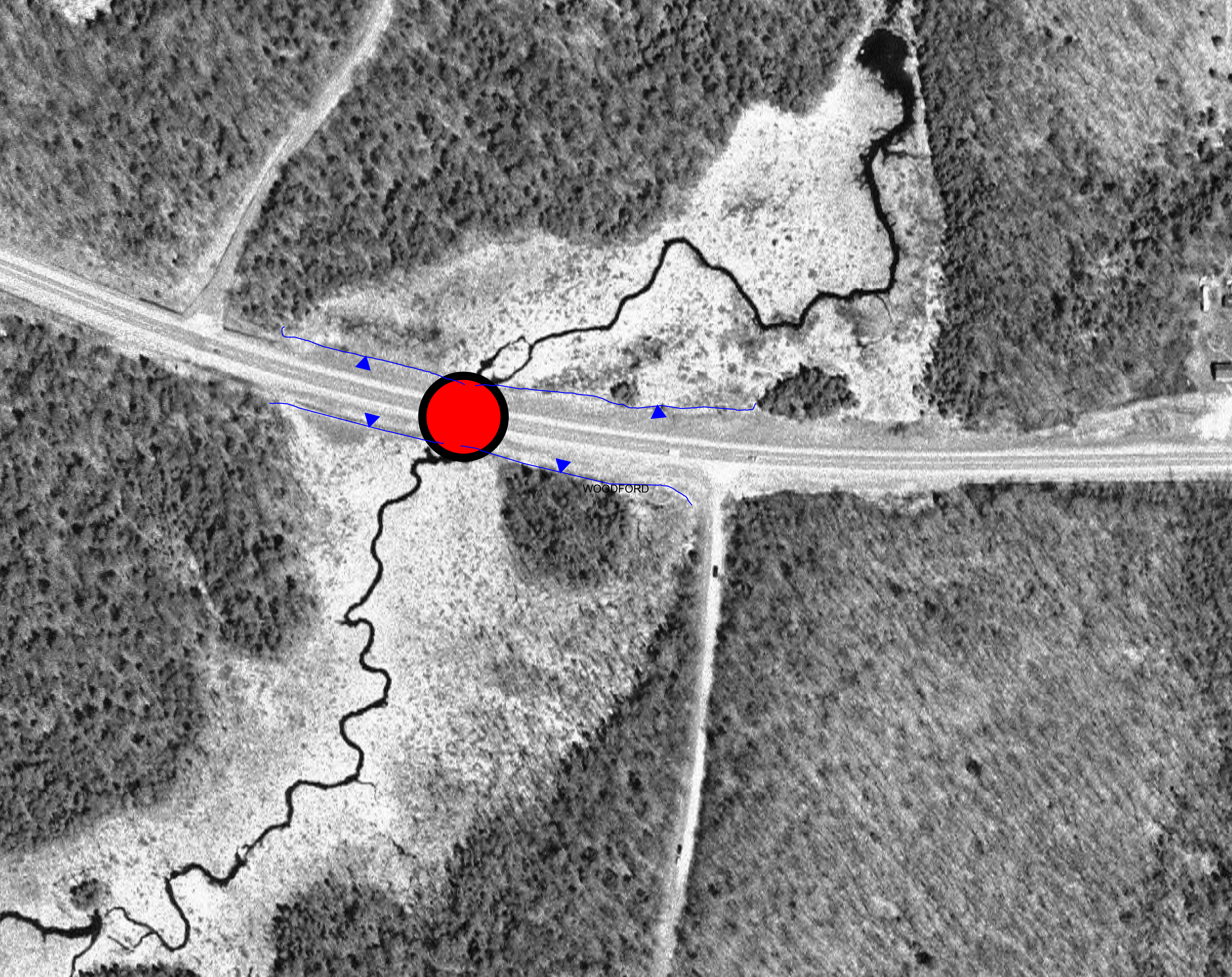
Wetlands
There is a large Class II wetland complex on either side of VT 9 and the boundary was picked up using GPS. Impacts to this resource will necessitate both State Wetland Permit and a Section 404 permit.

Species/habitats of Special Concern
A plant species of special concern is known to occur in nearby wetlands. Although it is not known to occur in the vicinity of Br. 18, any impacts to the wetland would necessitate further coordination with the Agency of Natural Resources.

Watercourses
The watercourse's profile in this area is pretty flat, and Bridge 18 acts much like an equalizer pipe. Just the same, it does contain a cold water fishery which should be maintained.

Permitting Recommendations
Aquatic organism passage should be a provision of this project, and any increase of the structure's size would also be a benefit to facilitating wildlife passage. This recommendation is emphasized more than other site's due to the fact that the lands on both sides of VT 9 is associated with the Green Mountain National Forest. In addition, there is currently a small VAST bridge at the inlet of this structure. If the new structure was created using wing-walls and a header, the VAST bridge could in theory be eliminated so as to allow the trail to cross the watercourse over the end of the new structure.

If you have any questions about this, call me at 828-3963.


WOODFORD

Appendix G: Archaeology Memo

VERMONT

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

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

Agency of Transportation

To: James Brady, Environmental Specialist

From: Jeannine Russell, VTrans Archaeology Officer

Date: May 5, 2014

Subject: Woodford BF 010-1(52) – Archaeological Resource ID

The scope of this project is not yet defined so for the purposes of this resource ID, the project area consists of a 200 foot radius around Br 18 on VT RT 9 in Woodford.

The VTrans Archaeology Officer completed a site visit on 4-28-14. The general project area is surrounded by large wetland areas at the base of RT 9 with fairly steep side slopes. There are no archaeologically sensitive areas or known sites within or adjacent to the project area.

A review of conceptual plans will be necessary prior to issuing a formal clearance. Please contact me if you have any questions.

Thank you,
Jen Russell
VTrans Archaeology Officer

VTrans Working to Get You There
Vermont Agency of Transportation

Appendix H: Historic Memo

Brady, James

From: Newman, Scott
Sent: Thursday, February 06, 2014 3:12 PM
To: Brady, James
Cc: O'Shea, Kaitlin
Subject: Woodford BF 010-1(52) Resource ID

Hi James,

Woodford Bridge 18 Carries VT 9 over a 'brook' in, Woodford. The structure itself is not historic, and there are no above-ground historic properties in the project area. When this comes through for NEPA, it will be processed as an un-conditioned NHPA for historic.

Thanks,
Scott

Appendix I: Crash Data

Vermont Agency of Transportation

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

From 01/01/09 To 12/31/13 General Yearly Summaries Information

Route: VT-9 Continued ...

*	Reporting Agency/ Number	Town	Mile Marker	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VTVSP0900/13C30 0249	Woodford	8.14	01/25/2013	22:39	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0		SH
	VTVSP0900/09C30 0111	Woodford	8.33	01/10/2009	06:20	Clear	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	0	0	0	E	SH
	VTVSP0900/10C30 0413	Woodford	8.36	02/18/2010	23:38	Blowing Sand, Soil, Dirt, Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0	E	SH
	VTVSP0900/10C30 1364	Woodford	8.77	06/08/2010	13:50	Cloudy	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Single Vehicle Crash	0	0	0	W	SH
	VTVSP0900/13C30 0477	Woodford	8.8	02/19/2013	20:15	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0	W	SH
	VTVSP0900/09C30 2064	Woodford	8.91	08/11/2009	17:28	Cloudy	Fatigued, asleep, No improper driving	Rear End	2	0	0	E	SH
	VTVSP0900/13C30 3346	Woodford	9.28	11/10/2013	05:31				0	0	0		SH
	VTVSP0900/12C30 0522	Woodford	UNK	02/24/2012	20:09	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0	E	SH
	VTVSP0900/13C30 3455	Woodford	UNK	11/19/2013	07:06				0	0	0		SH
	VTVSP0900/13C30 3509	Woodford	UNK	11/23/2013	18:16				0	0	0		SH
	VTVSP0900/13C30 3715	Woodford	UNK	12/13/2013	13:31				0	0	0		SH
	VTVSP0900/13C30 3894	Woodford	UNK	12/29/2013	15:58				0	0	0		SH
	VTVSP0900/10C30 0025	Searsburg	0.47	01/02/2010	14:40	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0		SH
	VTVSP0900/11C30 1429	Searsburg	0.82	06/30/2011	05:54	Cloudy	Fatigued, asleep	Single Vehicle Crash	1	0	0		SH
	VTVSP0900/10C30 1582	Searsburg	0.88	07/02/2010	16:04	Clear	Failure to keep in proper lane, No improper driving	Head On	2	1	0		SH
	VTVSP0900/10C30 2274	Searsburg	1.23	09/13/2010	01:53	Rain	Fatigued, asleep	Single Vehicle Crash	1	0	0	W	SH
	VTVSP0900/11C30 0178	Searsburg	1.32	01/22/2011	14:52	Cloudy	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	0	0	0	W	SH
	VTVSP0900/10C30 0875	Searsburg	1.57	04/09/2010	13:45	Cloudy	Fatigued, asleep	Single Vehicle Crash	0	0	0	W	SH
	VTVSP0300/09C30 3393	Searsburg	1.62	12/26/2009	22:29	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	0	0	0	E	SH
	VTVSP0900/13C30 0525	Searsburg	1.62	02/23/2013	20:03	Snow	Operating defective equipment	Single Vehicle Crash	0	0	0	E	SH
	VTVSP0900/12C30 3577	Searsburg	1.83	11/24/2012	14:00	Cloudy		Single Vehicle Crash	0	0	0	E	SH
	VTVSP0900/10C30 0209	Searsburg	2.11	01/24/2010	17:25	Rain	Driving too fast for conditions	Single Vehicle Crash	1	0	0	E	SH
	VTVSP0900/09C30 1434	Searsburg	2.12	06/07/2009	15:40	Cloudy	Failure to keep in proper lane, Fatigued, asleep	Single Vehicle Crash	0	0	0		SH
	VTVSP0900/12C30 0329	Searsburg	2.15	02/03/2012	22:45	Snow	Operating defective equipment	Single Vehicle Crash	0	0	0	E	SH
	VTVSP0900/09C30 2411	Searsburg	2.17	09/12/2009	11:38	Rain	Failed to yield right of way, Other improper action	No Turns, Thru moves only, Broadside ^<	3	0	0		SH
	VTVSP0900/09C30 0808	Searsburg	2.32	04/04/2009	18:25	Snow	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	0	0	0	E	SH
	VTVSP0900/11C30 1455	Searsburg	2.32	07/02/2011	10:05	Clear	No improper driving, Failed to yield right of way, Inattention	Left Turn and Thru, Broadside v<--	2	0	0		SH
	VTVSP0900/10C30 1843	Searsburg	2.34	07/27/2010	16:10	Clear	Failure to keep in proper lane, Fatigued, asleep	Single Vehicle Crash	1	0	0		SH

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

Appendix J: Local Input

Local & Regional Input Questionnaire

Project Name: ______________________ **Project Number:** **WOODFORD C18 BF 010-1(52)**

Community Considerations

1. Are there any scheduled public events in the community that will generate increased traffic (e.g. vehicular, bicycles and/or pedestrians), or may be difficult to stage if the bridge is closed during construction? Examples include: a bike race, festivals, cultural events, farmers market, concerts, etc. that could be impacted? If yes, please provide date, location and event organizers' contact info. **None that we are aware of.**
2. Is there a "slow season" or period of time from May through October where traffic is less? **The slow season is between the end of the ski and snowmobile season, and May, when traffic picks up again.**
3. Please describe the location of emergency responders (fire, police, ambulance) and emergency response routes.

Route 9 would be the route that emergency responders would take. Because many of the roads off of Route 9 are dead-end roads, a detour/alternative route would not be feasible around the project site during an emergency. Listed below are the fire, police, and rescue squad departments located east and west of the project site, in case the road must be closed for construction.

The locations of emergency responders in the area:

Fire Departments: Bennington Rural Fire Department, 276 Orchard Rd, Bennington, VT 05201 (approx. 13.6 miles west of the project site); Bennington Fire Department, 130 River Rd, Bennington, VT 05201 (approx. 11.9 miles west of the project site); Wilmington Fire Department, 18 Beaver St, Wilmington, VT 05363 (approx. 9.2 miles east of the project site); Readsboro Fire Department, 122 School St, Readsboro, VT 05350 (approx. 12.4 miles southeast of the project site).

Police Departments: Bennington Police, 118 South St, Bennington, VT 05201 (approx. 11.5 miles west of the project site); Wilmington Police, 2 East Main St, Wilmington, VT 05363 (approx. 9.1 miles east of the project site).

Rescue Squads: Bennington Rescue Squad, 120 McKinley St, Bennington, VT 05201 (approx. 12.1 miles west of the project site); Deerfield Valley Rescue Squad, 34 Route 100 South, Wilmington, VT 05363 (approx. 10.3 miles east of the project site).

4. Where are the schools in your community and what are their schedules? **Woodford Hollow Elementary School is located 8 miles west of the project on VT -9. Their scheduled activities end June 23.**
5. In the vicinity of the bridge, is there a land use pattern, existing generators of pedestrian and/or bicycle traffic, or zoning that will support development that is likely to lead to significant levels of walking and bicycling? Please explain. **VT - 9 is Woodford's main street. Residents and non-**

residents walk and ride bicycles on the shoulder of Route 9 for pleasure and as an affordable transportation option. During the warm season a growing number of Bennington and other area residents use the climb on Route 9 to Prospect Mt Ski Area and beyond for stamina training and enjoyment.

Also, Woodford State Park is located 0.8 miles west of the project on VT-9 and many hiking trails intersect with VT – 9.

6. Are there any businesses (including agricultural operations) that would be adversely impacted either by a detour or due to work zone proximity? **The impacts from a work zone would be manageable but a detour is not feasible due to the lack of an alternate route. Completely closing the VT - 9 would be a disaster for local businesses for many miles around.**

7. Are there any important public buildings (town hall or community center) or community facilities (recreational fields or library) in close proximity to the proposed project? **Woodford State Park is 0.8 miles to the west.**

8. Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road? **VT – 9 is the only through road in the area.**

9. Are there any other municipal operations that could be adversely impacted if the bridge is closed during construction? If yes, please explain. **All municipal operations would be negatively impacted because there is no alternate route.**

10. Please identify any local communication channels that are available—e.g. weekly or daily newspapers, blogs, radio, public access TV, Front Porch Forum, etc. Also include any unconventional means such as local low-power FM. **The Bennington Banner is a daily local newspaper that covers the project area. Catamount Access Television is a local access TV station that serves the area.**

11. Is there a local business association, chamber of commerce or other downtown group that we should be working with? **The Bennington Area Chamber of Commerce serves the project area.**

Design Considerations

1. Are there any concerns with the alignment of the existing bridge? For example, if the bridge is located on a curve, has this created any problems that we should be aware of? **None that we are aware of.**

2. Are there any concerns with the width of the existing bridge? **None that we are aware of.**

3. What is the current level of bicycle and pedestrian use on the bridge? **Low to moderate.**

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

The new bridge should have a shoulder wide enough to accommodate bicycles and pedestrians.

5. Does the Town have plans to construct either bicycle or pedestrian facilities leading up to the bridge? Please provide a copy of the planning document that demonstrates this (e.g. scoping study, master plan, corridor study) Please explain and provide documentation. **No.**

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

7. Are there any special aesthetic considerations we should be aware of? **None that we are aware of.**

8. Are there any traffic, pedestrian or bicycle safety concerns associated with the current bridge? If yes, please explain. **None that we are aware of.**

9. Does the location have a history of flooding? If yes, please explain. **Not that we are aware of.**

10. Are you aware of any nearby Hazardous Material Sites? **No.**

11. Are you aware of any historic, archeological and/or other environmental resource issues? **No.**

12. Are there any other comments you feel are important for us to consider that we have not mentioned yet? **No.**

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

1. Does your municipal land use plan reference the bridge in question? If so please provide a copy of the applicable section or sections of the plan. **No.**

2. Please provide a copy of your existing and future land use map, if applicable. **Not applicable.**

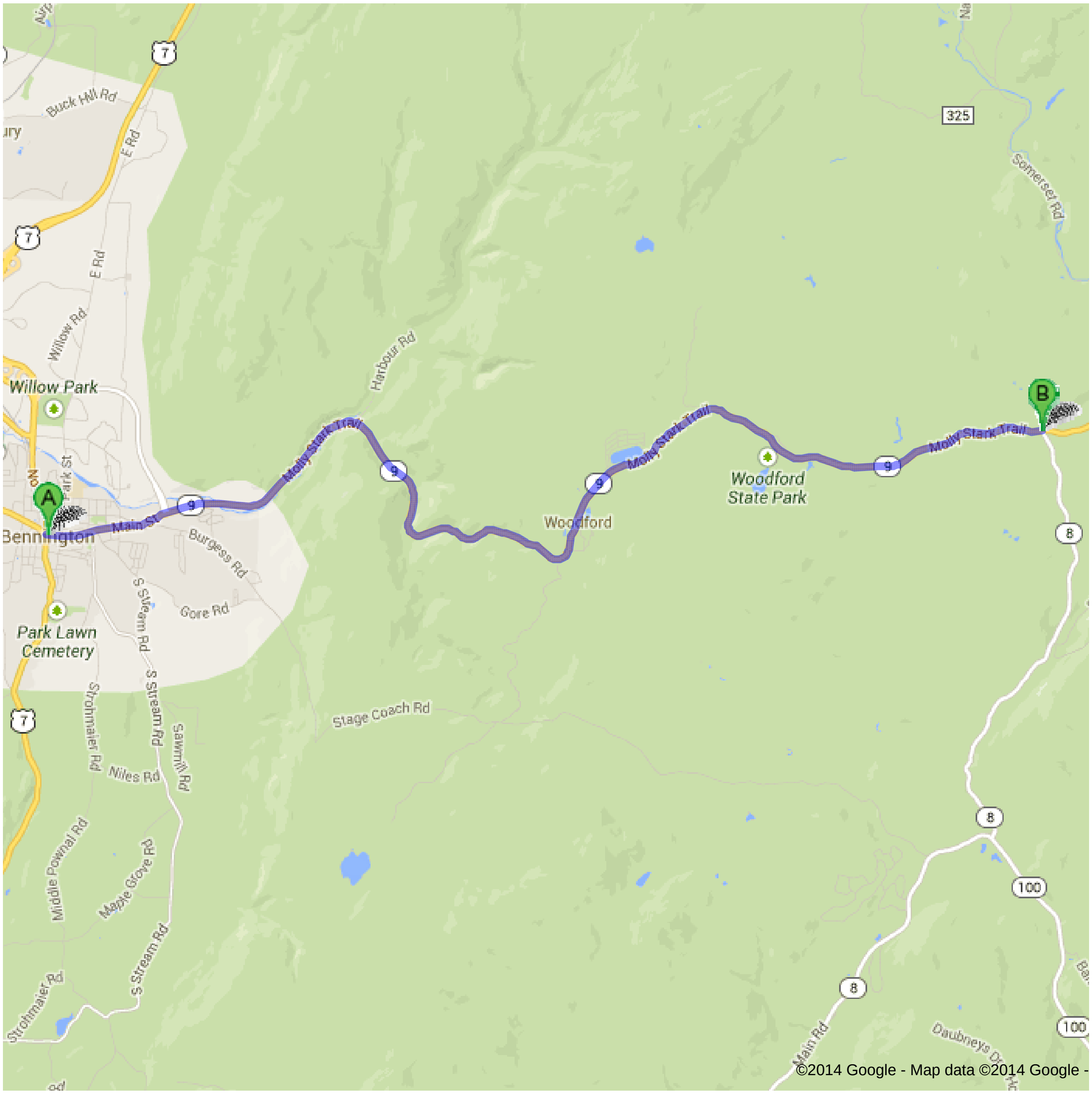
3. Are there any existing, pending or planned development proposal that would impact future transportation patterns near the bridge? If so please explain. **Not that we are aware of.**

4. Is there any planned expansion of public transit service in the project area? If not known please contact your Regional Public Transit Provider. **Public transit now uses VT – 9, but there is no planned expansion.**

Appendix K: Detour and Thru Routes

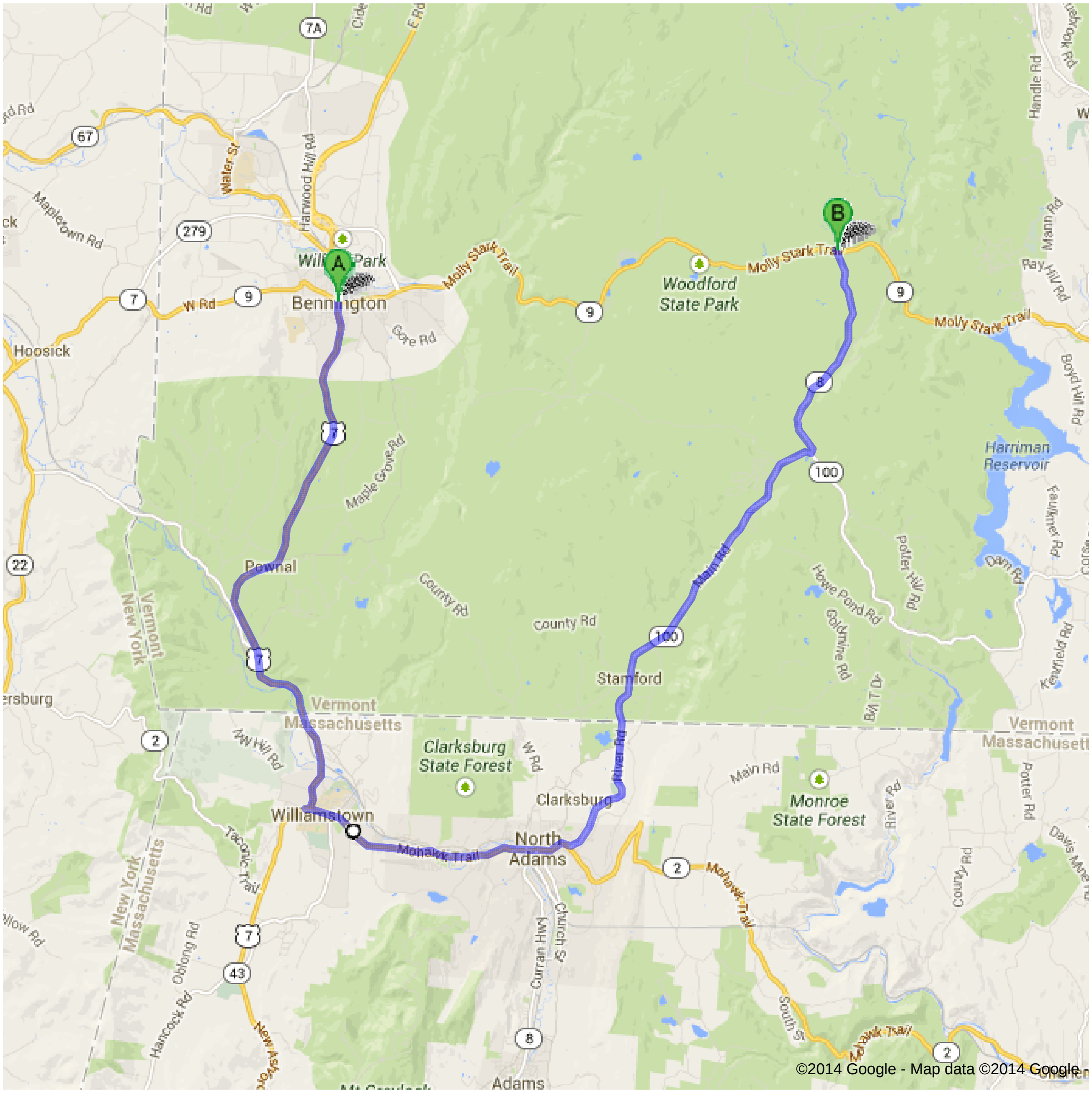
Google

Directions to VT-9 E/Molly Stark Trail
13.8 mi – about **19 mins**
Woodford Thru Route



Google

Directions to VT-9 E/Molly Stark Trail
36.5 mi – about **56 mins**
Woodford Detour Route
Note: Goes through Massachusetts



Appendix L: Plans

EXISTING CURVE
DELTA = 23°00'40"
D = 1°30'00"
R = 3819.72'
T = 777.51'
L = 1534.07'
E = 78.33'

EXISTING 7' CGMPP
92' LONG, BUILT 1919
RECONSTRUCTED 1965
6' AVERAGE COVER
38 SQFT WATERWAY AREA

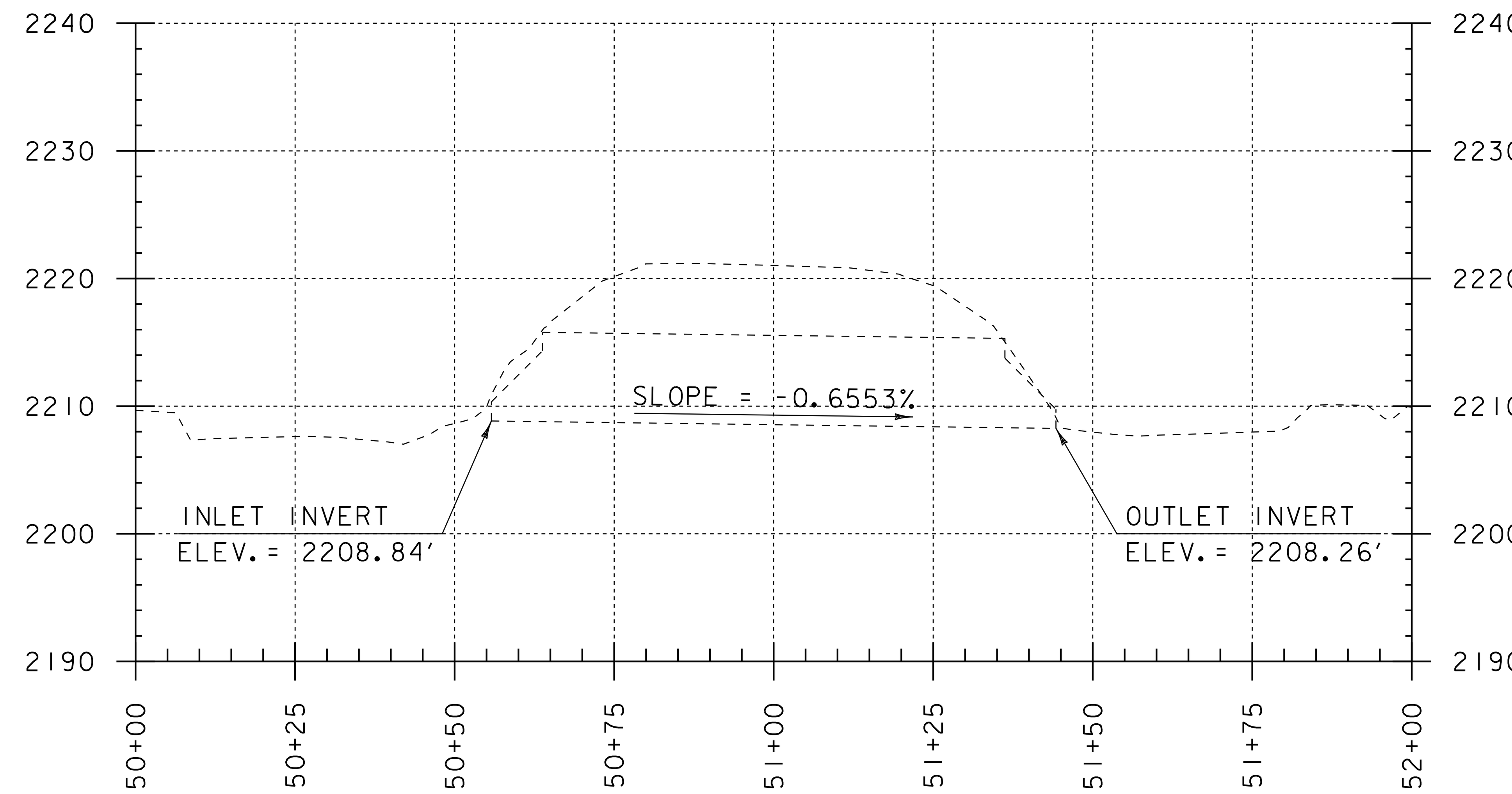
EXISTING CONDITIONS

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

PROJECT NAME: WOODFORD
PROJECT NUMBER: BF 010-1(52)

FILE NAME: 13b270/s13b270border.dgn
PROJECT LEADER: J.FITCH
DESIGNED BY: G.SWEENY
EXISTING CONDITIONS LAYOUT

PLOT DATE: 19-FEB-2016
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 1 OF 15



EXISTING CULVERT PROFILE

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

VT ROUTE 9 EXISTING PROFILE

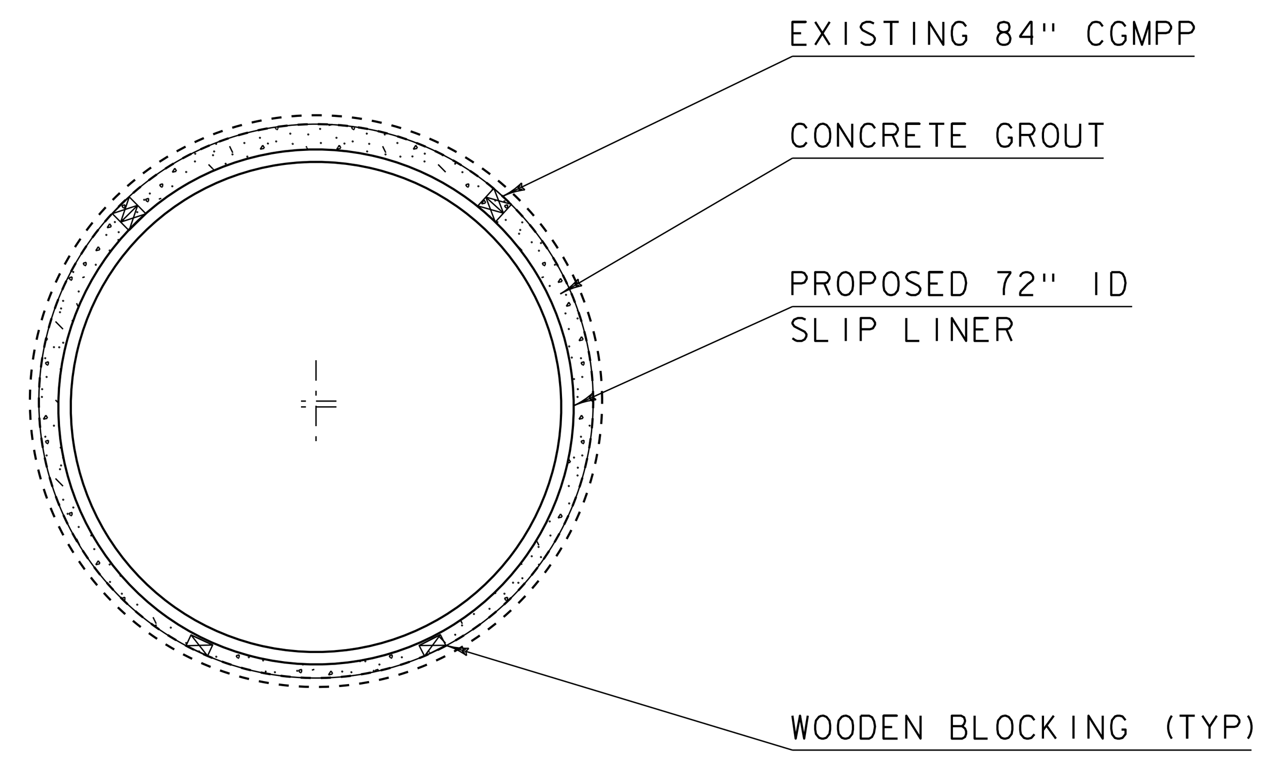
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

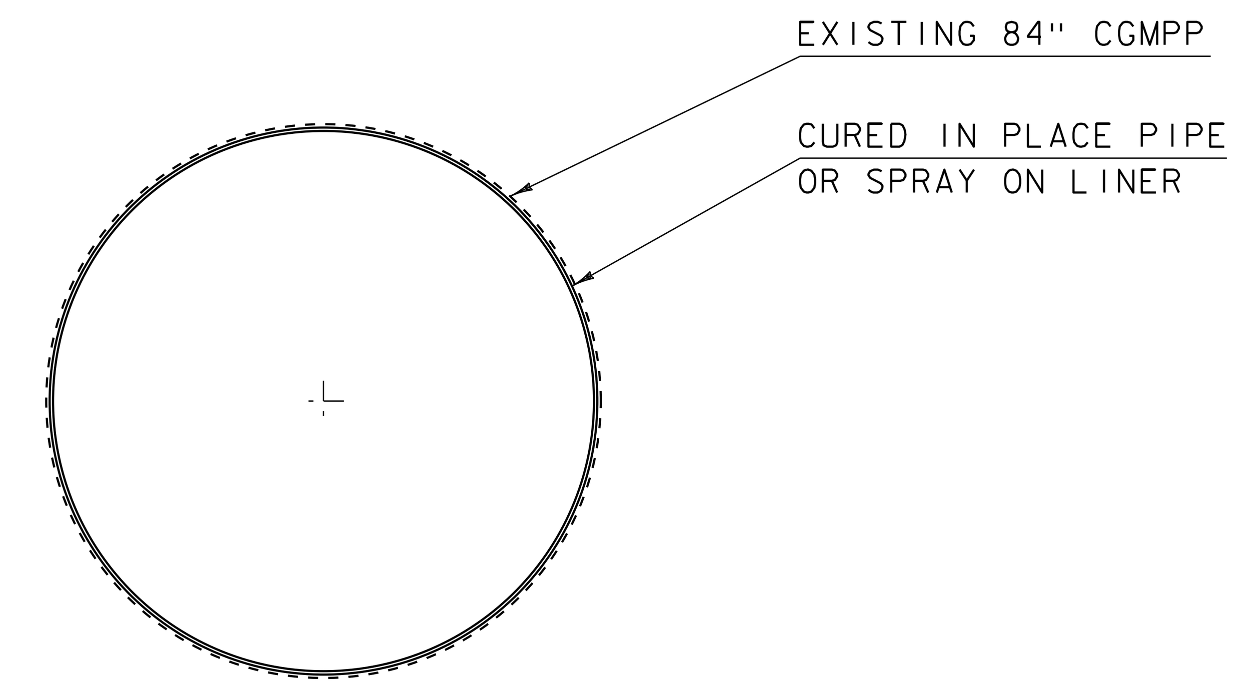
PROJECT NAME: WOODFORD
PROJECT NUMBER: BF 010-1(52)

FILE NAME: 13b270/s13b270profile.dgn
PROJECT LEADER: J.FITCH
DESIGNED BY: G.SWEENY
PROFILE SHEET

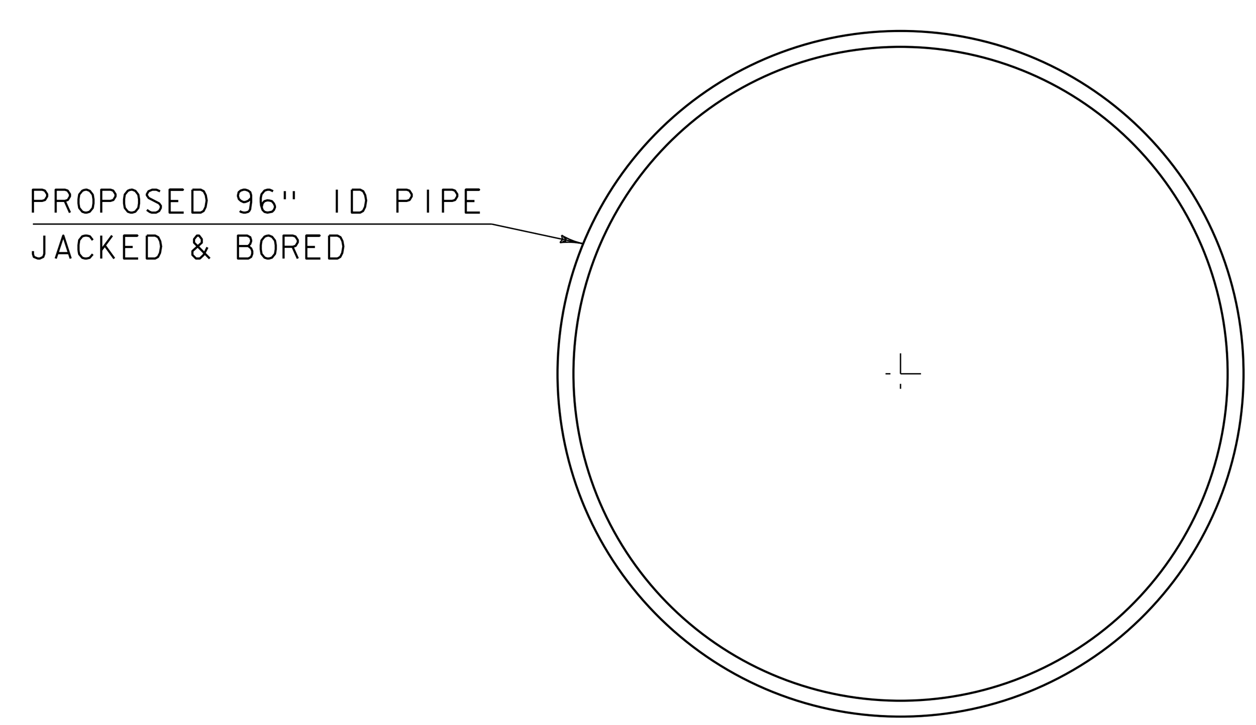
PLOT DATE: 19-FEB-2016
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 2 OF 15



ALTERNATIVE 1A TYPICAL SECTION



ALTERNATIVES 1B & 1C TYPICAL SECTION



ALTERNATIVE 2 TYPICAL SECTION

PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-1(52)	
FILE NAME: 13b270/s13b270typical.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
TYPICAL SECTIONS	SHEET 3 OF 15

EXISTING CURVE
DELTA = 23°00′40″
D = 1°30′00″
R = 3819.72′
T = 777.51′
L = 1534.07′
E = 78.33′

EXISTING 7′ CGMPP
92′ LONG, BUILT 1919
RECONSTRUCTED 1965
6′ AVERAGE COVER
38 SQFT WATERWAY AREA

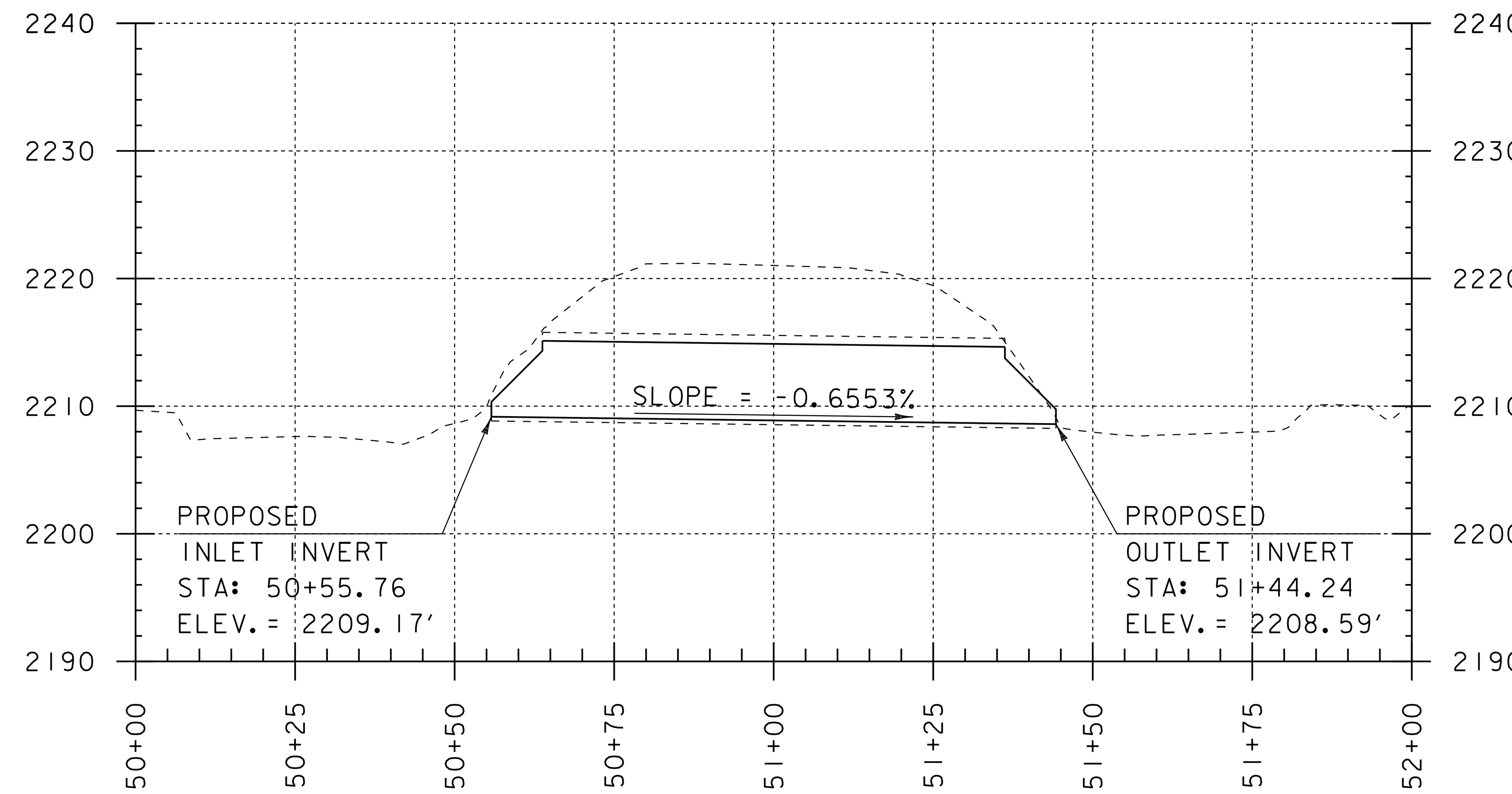
ALTERNATIVE 1

SCALE 1″ = 20′-0″
20 0 20

PROJECT NAME: WOODFORD
PROJECT NUMBER: BF 010-1(52)

FILE NAME: 13b270/sl3b270border.dgn
PROJECT LEADER: J.FITCH
DESIGNED BY: G.SWEENY
ALTERNATIVE #1 LAYOUT

PLOT DATE: 19-FEB-2016
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 4 OF 15



ALTERNATIVE 1 CULVERT PROFILE

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

VT ROUTE 9 ALTERNATIVE 1 PROFILE

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

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

PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-1(52)	
FILE NAME: 13b270/s13b270profile.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
SNOW ALTERNATIVE 1 PROFILE SHEET	SHEET 5 OF 15

EXISTING CURVE
DELTA = 23°00′40″
D = 1°30′00″
R = 3819.72′
T = 777.51′
L = 1534.07′
E = 78.33′

EXISTING 7′ CGMPP
92′ LONG, BUILT 1919
RECONSTRUCTED 1965
6′ AVERAGE COVER
38 SQFT WATERWAY AREA

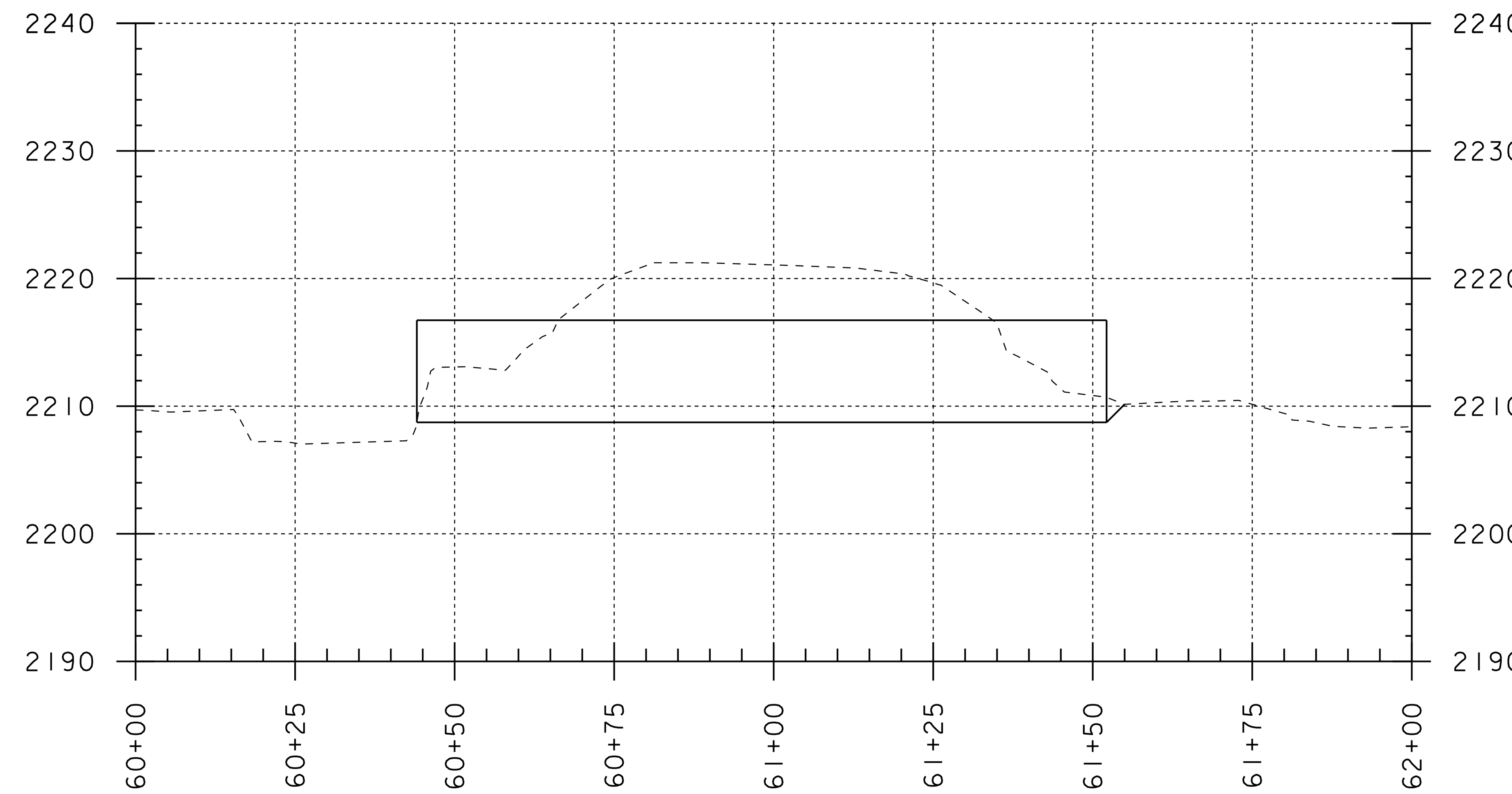
ALTERNATIVE 2

SCALE 1″ = 20′-0″
20 0 20

PROJECT NAME: WOODFORD
PROJECT NUMBER: BF 010-1(52)

FILE NAME: 13b270/s13b270border.dgn
PROJECT LEADER: J.FITCH
DESIGNED BY: G.SWEENY
ALTERNATIVE #2 LAYOUT

PLOT DATE: 19-FEB-2016
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 6 OF 15



ALTERNATIVE 2 CULVERT PROFILE

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

ALTERNATIVE 2 VT ROUTE 9 PROFILE

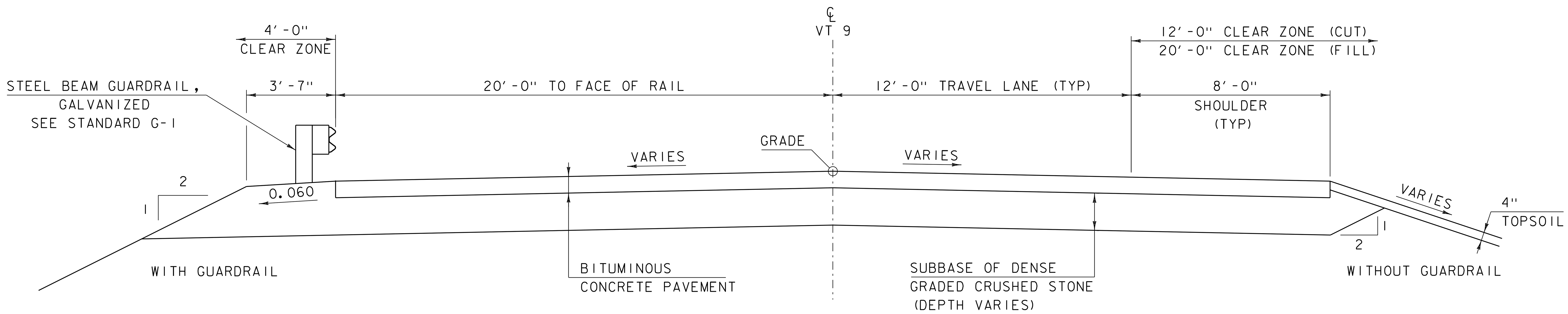
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

PROJECT NAME: WOODFORD
PROJECT NUMBER: BF 010-1(52)

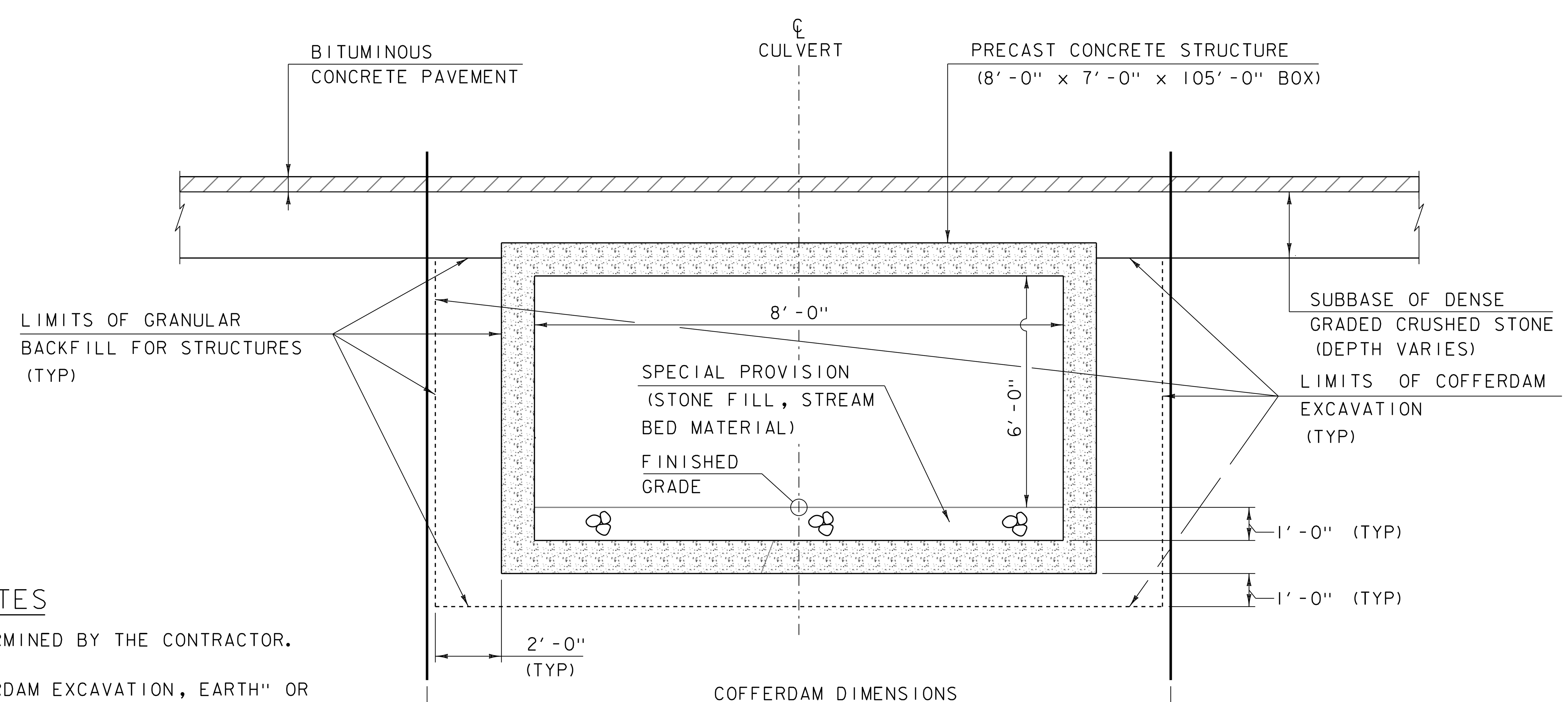
FILE NAME: 13b270/s13b270profile.dgn
PROJECT LEADER: J.FITCH
DESIGNED BY: G.SWEENY
ALTERNATIVE 2 PROFILE SHEET

PLOT DATE: 19-FEB-2016
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 7 OF 15



EXISTING/PROPOSED VT 9 TYPICAL SECTION

SCALE 3/8" = 1'-0"



ALTERNATIVE 3

N.T.S.

STRUCTURE MAY ALSO BE A 96" ID PIPE
WITH INVERT BURIED 1' DEEP

COFFERDAM NOTES

1. COFFERDAM DIMENSIONS TO BE DETERMINED BY THE CONTRACTOR.
2. THE PAY LIMITS OF EITHER "COFFERDAM EXCAVATION, EARTH" OR "COFFERDAM EXCAVATION, ROCK" SHALL BE AS DETAILED IN THE TYPICAL SECTION.
3. IF A COFFERDAM IS CONSTRUCTED WHICH IS LARGER THAN DETAILED ABOVE, NO MEASUREMENT AND PAYMENT WILL BE MADE FOR COFFERDAM EXCAVATION AND GRANULAR BACKFILL FOR STRUCTURES OUTSIDE THOSE PAY LIMITS.

MATERIAL TOLERANCES

(IF USED ON PROJECT)

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

PROJECT NAME: WOODFORD
PROJECT NUMBER: BF 010-1(52)

FILE NAME: 13b270\s13b270typical.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
TYPICAL SECTIONS	SHEET 8 OF 15

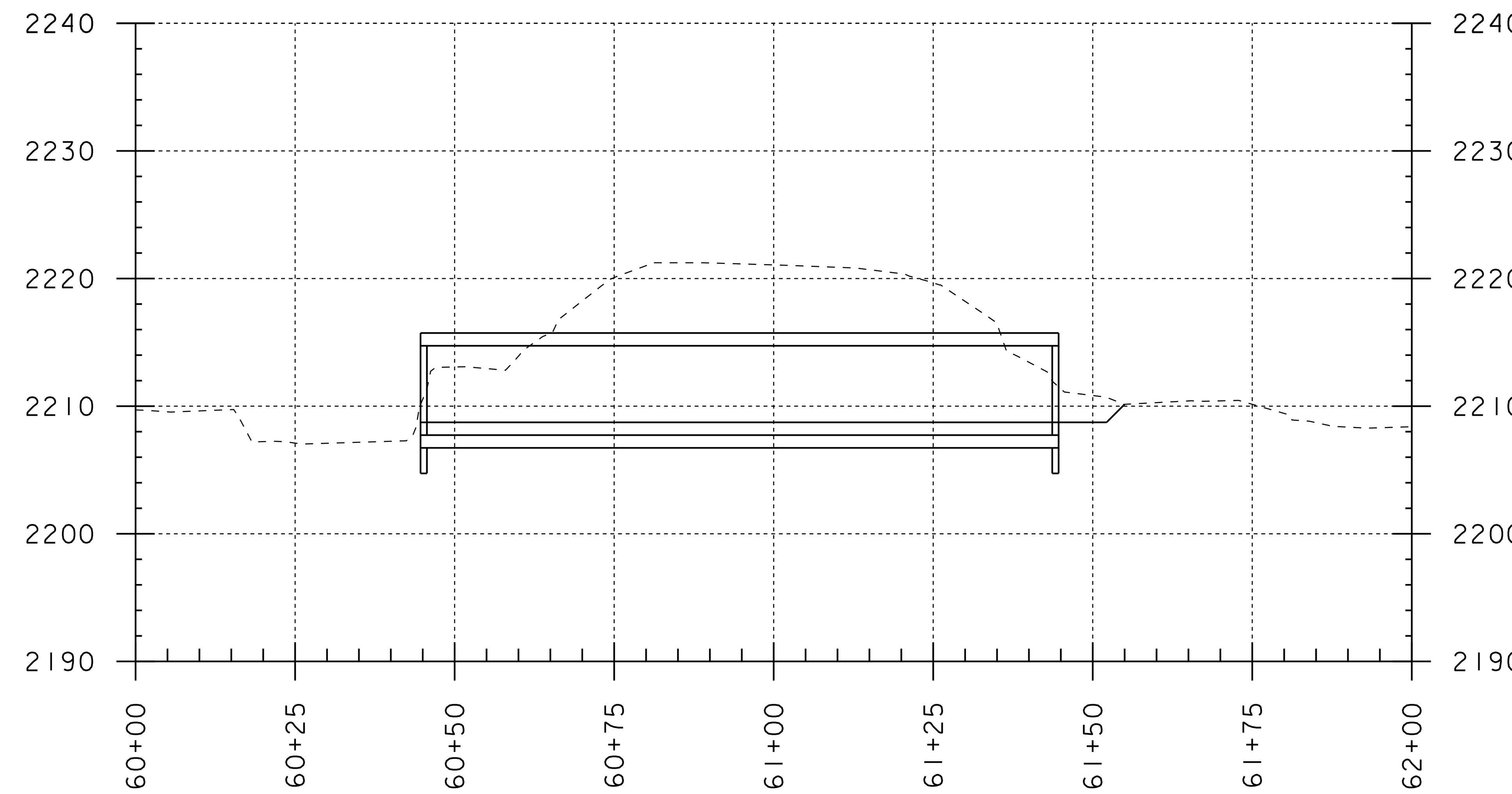
EXISTING CURVE
DELTA = 23°00′40″
D = 1°30′00″
R = 3819.72′
T = 777.51′
L = 1534.07′
E = 78.33′

EXISTING 7′ CGMPP
92′ LONG, BUILT 1919
RECONSTRUCTED 1965
6′ AVERAGE COVER
38 SQFT WATERWAY AREA

ALTERNATIVE 3

SCALE 1″ = 20′-0″
20 0 20

PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-1(52)	
FILE NAME: 13b270/s13b270border.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
ALTERNATIVE #3 LAYOUT	SHEET 9 OF 15



ALTERNATIVE 3 CULVERT PROFILE

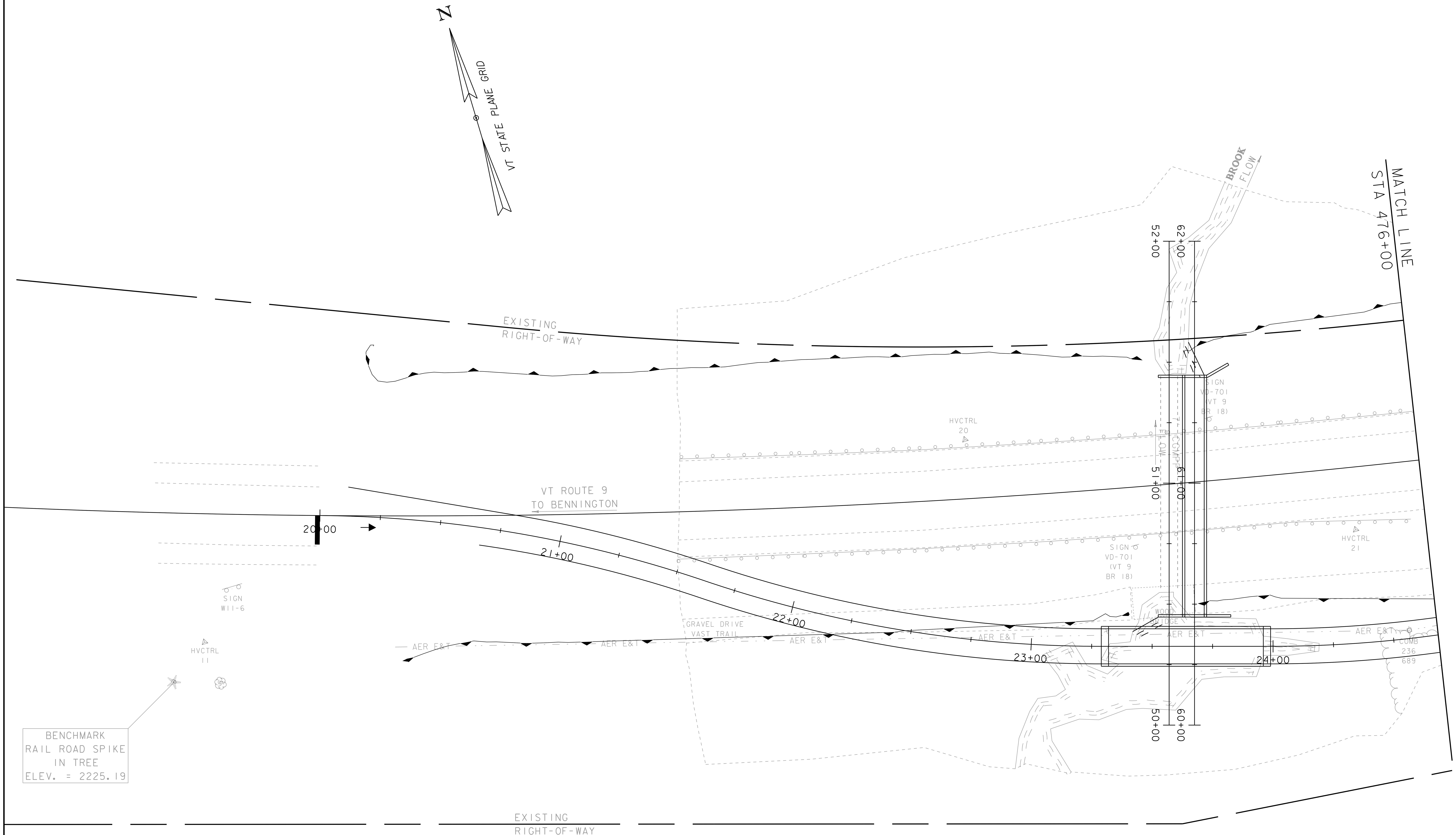
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

ALTERNATIVE 3 VT ROUTE 9 PROFILE

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

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

PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-1(52)	
FILE NAME: 13b270/s13b270profile.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
ALTERNATIVE 3 PROFILE SHEET	SHEET 10 OF 15

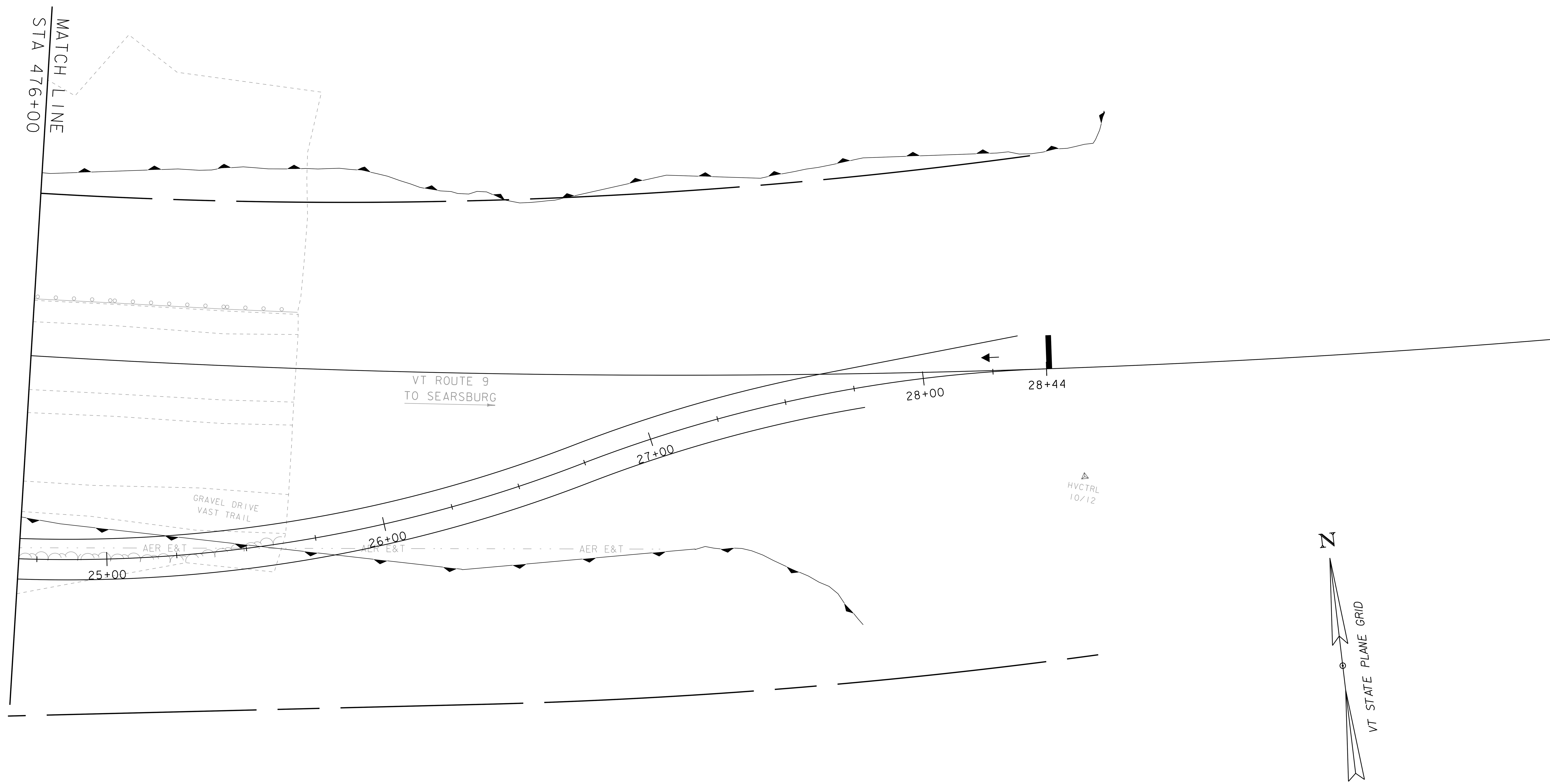


EXISTING 7' CGMPP
92' LONG, BUILT 1919
RECONSTRUCTED 1965
6' AVERAGE COVER
38 SQFT WATERWAY AREA

UPSTREAM TEMPORARY BRIDGE 1

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

PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-1(52)	
FILE NAME: 13b270/s13b270TCborder.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
UPSTREAM TEMPORARY BRIDGE LAYOUT 1	SHEET 11 OF 15

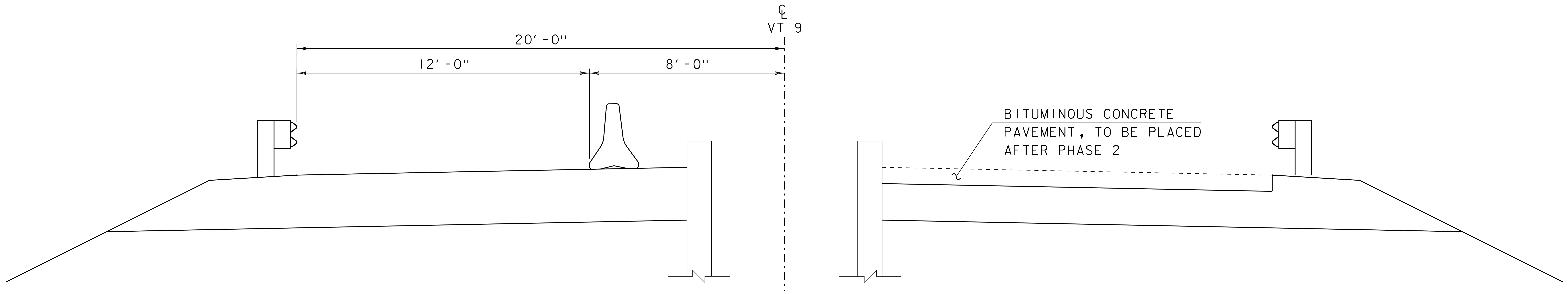


UPSTREAM TEMPORARY BRIDGE 2

SCALE 1" = 20'-0"

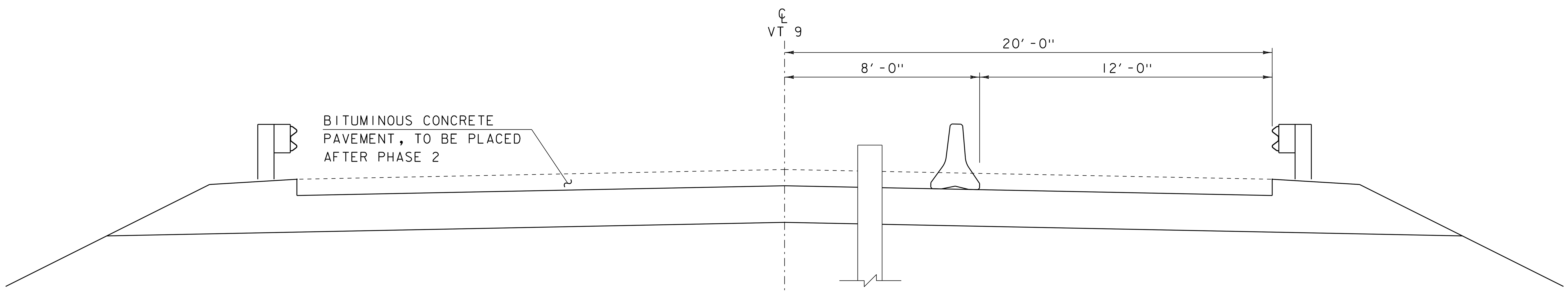
20 0 20

PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-1(52)	
FILE NAME: 13b270/s13b270TCborder.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
UPSTREAM TEMPORARY BRIDGE LAYOUT 2	SHEET 12 OF 15



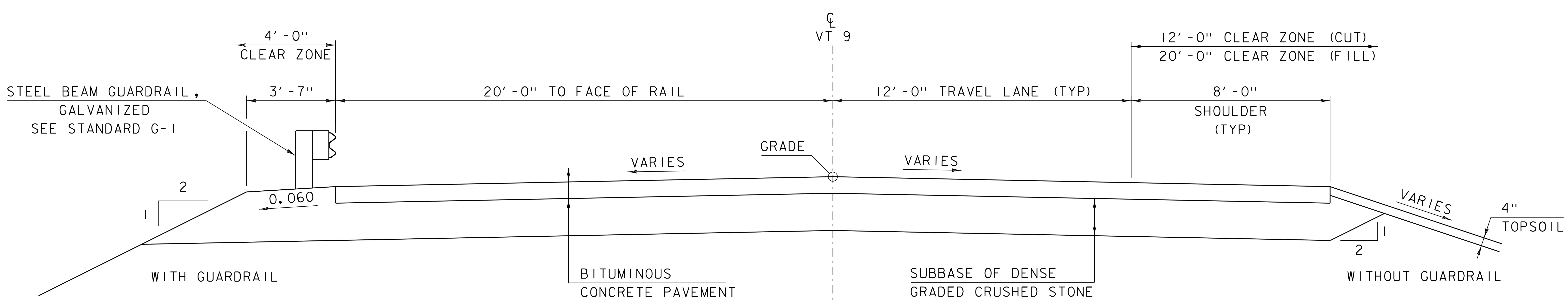
PHASE 1 TYPICAL SECTION

SCALE 3/8" = 1'-0"



PHASE 2 TYPICAL SECTION

SCALE 3/8" = 1'-0"



EXISTING/PROPOSED VT 9 TYPICAL SECTION

SCALE 3/8" = 1'-0"

PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-1(52)	
FILE NAME: 13b270\s13b270phasing.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
PHASING TYPICAL SECTIONS	SHEET 13 OF 15

EXISTING 7' CGMPP
92' LONG, BUILT 1919
RECONSTRUCTED 1965
6' AVERAGE COVER
38 SQFT WATERWAY AREA

PHASE #1

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

PROJECT NAME:	WOODFORD
PROJECT NUMBER:	BF 010-1(52)

FILE NAME: 13b270/s13b270TCborder.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
PHASE #1 LAYOUT	SHEET 14 OF 15

EXISTING 7' CGMPP
92' LONG, BUILT 1919
RECONSTRUCTED 1965
6' AVERAGE COVER
38 SQFT WATERWAY AREA

PHASE #2

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

PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-1(52)	
FILE NAME: 13b270/s13b270TCborder.dgn	PLOT DATE: 19-FEB-2016
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
PHASE #2 LAYOUT	SHEET 15 OF 15