STATE OF VERMONT
AGENCY OF TRANPORTATION

Scoping Report

FOR

Fairfield BRF 0281(25)

FAS ROUTE 281 (TH 1), Bridge 14 OVER FAIRFIELD RIVER

September 12,
2012

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I. Site Information

Bridge 14 is located in a rural area along FAS Route 281 (TH 1) approximately 2.5 miles south of the junction with VT 36. The bridge is located on a straight segment of FAS Route 281. There are field driveways located in the northeast, northwest, and southeast quadrants of the bridge. 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 Major Collector, (Class 2 Town Highway)
Bridge Type	Concrete Slab Bridge
Bridge Span	23 feet long
Year Built	1949
Ownership	Town of Fairfield

Need

The following is a list of the deficiencies of Bridge 14 and TH 1 in this location.

1. The substructure and channel are in poor condition and the bridge is classified as Structurally Deficient.

2. The original cable rail has been replaced with w-beam rail with curb mounted concrete posts. This bridge rail is still substandard.

3. The existing bridge does not have adequate hydraulic capacity. There is occasional overtopping of the bridge and roadway with significant traffic delays. Additionally, the existing bridge has obvious scour issues.

4. Abutment 1's upstream wingwall has significant undermining.

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	2055
ADT	580	620	~
DHV	90	95	~
ADTT	40	60	~
%T	6.7	10.8	~
%D	50	50	~
FLEXIBLE ESAL	~	2015 ~ 2035	2015 ~ 2055
		206,000	506,000

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on an ADT of 620 and a design speed of 40 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 5.3	9'/1' (20')	9'/3' (24')	Substandard
Bridge Lane and Shoulder Widths	VSS Table 5.3	9'/2.5' (23')	9'/3' (24')	Substandard
Clear Zone Distance	VSS Table 5.5		7' fill / 7' cut	
Banking			8% (max)	
Speed		40 mph (Posted)	40 mph (Design)	
Horizontal Alignment	AASHTO Green Book Exhibit 3-26	R=∞' , Bridge located on a straight segment of roadway	R_{min}=5410' (Normal Crown)	
Vertical Grade	VSS Table 5.6	Bridge located in transition from (-)0.4699% grade to (-)0.2679% grade	7% (max) for level terrain	
K Values for Vertical Curves	VSS Table 5.1	Bridge located on sag (K = 990)	60 crest / 60 sag	
Vertical Clearance Issues	VSS Section 5.8	None noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 5.1	3,577'	275'	
Bicycle/Pedestrian Criteria	VSS Table 5.8		2' Shoulder	
Bridge Railing	N/A	W-beam rail with curb mounted concrete posts	TL-2	Substandard

Inspection Report Summary

Deck Rating	7 Good
Superstructure Rating	7 Good
Substructure Rating	4 Poor
Channel Rating	4 Poor

05/27/2010 – Concrete curbs along both sides are in need of moderate repairs. Anti-scour protection is needed along the footing of abutment No. 2. ~PLB

8/28/2008 – This structure is in poor to good condition. Abutment 2 has settled some in the past, but appears to have stabilized. Abutment 1's upstream wingwall has some undermining. The undermining runs along the wingwall for about 6' from the end of the wingwall. The undermining goes under the toe of the footing about $1^1/_2$' to $2^1/_2$' and is about 6" deep. The town should fill the undermining in and protect the wingwall with some means of scour protection. ~DCP

Hydraulics
From preliminary hydraulics report:

Most of the calculated flows do not pass through the existing structure, except the Q_{10} event. Therefore, the existing bridge is grossly undersized and does not have adequate hydraulic capacity for the design flow (Q_{50}) event based on our analysis of the existing conditions. Furthermore, the existing bridge appears to constrict the channel which has resulted in scour occurring near the bridge and particularly along the left abutment which appears to be partially undermined.

Recommendations

Based on our analysis, the primary recommendation will be for a bridge having a 40-foot clear span normal to the stream channel (between the abutment faces) with a low beam elevation at or above 602.1 feet and stone fill protection to allow for adequate hydraulic capacity for the Q_{50} design storm event.

Utilities

There are overhead utility lines passing over the river on the eastern side of the bridge. These utility lines remain on the downstream side of the road for the entirety of the project area and do not cross over the road at the project location.

Right Of Way

The existing Right-of-Way at the project location is 3-rods. It is shown on the Layout sheet. It is anticipated that work can be done within the Right-of-Way for all options, except the temporary bridge option.

Resources

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

Archaeological:
There are two areas of archaeological sensitivity that have been identified in the northeast and southeast quadrants of the project area. See the appendix and resource layout sheet for more information.

Biological:

Wetlands
There are wetlands within the project area. Formal wetland delineation according to US Army Corps of Engineers Wetland Delineation Manual was not completed and wetlands were identified using best professional judgment for resource identification/planning purposes. The wetlands are located in all quadrants of the project and would be considered contiguous to the mapped class II

wetlands. Wetlands in the project area are emergent wetlands adjacent to the Fairfield River and its floodplain. A shape file with approximate wetland boundaries is available for reference.

The Fairfield River flows north easterly through the project area. This river would support a variety of aquatic organisms including wild brook trout. Efforts to minimize water quality impacts during construction will need to be evaluated as the project design moves forward.

The US Corps of Engineers and the Agency of Natural Resources- Department of Environmental Conservation would regulate all activities below ordinary high water and to wetlands.

Wildlife Habitat

General Wildlife habitat exists within the surrounding area. The project area consists of agricultural lands. There are no wildlife corridor issues within the project area.

Rare, Threatened and Endangered Species

There are no mapped rare, threatened or endangered species within the project area.

Agricultural

There are prime agricultural soils within the project area. These soils are in the Winooski silt loam and Binghamville silt loam series.

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

Historic:
Bridge 14 and the adjacent properties are not historic.

Stormwater:
There are no storm water related concerns for 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: Temporary Bridge

Initial investigations indicate that any temporary bridge should be located downstream of the existing structure. Due to the layout of the Fairfield River, a temporary bridge would be difficult

to place on the upstream side of the bridge. The brook bends to get into the bridge as the river mostly parallels the road upstream of the bridge. Additionally, an upstream temporary bridge would require cutting down a number of mature trees.

A one-way temporary bridge without traffic signals would be appropriate based on the daily traffic volumes. This would require temporary Right-of-Way acquisition, which would extend the project development phase. A downstream temporary bridge would have adverse impacts to class II wetland areas. There are class II wetlands located in all four quadrants of the project site. This option would have the smallest impacts to the traveling public. See the Temporary Bridge Layout Sheet in the appendix.

Advantages: Traffic flow can be maintained through the project site.

Disadvantages: This option would require Right of Way acquisition and would be relatively high in cost. This option would have adverse impacts to the environmental resources located on the downstream side of the bridge. There would be some delays and disruption to traffic, since the road would be reduced to one-way traffic, and the speed limit reduced to 30 mph. 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. Also, a downstream temporary bridge would require overhead utilities to be relocated.

Option 2: Phased Construction

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

Based on traffic volumes, it is reasonable to close one lane of traffic, and maintain one lane of traffic, both ways, without a traffic signal.

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

Phased construction would not be possible at this site without shifting the alignment of the proposed bridge, widening the proposed bridge, or using a temporary bridge for one of the phases. None of those options are ideal. Additionally, phased construction would result in a longer, more expensive, and less safe construction project, and thus, it will not be considered further.

Advantages: This option would not require Right-of-Way acquisition. As a result, there are decreased costs and development time, by not having to go through the Right-of-Way process.

Additionally, this option would maintain traffic while having minimal impacts to the surrounding resources.

Disadvantages: Phased construction generally involves higher costs and complexity of construction. Costs are usually higher, since many construction activities have to be performed two times. It would not be possible at this site without shifting the alignment of the proposed bridge, widening the proposed bridge, or using a temporary bridge for one of the phases. Additionally, since cars are traveling near construction activity, there is decreased safety. There would be some delays and disruption to traffic, since the road would be reduced to one-way traffic.

Option 3: Off-Site Detour

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

There are several possible routes that would be appropriate for a detour at this site. These routes vary in end-to-end distance from 9.88 miles to 14.97 miles, and take approximately the same time to drive. Regardless of the route chosen, it is likely that any of these routes could see increased traffic if TH 1 were closed during construction. Some possible detour routes which the Town of Fairfield may want to choose are as follows:

1. South Rd. (TH 1), to Bradley Rd., West St., Carroll Hill Rd. (TH 11), Buck Hollow Rd., back to South Rd. (TH 1) (9.88 mi end-to-end)

2. South Rd. (TH 1), to VT 36, Swamp Rd., Cadieux Rd., Carroll Hill Rd. (TH 11), Buck Hollow Rd., back to South Rd. (TH 1) (13.87 mi end-to-end)

3. South Rd. (TH 1), to VT 36, Mill St., Trudell Rd., Lapland Rd., Howrigan Rd., back to South Rd. (TH 1) (14.97 mi end-to-end)

A map of possible detour routes can be found in the appendix.

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

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

III. Alternatives Discussion

The existing bridge is in poor to good condition. The existing bridge does not meet hydraulic standards, and scour is present along the abutments. Most of the calculated flows do not pass through the existing structure, except the Q_{10} event. Abutment 2 has been partially undermined.

No Action
This alternative is not recommended. The substructure is rated poorly, and should be replaced in the near future. The structure is not adequate hydraulically, and failure to address this will result in future scour and undermining of the abutments. 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.

Alternative 1: Preventative Maintenance
This alternative involves scour mitigation for the existing substructure. The substructure has been rated a 4, which is considered poor. However, this rating is largely due to scour. Since the superstructure and deck are in good condition, it is possible to extend the life of the existing structure 20 years, with scour mitigation. Mitigation would consist of temporarily diverting the stream, and pouring a concrete apron along the footings to four feet below the stream bed. The mitigation would need to be monitored for the life of the existing structure, as this would be a scour critical fix.

Advantages: This option would have the lowest upfront costs.

Disadvantages: This option would not address the substandard hydraulic capacity of the existing bridge. This alternative would require future monitoring for scour. The channel is rated as poor, and this option would not improve the channel rating. Additionally, the existing bridge width is substandard by one foot, which would not be addressed by this option.

Alternative 2: New Structure
The existing horizontal alignment meets current standards; therefore, no off-alignment options will be considered because of the additional expense and impacts associated with realigning a roadway. The various considerations under this option include: the bridge width and length, skew, superstructure type and substructure type.

This option would be a brand new bridge that addresses both the current structural deficiencies and hydraulic deficiencies of the existing bridge. The low beam elevation required to provide adequate hydraulic capacity is 11 inches below the existing grade of the road. Therefore, the road will need to be raised at the bridge location; a superstructure type with a shallow profile should be chosen to minimize the vertical change from existing. The existing structure has an obvious scour issue. Thus, lining the channel at the bridge location with Type III or Type IV stone would be mandatory for scour protection.

a. Bridge Width

The current rail to rail width is 23 feet. This does not meet the minimum standard of 24 feet. Since a new 80+ year bridge is being proposed in this location, the bridge geometry should meet the minimum standards. A 24 foot width bridge will be proposed.

b. Bridge Length and Skew

The existing bridge is 23 feet long and with no skew. This does not match the existing channel, which is significantly skewed to the roadway both upstream and downstream of the bridge. The

preferred substructure type is an integral abutment. Based on the layout procedures for integral abutments, the appropriate span for this location is 44 feet. Integral abutments do not accommodate skews over 20° well. Therefore a skew of 20 degrees will be chosen, to best match the channel.

By increasing the span to 53', the skew could be eliminated providing a simple square superstructure and integral abutment substructure. However, in order to maintain hydraulic clearance, a deeper superstructure would need to be chosen. The roadway already needs to be raised approximately one foot at the bridge location. If the bridge is raised an additional 3 inches, then the roadway vertical profile would not meet current state standards. It does not make sense to construct a bridge with a substandard vertical alignment in order to eliminate the skew. Therefore, a span of 44 feet with a bridge skew of 20 degrees will be chosen.

c. Superstructure Type

Since the roadway will need to be raised in order to meet hydraulic capacity standards, the superstructure type that is the shallowest that can accommodate the span should be chosen. The possible 44' span length bridge types that are most commonly used in Vermont, are steel and composite concrete deck, NEXT beams, and voided slabs. Voided slabs with a cast-in-place concrete overlay provide the shallowest depth for this span, and should be considered as the best superstructure type for this location. This will result in an overall superstructure depth of 21 inches. NEXT beams for this span range would have an overall superstructure depth of 31 inches.

d. Substructure Type

There is no visible bedrock in the location of the project, and available subsurface information indicates that the site is comprised of a mixture of silt, sand, and gravel. This should be conducive for an integral abutment at this location. This type of substructure will provide the best scour protection for this scour critical bridge location. Any rapid construction alternative should have sufficient subsurface information to verify the in-situ conditions.

e. Maintenance of Traffic

Either a temporary bridge or a road closure would be appropriate measures for traffic control at this site. If the road is closed during construction, the local share of funds will be reduced by 50%.

IV. Alternatives Summary

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

Alternative 1: Preventative Maintenance: Concrete Apron for Scour Mitigation
Alternative 2a: New Integral Abutment Bridge with Traffic Maintained on an Offsite Detour
Alternative 2b: New Integral Abutment Bridge with Traffic Maintained on a Temporary Bridge

V. Cost Matrix

A cost evaluation for each of the alternatives is shown below.

Fairfield BRF 0281(25)		Do Nothing	Alt 1 Preventative Maintenance: Concrete Apron Scour Mitigation	Alt 2a New Structure with Traffic Maintained on Offsite Detour	Alt 2b New Structure with Traffic Maintained on a Temporary Bridge
COST	Bridge Cost	$0	$62,500	$297,000	$297,000
	Removal of Structure	$0	$0	$50,000	$50,000
	Channel Work	$0	$4,000	$8,000	$8,000
	Roadway	$0	$43,987	$170,391	$226,641
	Erosion Control	$0	$5,000	$20,000	$30,000
	Temporary Bridge	$0	$0	$0	$100,000
	Total Construction Costs	$0	115,375	$545,391	$711,641
	Construction Duration		1 month, w/ daily lane closures	4 months, with 4 week closure	18 months
	Preliminary Engineering[1]	**$0**	**$46,150 (40%)**	**$190,887 (35%)**	**$213,492 (30%)**
	Right of Way	**$0**	**$0**	**$0**	**$85,397**
	Construction Costs + Construction Engineering + Contingencies	**$0**	**$149,988**	**$709,008**	**$925,133**
	Project Development Duration		1 year	2 years	4 years
	Total Costs	$0	$196,138	$899,895	$1,224,022
	Premium			0%	36.02%
	Design Life		20 years	80 years	80 years
TOWN SHARE	Town Share	$0	$9,807 (5%)	$44,995 (5%)	$122,402 (10%)
ENGINEERING					
	Typical Section - Roadway (feet)	20'	20'	24'	24'
	Typical Section - Bridge (feet)	2.5 - 9 - 9 – 2.5	2.5 - 9 - 9 – 2.5	3 - 9 - 9 - 3	3 - 9 - 9 – 3
	Geometric Design Criteria	Substandard	Substandard	Meets Criteria	Meets Criteria
	Traffic Safety	No Change	Improved	Improved	Improved
	Alignment Change	No	No	Raised Vertical	Raised Vertical
	Bicycle Access	No Change	No Change	No Change	No Change
	Hydraulic Performance	No Change	Slightly Improved	Improved	Improved
	Pedestrian Access	No Change	No Change	No Change	No Change
	Utility	No Change	No Change	Relocation	Relocation
OTHER	ROW Acquisition	No	No	No	Yes
	Road Closure	No	No	Yes	No

[1] Preliminary Engineering costs are estimated starting from the end of the Project Definition Phase.

VI. Conclusion

We recommend Alternate 2a; to replace the existing bridge while maintaining traffic on an offsite detour.

Structure

The existing structure is undersized for hydraulics, and without a full replacement, scour will continue to be a major cause of the deterioration of this bridge. Additionally, constructing a new bridge is the only way to improve the channel alignment. Based on the soil conditions at the site, an integral abutment is the preferred substructure type, which will provide adequate scour protection. The new bridge should have a span of 44 feet. A superstructure type with the shallowest profile for this span length should be chosen to maximize the hydraulic capacity. In order to achieve the required low beam elevation for the Q50 event, the finished grade at the bridge should be raised approximately 1 foot. It is anticipated that Type III or Type IV stone fill be necessary for armoring the channel banks.

Traffic Control

It is recommended that traffic be maintained on an offsite detour. This option will not have permanent impacts to surrounding environmental resources and will not require Right-of-Way acquisition. The ADT on TH 1 is 580, which is considered relatively low. Additionally, there are several reasonable detour routes that could be signed by the Town of Fairfield. Therefore, it is reasonable to close the road and reroute traffic while the new bridge is being constructed. By not providing a temporary bridge, both the project development time and the project cost are significantly reduced.

VII. Appendices

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

Site Pictures

Western side of the bridge

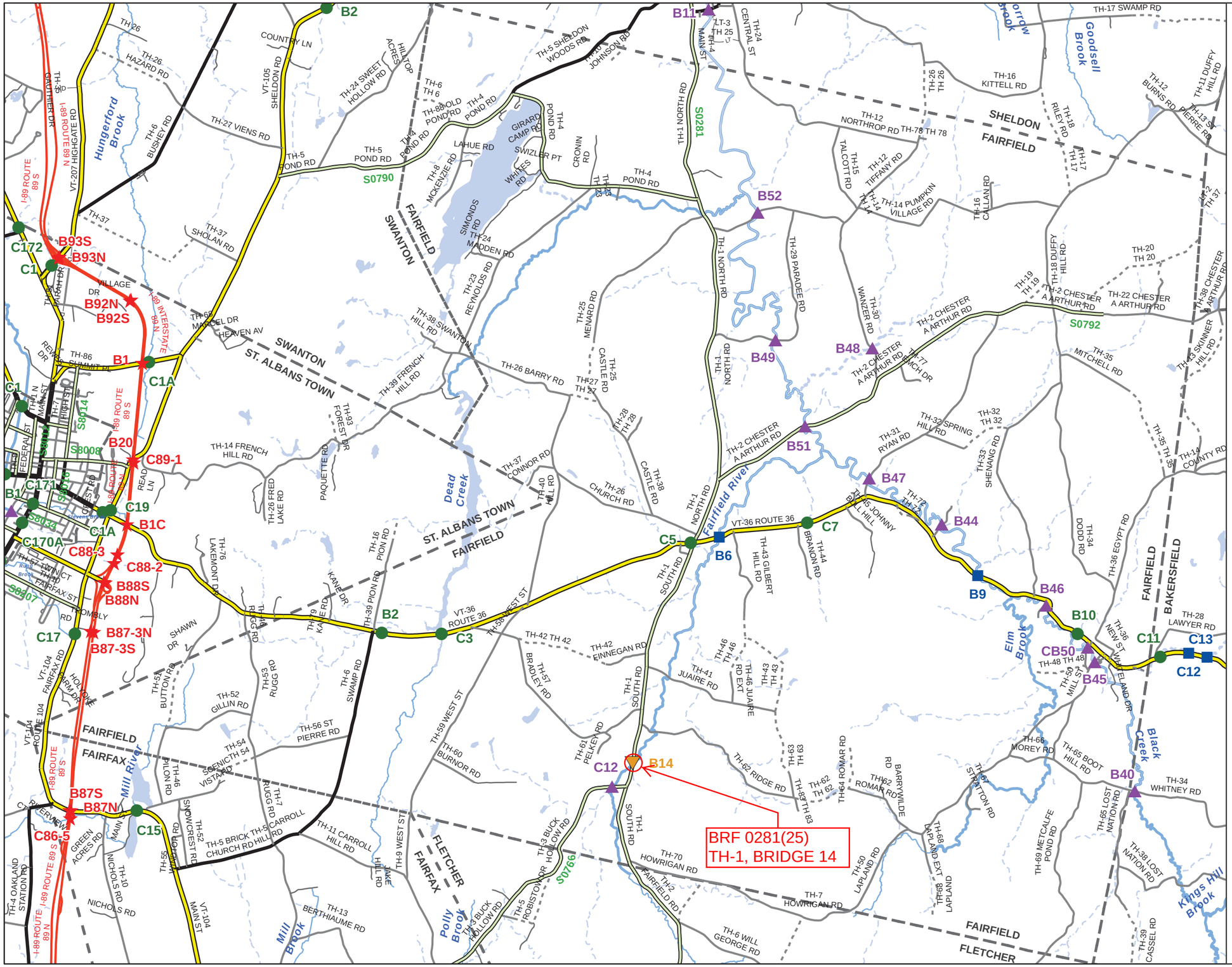
Eastern side of the bridge

Looking upstream, to the north

Looking downstream, to the south

Deterioration of concrete

Cracking in Abutment 2


BRF 0281(25)
TH-1, BRIDGE 14
FAIRFIELD
SHELDON
SWANTON
ST. ALBANS TOWN
FAIRFAX
FLETCHER
BAKERSFIELD
Hungerford Brook
Dead Creek
Fairfield River
Mill River
Mill Brook
Polly Brook
Elm Brook
Black Creek
Kings Hill Brook
Goodsell Brook
Scale 1:63,099
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
FAIRFIELD
FRANKLIN COUNTY
DISTRICT # 8

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for FAIRFIELD **bridge no.:** 00014 **District:** 8

Located on: TR 01 FAS 281 **over** FAIRFIELD RIVER **approximately** 2.5 MI S JCT. VT.36 **Owner:** 03 TOWN-OWNED

CONDITION

Deck Rating: 7 GOOD

Superstructure Rating: 7 GOOD

Substructure Rating: 4 POOR

Channel Rating: 4 POOR

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200281001406052

Federal Sufficiency Rating: 46.5

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1949 **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): 17

ADT: 000450 **% Truck ADT:** 06

Year of ADT: 1995

GEOMETRIC DATA

Length of Maximum Span (ft): 0023

Structure Length (ft): 000026

Lt Curb/Sidewalk Width (ft): 0.9

Rt Curb/Sidewalk Width (ft): 0.9

Bridge Rdwy Width Curb-to-Curb (ft): 23.8

Deck Width Out-to-Out (ft): 27.4

Appr. Roadway Width (ft): 020

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: CONCRETE SLAB

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

Kind of Material and/or Design: 1 CONCRETE

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane 0 NONE

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 0 DOES NOT MEET CURRENT STANDARD

Transitions: 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail: 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail Ends: 0 DOES NOT MEET CURRENT STANDARD

Structural Evaluation: 4 MEETS MINIMUM TOLERABLE CRITERIA

Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal: N NOT APPLICABLE

Waterway Adequacy: 5 OCCASIONAL OVERTOPPING OF BRIDGE & ROADWAY WITH SIGNIFICANT TRAFFIC DELAYS

Approach Roadway Alignment: 8 EQUAL TO DESIRABLE CRITERIA

Scour Critical Bridges: 2 SCOUR CRITICAL - IMMEDIATE ACTION REQUIR

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: 10 NO LOAD POSTING SIGNS ARE NEEDED

Posted Vehicle: POSTING NOT REQUIRED

Posted Weight (tons):

Design Load: 0 OTHER OR UNKNOWN

INSPECTION and CROSS REFERENCE

X-Ref. Route:

Insp. Date: 052010 **Insp. Freq. (months)** 24 **X-Ref. BrNum:**

INSPECTION SUMMARY and NEEDS

05/27/10 Concrete curbs along both sides are in need of moderate repairs. Anti-scour protection is needed along the footing of abutment No.2. PLB

THIS STRUCTURE IS IN POOR TO GOOD CONDITION. ABUTMENT 2 HAS SETTLED SOME IN THE PASS BUT APPEARS TO HAVE STABILIZED. ABUTMENT 1'S UPSTREAM WING HAS SOME UNDERMINING. THE UNDERMINING RUNS ALONG THE WING FOR ABOUT 6' FROM THE END OF THE WING. THE UNDERMINING GOES UNDER THE TOE OF THE FOOTING ABOUT 1-1/2' TO 2-1/2' AND IS ABOUT 6" DEEP. THE TOWN SHOULD FILL THE UNDERMINING IN AND PROTECT THE WING WITH SOME MEANS OF SCOUR PROTECTION. 8 / 28 / 08 DCP

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: July 23, 2012

SUBJECT: FAIRFIELD – BRF-0281(25) – FAS 0281 (TH1) Bridge 14 over Fairfield River

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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 1949 based on available information. The bridge is owned by the Town. The original bridge is a 2-lane single span having a concrete deck having a width of approximately 27 feet. The perpendicular clear span between the abutment faces is approximately 23 feet with vertical cast-in-place concrete abutment walls having a "stepped" type footing. The approximate height to the bottom of the superstructure over the streambed is approximately 5 – 7 feet (right to left respectively). The bridge is located at the tangent point of a large bend with the low flow being on the left (outside) edge of the channel. The channel is basically perpendicular to the roadway and the clear span of the bridge is normal to the channel at its current location.

Most of the calculated flows do not pass through the existing structure, except the Q_{10} event. Therefore, the existing bridge is grossly undersized and does not have adequate hydraulic capacity for the design flow (Q_{50}) event based on our analysis of the existing conditions. Furthermore, the existing bridge appears to constrict the channel which has resulted in scour occurring near the bridge and particularly along the left abutment which appears to be partially undermined. We did not evaluate the scour for the existing or proposed bridge configurations as part of the preliminary design. Scour calculations will be performed during final hydraulics.

Recommendations

Based on initial discussions with the Structures Group, it was determined that the existing bridge will be totally replaced with a new bridge that will be located in the existing alignment. It is anticipated the proposed deck will also be approximately 27 feet wide to meet the VTrans local road design standards. We have anticipated that the proposed abutments will be vertical face concrete abutments with stone fill scour protection. Based on the initial discussions, it is our understanding that the abutments will be built on piles as part of an integral abutment which will aid with scour protection.

Based on our analysis, the primary recommendation will be for a bridge having a 40-foot clear span normal to the stream channel (between the abutment faces) with a low beam elevation at or above 602.1 feet and stone fill protection to allow for adequate hydraulic capacity for the Q_{50} design storm event. This much wider structure will not constrict the stream channel width as significantly as the existing condition bridge, even with the additional stone fill used for scour protection. It is noted that with the proposed low beam elevation, it has been assumed that the roadway elevations will be raised from the existing grades (i.e. existing top of bridge grade at the edges is approximately 603 feet). However, the new top of bridge final grade should be transitioned back down to the existing

roadway grade (i.e. approximately elevation 602.5 feet) on the left (North) side of the structure to allow the roadway to act as a relief channel for very large storm events.

As noted above, scour was not reviewed during the preliminary design. However based on the velocities from the analyses and evidence from the site, it is anticipated that Type 3 or 4 Stone Fill will be necessary for armoring the channel banks near the replacement structure.

Temporary Bridge

Based on the initial discussions with the Structures Group, it is anticipated that the existing bridge will be used during the construction of the new bridge.

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

CEE CCB

From: Callie Ewald, Geotechnical Engineer, via Christopher C. Benda, P.E., Soils and Foundations Engineer

Date: May 29th, 2012

Subject: Fairfield BRF 0281(25) – TH 1, BR 14 Preliminary Geotechnical Information

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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 TH 1 (South Rd) crossing over the Fairfield River in Fairfield, Vermont. This review included our in-house bridge boring files, record plans, USDA Natural Resources Conservation soil survey records, surficial geology and bedrock maps of the State and the Agency of Natural Resources Well logs.

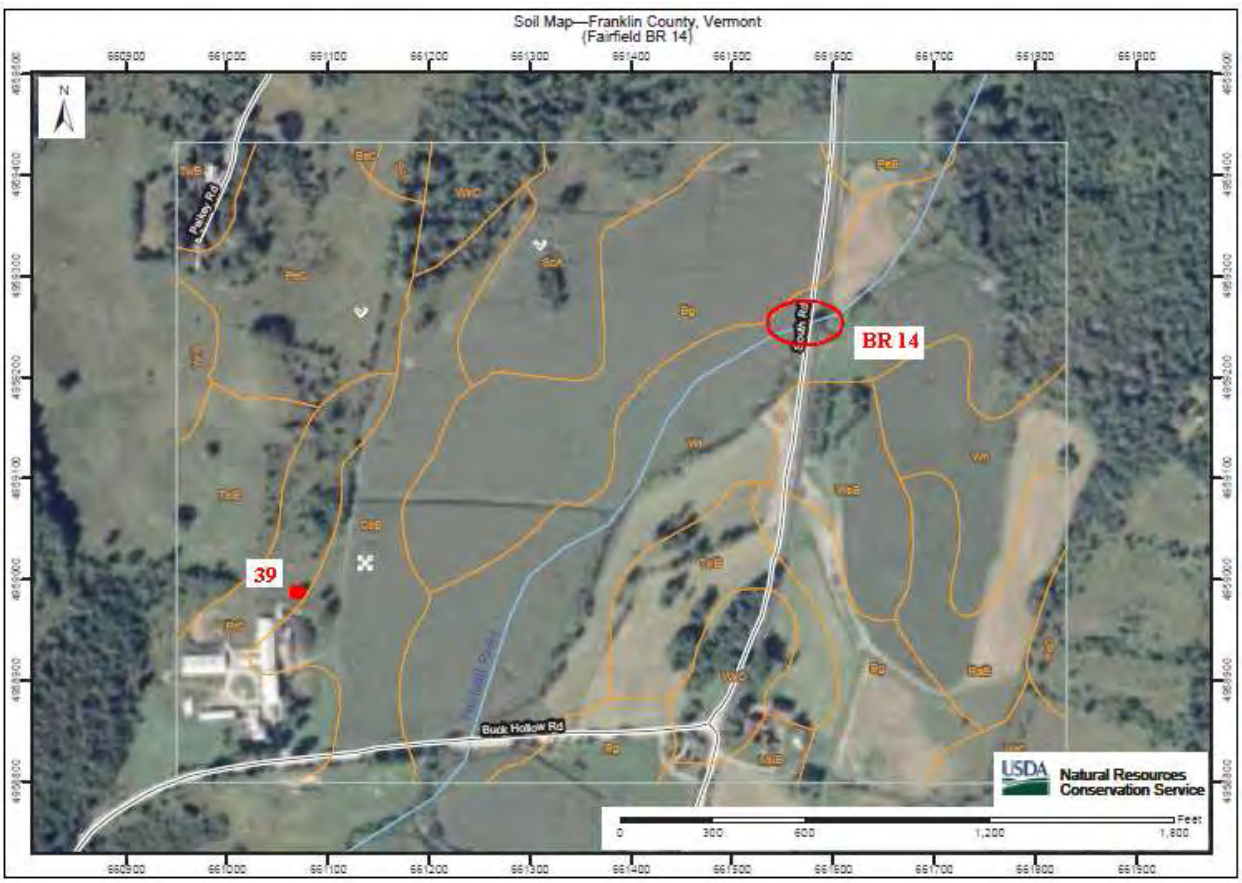

Figure 1, USDA Soil Survey and ANR Well Data near Bridge 14

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 done in the field, by unknown personnel, and as such, should only be used as an approximation. Based on subsurface information reported by well drilling reports on file at ANR and the USDA web soil survey, the surficial geology in the vicinity of the subject area is expected to consist of a mixture of silt, sand, and gravel. USDA soil descriptions and one nearby well location are shown in Figure 1 and summarized in Table 1.

Table 1, Well Log and USDA Soil Survey Descriptions

Well Number/ Map Symbol	Overburden Description/ Map Unit Name	Depth to Bedrock (ft)
Wt	Winooski Silt Loam	---
39	Gravel and Sand	39 feet

The Natural Resources Conservation Service USDA soil descriptions from Figure 1 indicate that the subject area is classified as Winooski silt loam. These deposits are usually found along floodplains and are evidenced in the water well records nearby and the 1970 Surficial Geologic Map of Vermont. Bedrock in the area is expected to be phyllite according to the new 2012 Bedrock Map of Vermont. No bedrock was seen near Bridge 14. Scour did appear to be an issue at this site with some undermining present at one of the wing walls and abutments (see Figure 2), and this should be considered when choosing a foundation alternative if the same bridge alignment is chosen.

Figure 2, Slight undermining of the Northern wing wall and abutment

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

- Pile caps on a single row of H-Piles (integral abutment or pinned superstructure)
- Reinforced concrete abutments on spread footings
- Stub abutments with spread footings founded on mechanically stabilized earth (MSE) walls.

When considering MSE Walls, please recognize that open graded backfill should be used below the flood elevation to limit the possibility of excess pore pressure build up behind the walls. Also, the addition of steel sheeting for scour protection should be evaluated.

We recommend two borings be taken at opposite corners of the proposed bridge, in order to more fully assess the subsurface conditions at the site including, but not limited to, the soil properties, ground water conditions and depth of bedrock. If shallow bedrock is present, borings should be performed at all four corners of the bridge to get an idea of the bedrock profile across the abutment.

Figure 3, Bridge 15 Looking North toward VT Route 36

Borings in opposite corners in the roadway appears to be feasible (see Figure 3). However, final recommendations for borings can be provided once an alignment and preliminary structure type have been selected.

If you have any questions, please feel free to call us at 828-1235.

c: WEA/Read File
CCB/Project File
CEE

State of Vermont
Program Development Division
One National Life Drive
Montpelier, VT 05633-5001
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[phone] 802-828-3979
[fax] 802-828-2334
[ttd] 800-253-0191

Agency of Transportation

To: Jeff Ramsey, VTrans Environmental Specialist

From: Glenn Gingras, VTrans Environmental Biologist

Date: 4/17/2012

Subject: Fairfield BRF 0281(25) - Natural Resource ID

I have completed my natural resource scoping review for the above referenced project. My evaluation has included the following resources: wetlands, wildlife habitat, agricultural soils, and rare, threatened and endangered species. I have reviewed all existing mapped information and performed a site review of the project area.

Wetlands/Watercourses
There are wetlands within the project area. Formal wetland delineation according to US Army Corps of Engineers Wetland Delineation Manual was not completed and wetlands were identified using best professional judgment for resource identification/planning purposes. The wetlands are located in all quadrants of the project and would be considered contiguous to the mapped class II wetlands. Wetlands in the project area are emergent wetlands adjacent to the Fairfield River and its floodplain. A shape file with approximate wetland boundaries is available for reference.

The Fairfield River flows north easterly through the project area. This river would support a variety of aquatic organisms including wild brook trout. Efforts to minimize water quality impacts during construction will need to be evaluated as the project design moves forward.

The US Corps of Engineers and the Agency of Natural Resources- Department of Environmental Conservation would regulate all activities below ordinary high water and to wetlands.

Wildlife Habitat
General Wildlife habitat exists within the surrounding area. The project area consists of agricultural lands. There are no wildlife corridor issues within the project area.

Rare, Threatened and Endangered Species
There are no mapped rare, threatened or endangered species within the project area.

Agricultural Soils
There are prime agricultural soils within the project area. These soils are in the Winooski silt loam and Binghamville silt loam series.

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: Jeff Ramsey, VTrans Environmental Specialist

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

Date: 6/27/2012

Subject: Fairfield BRF 0281 (25) – Archaeological Resource ID

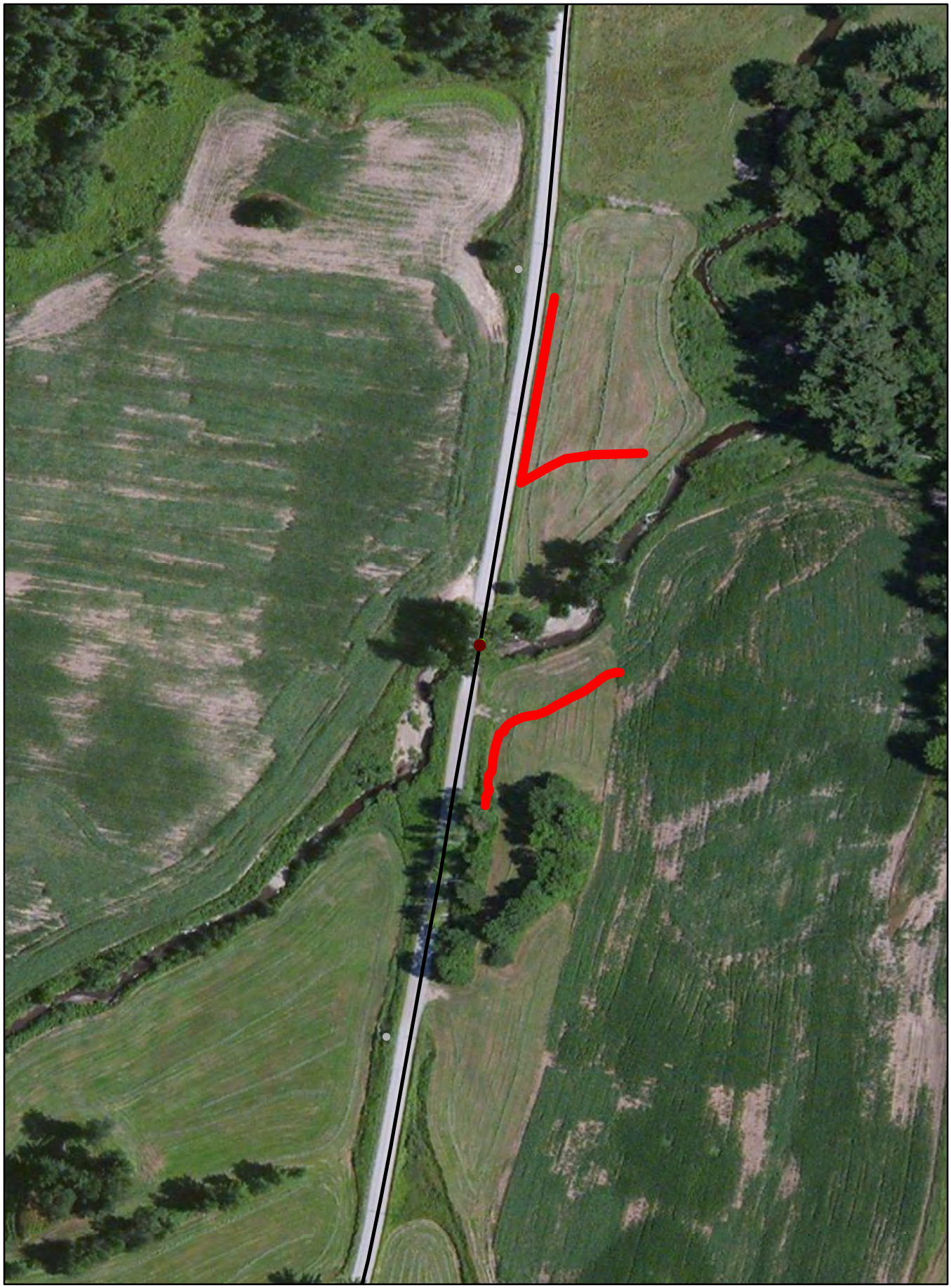
Jeff,

We've mapped archaeological resources within the general area around Fairfield BRF 0281(25). Two areas of sensitivity were identified in the NE and SE quadrants of the project area and have been mapped into the archaeological geodatabase.

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

Brennan

VTrans Working to Get You There
Vermont Agency of Transportation



Ramsey, Jeff

From: O'Shea, Kaitlin
Sent: Thursday, April 12, 2012 4:23 PM
To: Ramsey, Jeff
Cc: Williams, Chris; Newman, Scott
Subject: Pilot Project - Fairfield BRF 0281(25) Historic Resource ID

Good afternoon,

I have completed the historic resource ID for Enosburg Fairfield BRF 0281(25): Bridge 14 and the adjacent properties are not historic.

This resource ID is part of the GPS/GIS Pilot Project. As discussed, initial review for historic resources is completed via desk review (maps, bridge inspection photos, Google Earth) and can be determined to have no historic resources without site visits. Other projects will require a site visit in order to determine if there are historic resources located within the project area. Historic resources will continue to be identified on a map and scanned for the project files. When appropriate, historic resources will be mapped by the GPS in order to compare and contrast the effectiveness and application of these resource ID procedures.

I am keeping a spreadsheet for these pilot projects which outlines review methods, resource notes, resource ID and how the ID is submitted (GPS data, email memo, resource map, etc.) I'll bring this to the next project meeting.

Let me know if you have any questions.
Thanks,
Kaitlin

Kaitlin O'Shea
Historic Preservation Specialist
Vermont Agency of Transportation

802-279-0869
Kaitlin.O'Shea@state.vt.us

Ramsey, Jeff

From: Armstrong, Jon
Sent: Wednesday, May 23, 2012 12:44 PM
To: Ramsey, Jeff
Subject: RE: Environmental Request NOTIFICATION: FAIRFIELD BRF 0281(25)

Hi Jeff,
I have no stormwater related concerns of note to offer at this time for this project.

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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From: Ramsey, Jeff
Sent: Wednesday, March 28, 2012 4:02 PM
To: Armstrong, Jon; Gingras, Glenn; Gauthier, Brennan; O'Shea, Kaitlin
Cc: Williams, Chris
Subject: FW: Environmental Request NOTIFICATION: FAIRFIELD BRF 0281(25)

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\FairfieldBRF0281(25)12j156\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:

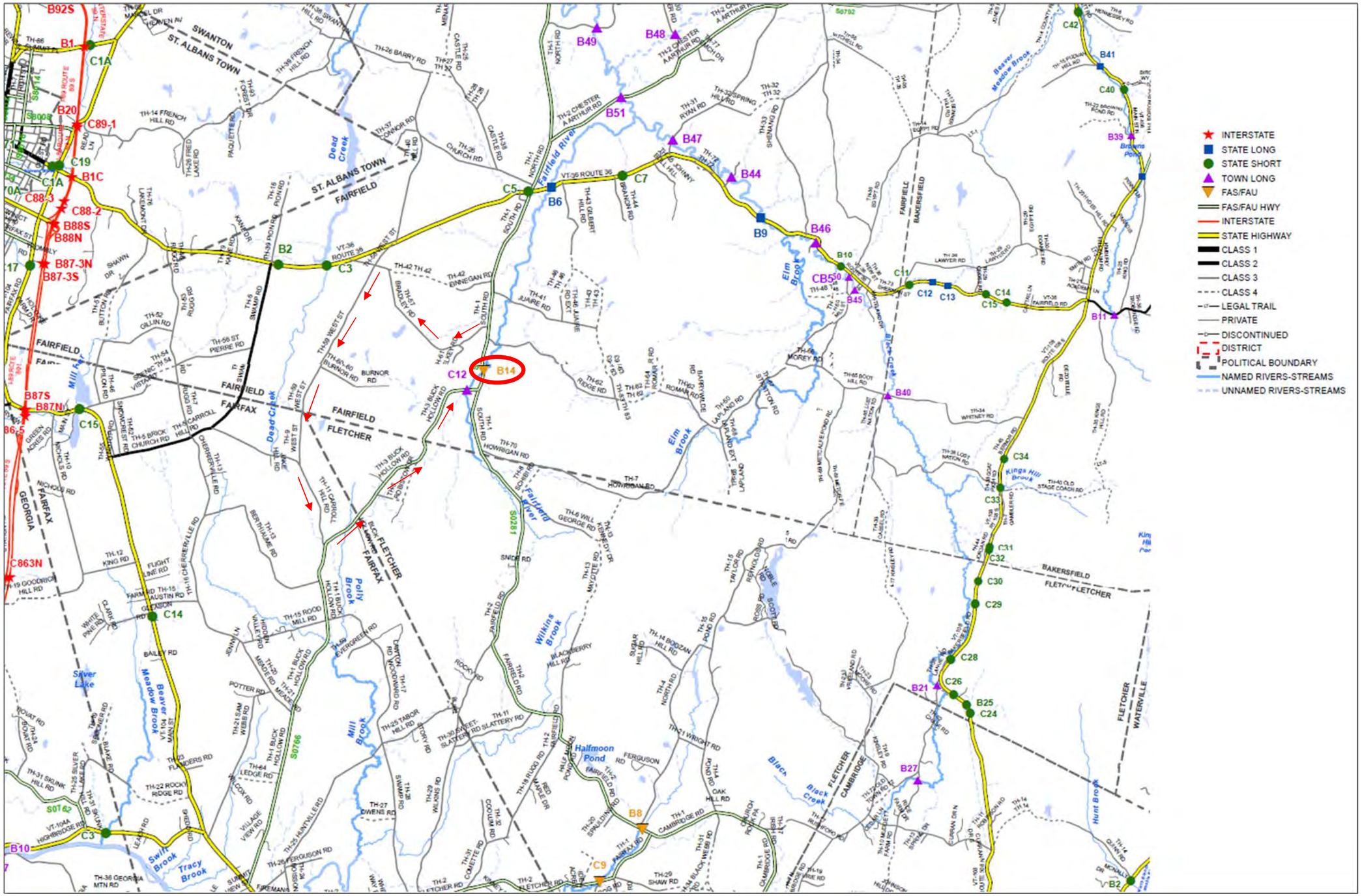
Project: Fairfield BRF 0281 (25)

ENVIRONMENTAL RESOURCES: **sent out 03/28/12; Glenn has plotted everything, but I don't have an Arch clearance email/ memo**

Wetlands:	X Yes	___ No	See naturalresource_fairfield_25scoping
Historic/Historic District:	___ Yes	X No	
Archaeological Site:	X Yes	___ No	Two areas of sensitivity were identified in the NE and SE quadrants, see Arch Resource ID Memo
4(f) Property:	___ Yes	X No	
6(f) Property:	___ Yes	X No	
Agricultural Land:	X Yes	___ No	See naturalresource_fairfield_25scoping
Fish & Wildlife Habitat:	X Yes	___ No	Fairfield River, See naturalresource_fairfield_25scoping
Endangered Species:	___ Yes	X No	
Hazardous Waste:	___ Yes	X No	
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 Option 1

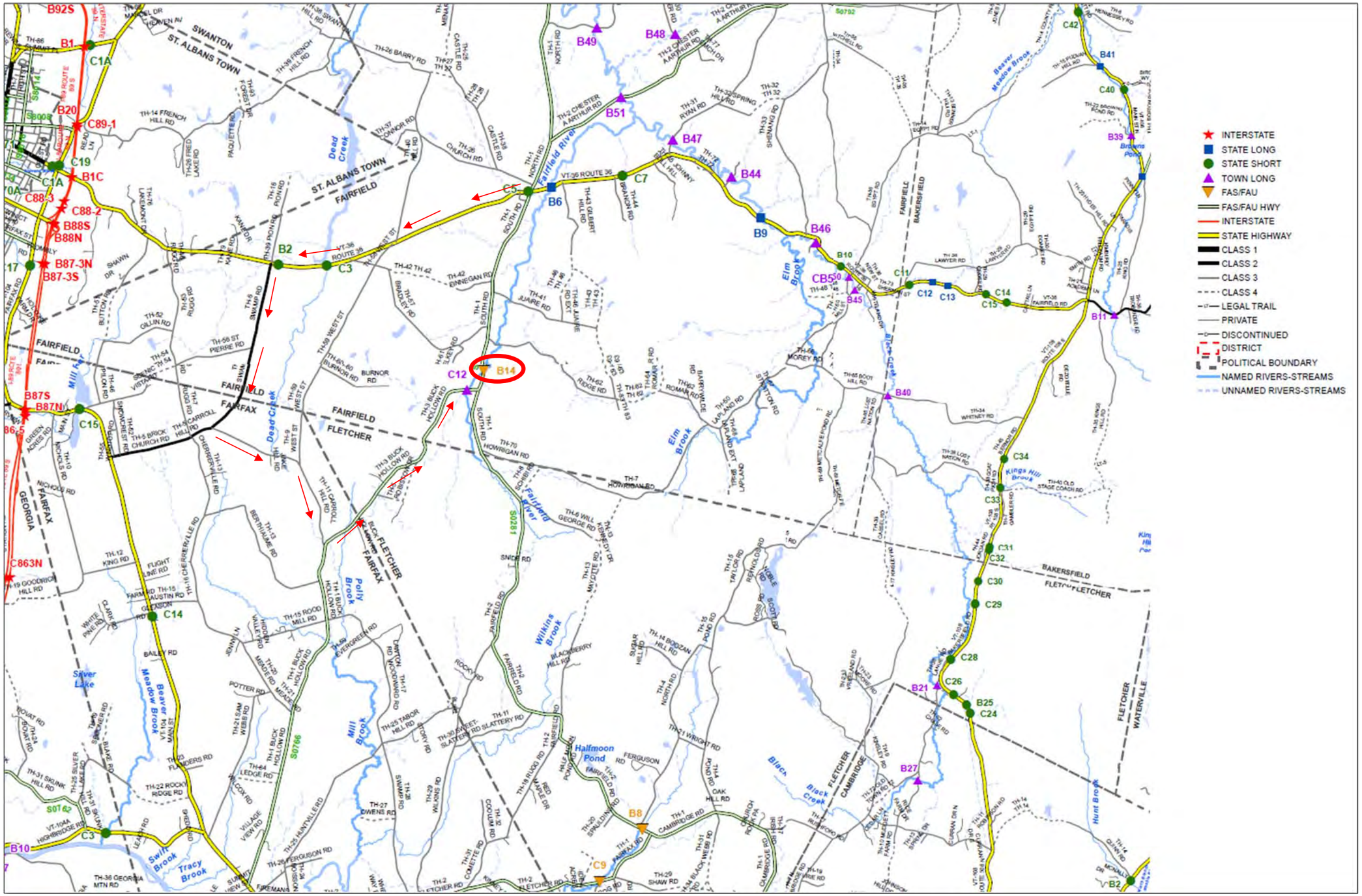
South Road (TH 1), to Bradley Road, West Street, Carroll Hill Road (TH 11), Buck Hollow Road, back to South Road (TH 1)

Through Distance: 0.84 Miles

Detour Distance: 9.04 Miles

Added Miles: 8.20 Miles

End-End Distance: 9.88 Miles



Detour Option 2

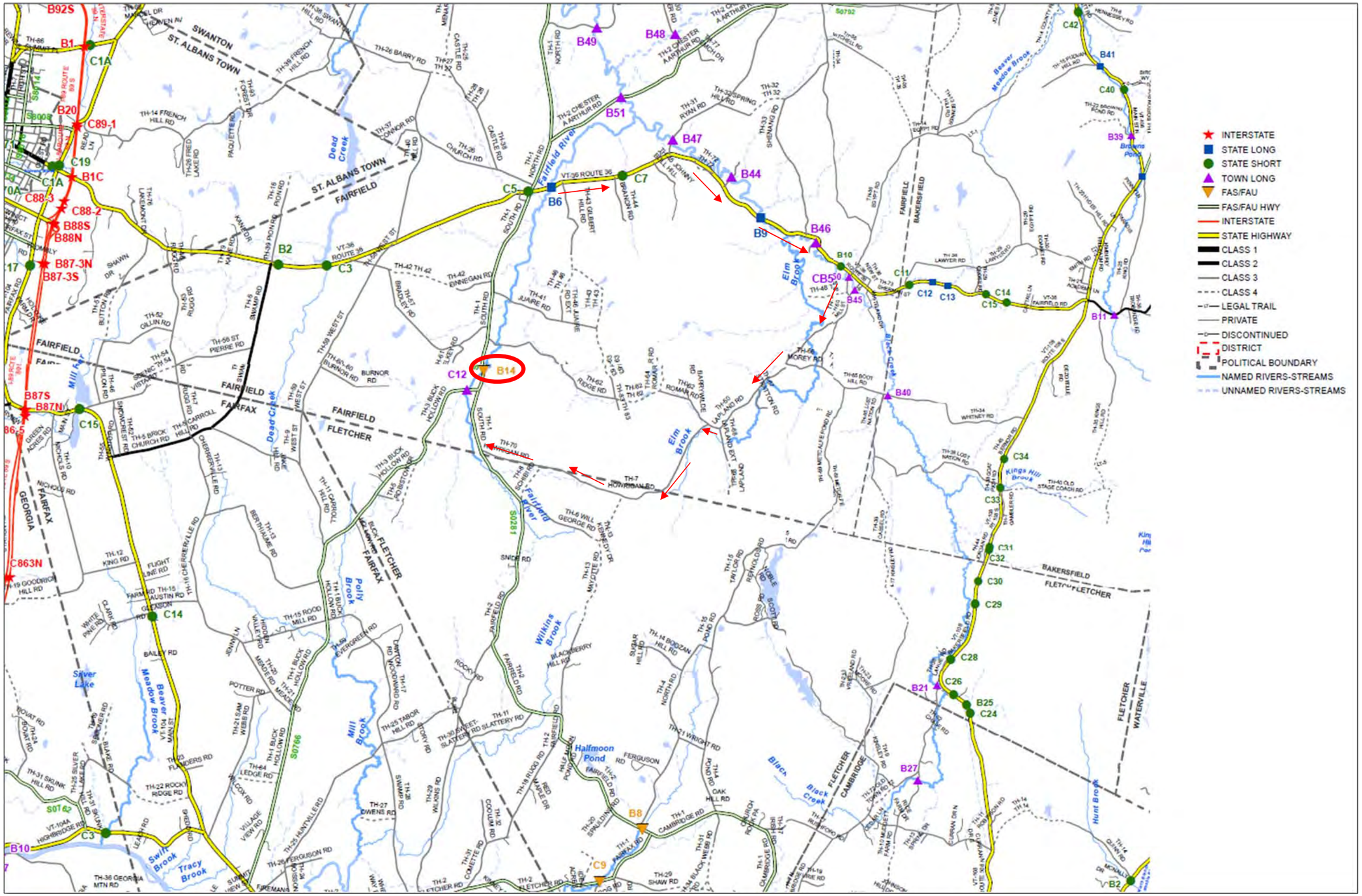
South Road (TH 1), to VT 36, Swamp Road, Cadieux Road, Carroll Hill Road (TH 11), Buck Hollow Road, back to South Road (TH 1)

Through Distance: 2.75 Miles

Detour Distance: 11.12 Miles

Added Miles: 8.37 Miles

End-End Distance: 13.87 Miles



Detour Option 3

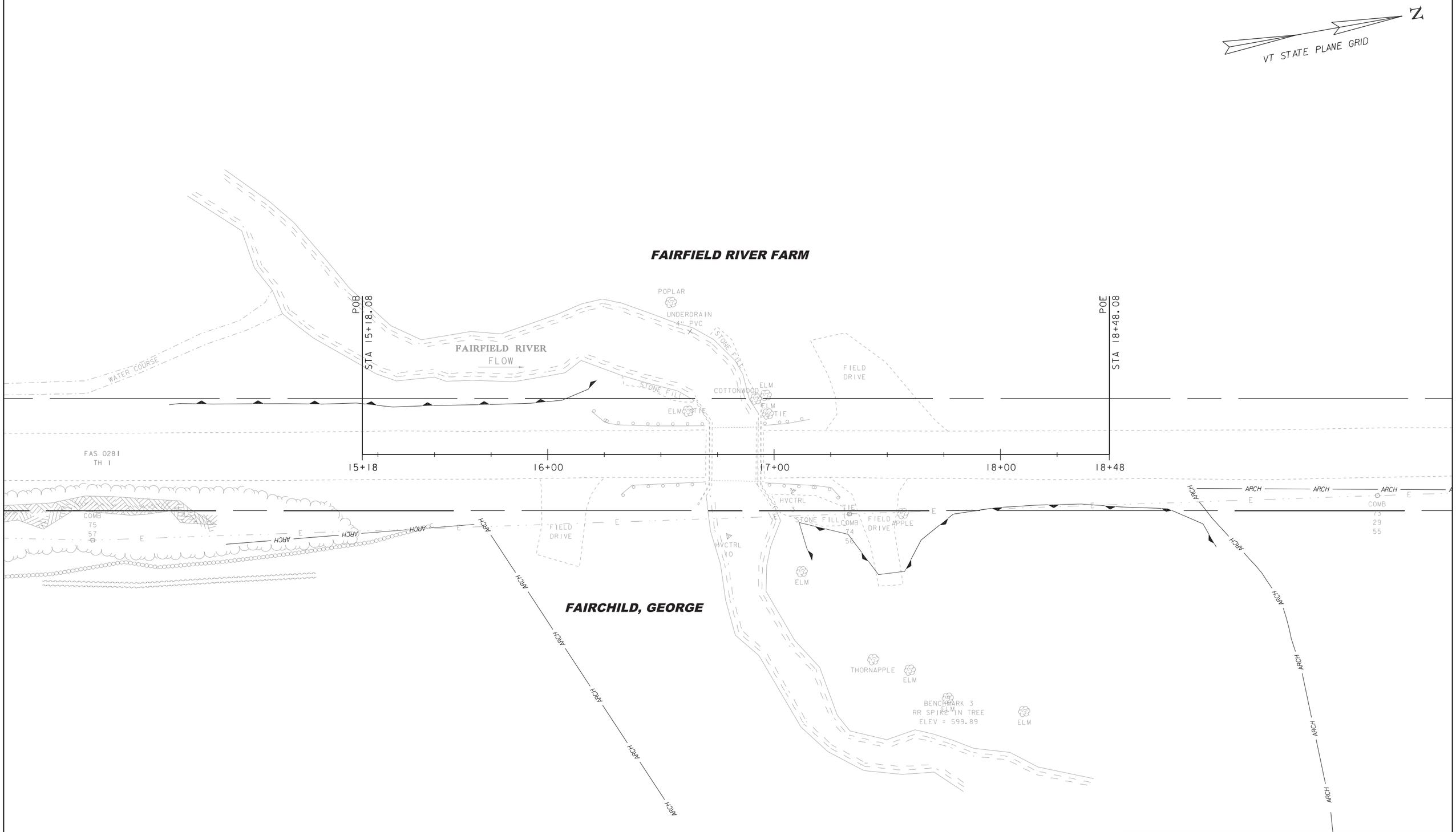
South Road (TH 1), to VT 36, Mill Street, Trudell Road, Lapland Road, Howrigan Road, back to South Road (TH 1)

Through Distance: 3.47 Miles

Detour Distance: 11.50 Miles

Added Miles: 8.03 Miles

End-End Distance: 14.97 Miles

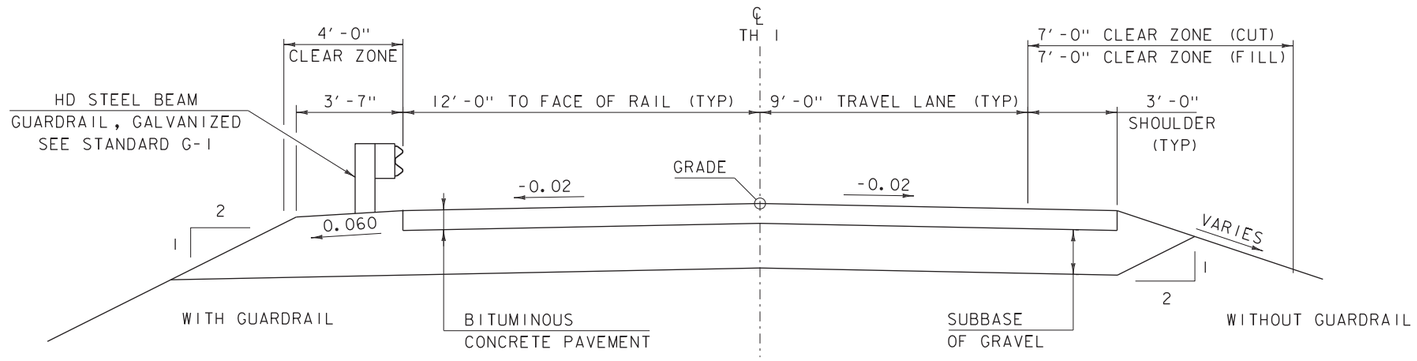


EXISTING CONDITIONS

20 0 20

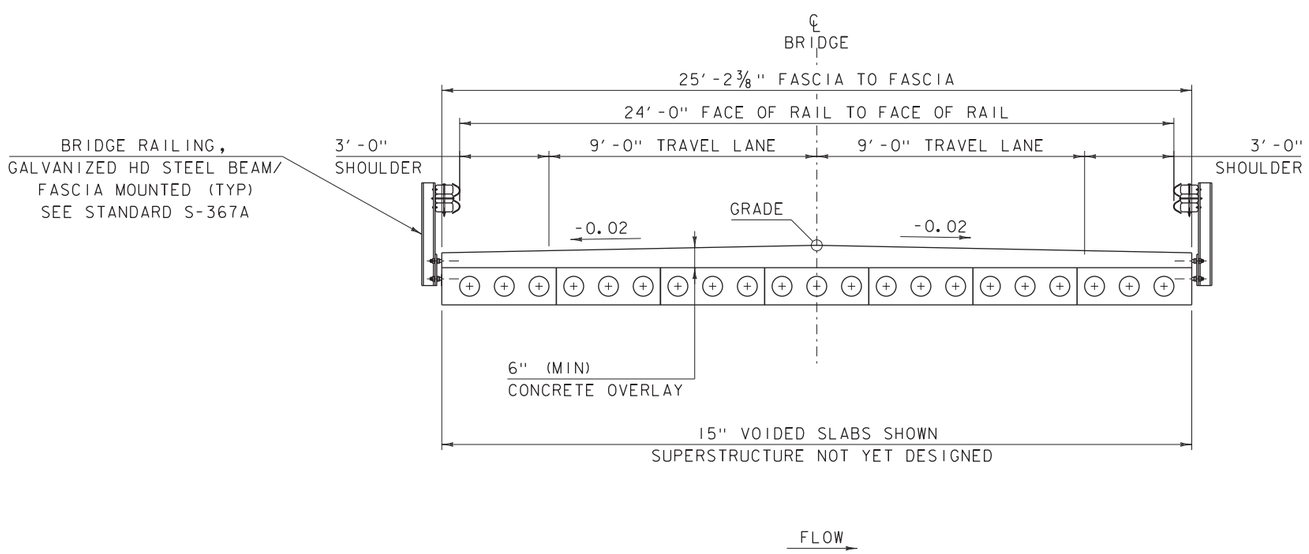
SCALE: 1" = 20'-0"

PROJECT NAME: FAIRFIELD	
PROJECT NUMBER: BRF 0281(25 101/100	
FILE NAME: s12j156bdr.dgn	PLOT DATE: 06-SEP-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS	SHEET 1 OF 5



PROPOSED FAS 0281(TH 1) TYPICAL SECTION

SCALE 3/8" = 1'-0"



PROPOSED BRIDGE TYPICAL SECTION

SCALE 3/8" = 1'-0"

MATERIAL TOLERANCES

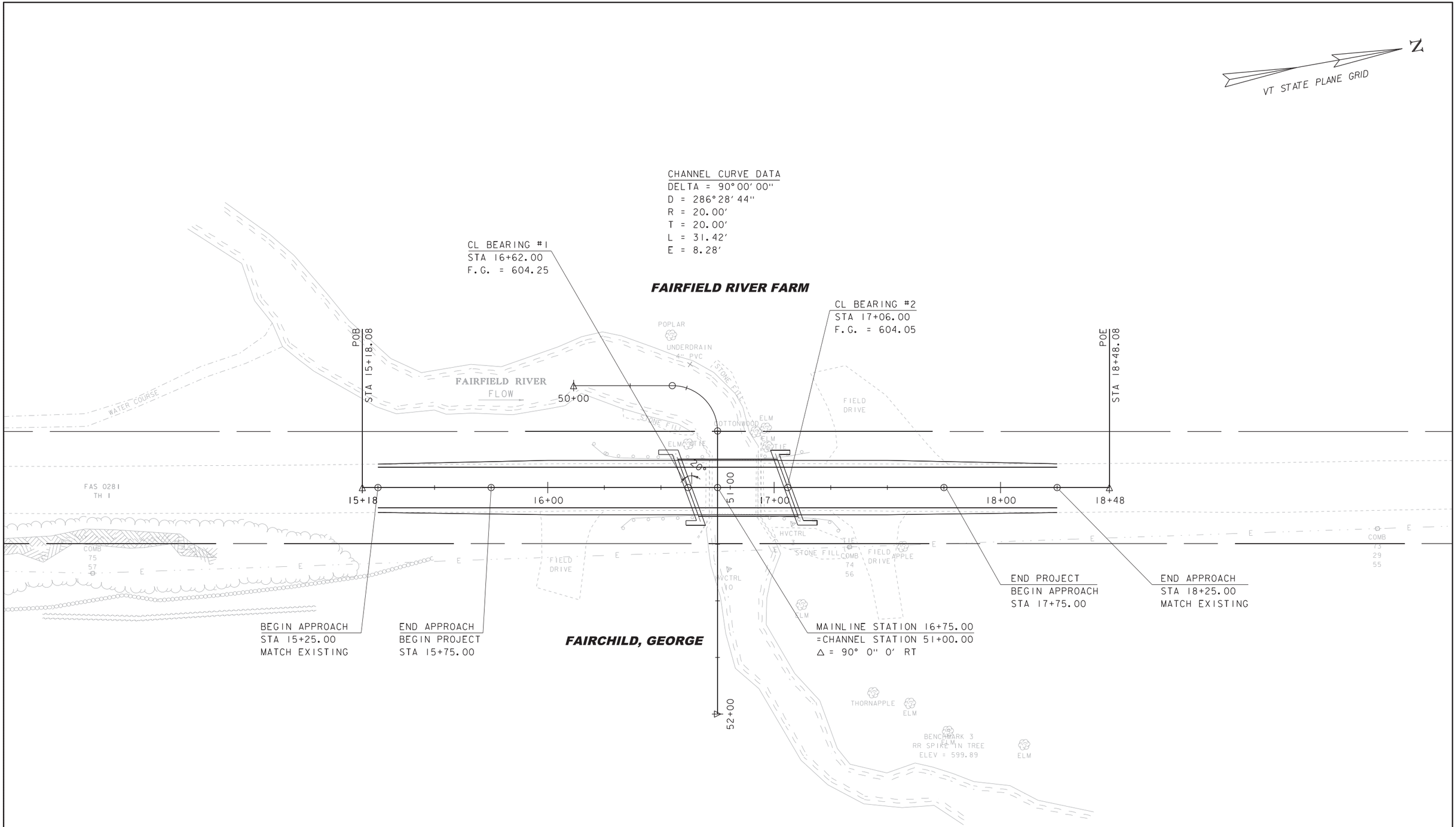
(IF USED ON PROJECT)

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

PROJECT NAME: FAIRFIELD
PROJECT NUMBER: BRF 0281(25)

FILE NAME: 12J156\s12J156typical.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: L.J.STONE
TYPICAL SECTIONS

PLOT DATE: 06-SEP-2012
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 2 OF 5

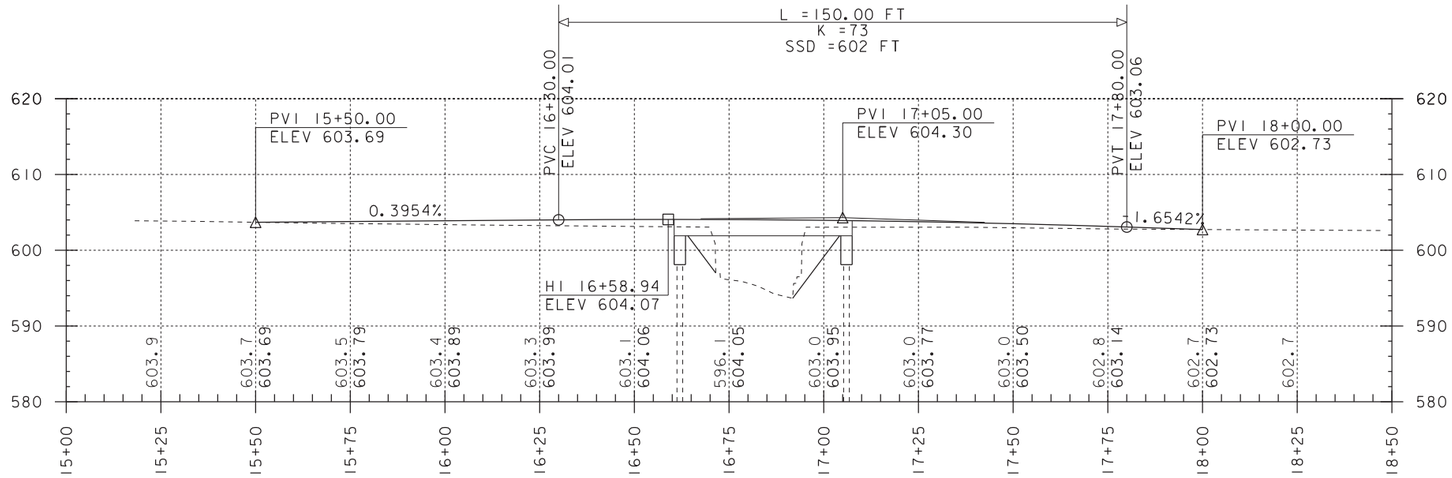


LAYOUT

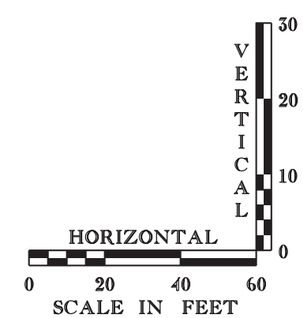
20 0 20

SCALE: 1" = 20'-0"

PROJECT NAME: FAIRFIELD	
PROJECT NUMBER: BRF 0281(25)	
FILE NAME: s12j156bdr.dgn	PLOT DATE: 06-SEP-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 3 OF 5



FAS 0281 (TH 1) PROFILE

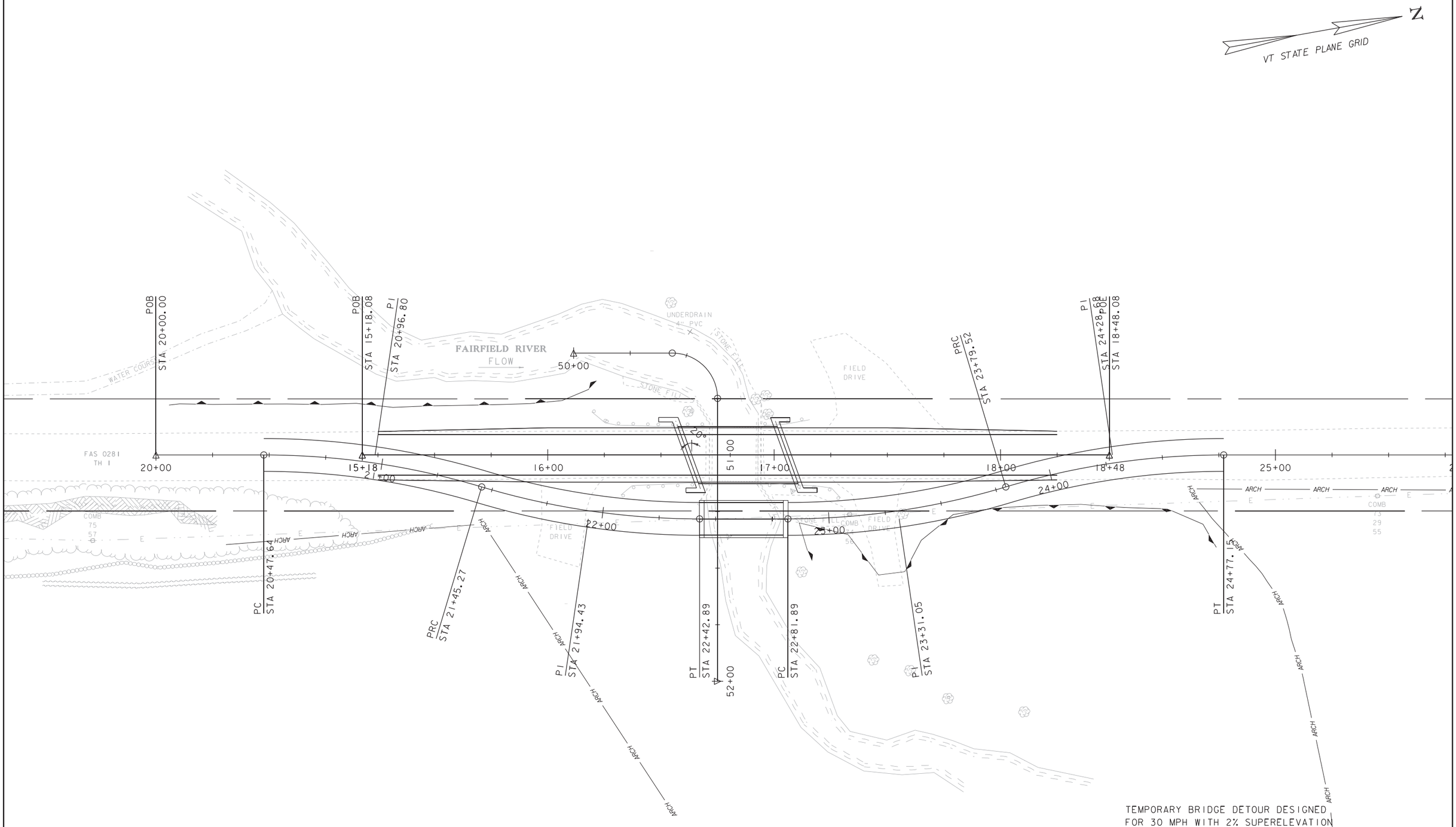


NOTE:

GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: FAIRFIELD	
PROJECT NUMBER: BRF 0281(25)	
FILE NAME: s12j56profile.dgn	PLOT DATE: 12-SEP-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PROFILE SHEET	SHEET 4 OF 5



TEMPORARY BRIDGE DETOUR DESIGNED
FOR 30 MPH WITH 2% SUPERELEVATION

TEMPORARY BRIDGE LAYOUT

20 0 20

SCALE: 1" = 20'-0"

PROJECT NAME: FAIRFIELD	
PROJECT NUMBER: BRF 0281(25)	
FILE NAME: s12j156bdr.dgn	PLOT DATE: 06-SEP-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
TEMPORARY BRIDGE LAYOUT SHEET	SHEET 5 OF 5