STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Strafford BF 0177(10)

FAS 177 (VT 132), Bridge 29 over the West Branch of Ompompanoosuc River

August 8, 2013

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I. Site Information

The bridge is located in a rural area along FAS 177 (VT 132) approximately 6.5 miles east of Exit 2 on Interstate 89. The bridge is located on a straight segment of FAS 177 approximately 200 feet after the sharp left curve where Mine Road (TH-4) meets FAS 177. There is a church in the flood plain on the northeast side of the bridge, which is the other side of the bridge from the South Strafford Village. There are driveways approximately 10 and 30 feet off the southeast and southwest side 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	Single Span Concrete T-Beam
Bridge Span	46 feet long
Width of Bridge	20.6 feet
With of Roadway Approach	22 feet
Year Built	1923
Ownership	Town of Strafford

Need

Bridge 29 provides access across the West Branch of the Ompompanoosuc River. The following is a list of the deficiencies of Bridge 29 and FAS 177 in this location.

1. The bridge is structurally deficient with a poor deck rating and an overall Federal Sufficiency Rating of 39.8.
2. The lane and shoulder widths for the bridge and approach are substandard.
3. The existing approach guardrail is substandard and does not connect to the solid concrete bridge railing.
4. The existing bridge is hydraulically inadequate and does not pass the Q_{50} storm event with 1 foot of freeboard.
5. The horizontal and vertical geometry does not meet the standard. The horizontal curve is too tight for the banking and the vertical curves are too tight for the speed.
6. There are several fixed objects in the clear zone.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2016 and 2036.

TRAFFIC DATA	2016	2036
ADT	1,400	1,500
DHV	180	190
ADTT	65	110
%T	3.7	6.0
%D	55	55

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 1500 and a design speed of 25 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 5.3	10'/1' (22')	10'/3' (26')	Substandard
Bridge Lane and Shoulder Widths	VSS Table 5.3	10'/0.3'(20.6')	10'/3' (26')	Substandard
Clear Zone Distance	VSS Table 5.5	Granite Posts located approximately 8.5 ft from roadway Utility pole on north end of bridge does not provide 3 foot of clear space behind guardrail	14' fill / 12' cut (1:3), 12' cut (1:4)	Substandard
Banking	VSS Section 5.13	4.3%	8% (max)	
Speed		25 mph (Posted)	25 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-11b	R=500'	R_{min}=134' @ 8% R_{min}=654' @ 4.3%	Substandard
Vertical Grade	VSS Table 5.6	Bridge located in transition from (+)1.13% grade to (-)5.1208% grade	7% (max) for level terrain	
K Values for Vertical Curves	VSS Table 5.1	Bridge located on crest (K = 8) Vertical Sag Station 2+50 (K = 16)	20 crest / 30 sag	Substandard Substandard
Vertical Clearance Issues	VSS Section 5.8	None noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 5.1	187'	150'	
Bicycle/Pedestrian Criteria	VSS Table 5.8	1' Shoulder	3' Shoulder on Bridge	Substandard
Bridge Railing (and Approach Railing)	Structures Design Manual Section 13.2	Solid concrete transitioning to steel beam on approach, no connection Improperly tensioned cable guardrails	TL-2	Substandard Substandard
Hydraulics	VTrans Hydraulic Section	Does not meet Q_{50} storm event	Pass Q_{50} storm event with 1.0' of freeboard	Substandard
Structural Capacity	S.M., Ch. 3.4.1	Structurally Deficient	Design Live Load: HL-93	Substandard

Inspection Report Summary

Deck Rating	4 Poor
Superstructure Rating	7 Good
Substructure Rating	5 Fair
Channel Rating	6 Satisfactory

7/9/2013 The deck and substructure continue to deteriorate. There is deep spalling along the base of the stemwalls and at the ends that penetrates as much as 6"+/-. The concrete remains saturated w/ scaling. The soffit has saturation throughout w/ large delams and minor staining of efflorescence. There are some large spalled areas w/ exposed rebar, up to the second layer. A rehabilitation project will be needed sometime in the future. JWW/JDM

06/07/2012 - The stemwall of abutment No.2 is in need of an added kneewall or anti-abrasion repair. The right upstream stone retaining wall is in need of added anti-erosion protection or realignment. -PLB

Hydraulics

The existing structure passes the 25 year storm frequency event with approximately 0.6 feet of freeboard.

Recommendations

Both a 50-foot clear span (normal to the stream channel (between the abutment faces) and 60-foot clear span are viable options that pass the design storm event through the structure and meet the VTrans hydraulic standards.

The 60-foot clear span structure is the preferred option hydraulically to better meet the bank full width criteria and create less of a constriction on the channel. However, the 50-foot clear span structure is also considered to be a viable option.

Utilities

There are overhead utility lines spanning the bridge from the southwest to the northeast quadrant, crossing the road directly over the project area. There are light fixtures on the utility pole at the southwest corner of the bridge and the utility pole in front of the church. Underground utility lines exist in the northeast quadrant of the project area for the church. An underground propane tank is also present in this area, located in front of the church and approximately 20’ from the existing guardrail. Any option besides doing nothing will require utility relocation.

Right Of Way

The existing 3 rod Right-of-Way through the project area is shown on the Layout sheet. It is anticipated that minor rehabilitation or superstructure replacement could be performed within the existing Right-of-Way, while a complete replacement would require additional temporary easements.

Resources

The resources present at this project are shown on the Layout sheet.

Archaeological:
Archeological data related to small-scale water power is likely to exist within the Southwest quadrant of the site. The area contains the remains of a grist-mill, identified as the J.L Barrett Mill, located on the 1850s and 1867 maps, respectively. Per the Resource ID, a Phase 1 survey and historic research on the site is suggested if the area cannot be avoided during construction.

Biological:
There are no threatened or endangered species.

Wetlands

There are no wetlands within the project area.

Wildlife Habitat

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 no prime agricultural soils within the project area.

Hazardous Materials:
According to the Vermont Agency of Natural Resources (VANR) Vermont Hazardous Sites List, there are no hazardous materials within the project site. However, there is some diesel contamination west of the project site toward Downtown Strafford. If the scope of the project is extended to include improvement on the horizontal alignment, further investigation of these contaminated sites will be performed.

Historic:
Although the bridge serves as a gateway to Strafford Village Historic District, Bridge 29 is not a historic structure. However, the railing will be of concern to historic resources if the bridge needs to be replaced as well as any adjacent historic properties that may be impacted.

Stormwater:
The Unnamed Brook is not listed as an impaired waterway according to the Vermont Department of Environmental Conservation, Water Quality Division.

II. Maintenance of Traffic

The Vermont Agency of Transportation created 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.

Because the existing horizontal alignment is relatively good through the project area and houses are located close to the existing alignment, maintaining traffic on the existing structure while constructing a new bridge on a different alignment was not considered. The following options for maintaining traffic have been considered:

Option 1: Temporary Bridge

Based on the structure length, vehicle speeds, peak traffic volumes and site distance, an unsignalized single lane temporary bridge with alternating traffic would be adequate in this location. Neither an upstream (western) or downstream (eastern) location would be ideal in this situation. The southwest quadrant is historically and archaeologically sensitive and would need to be cleared for use. The southeast quadrant contains a house and garage extremely close to the location where a temporary roadway would be constructed.

Advantages: A temporary bridge allows traffic to flow along the corridor during construction.

Disadvantages: Utilizing a temporary bridge in this location would be less safe for the traveling public and construction personnel than if the traffic were removed from the construction site. The impacts on the adjacent property owners, resources and historic and archaeological properties would be increased. The length of time to develop the project would be increased in order to acquire the additional Right of Way and clear the historic and archaeological property that would be impacted by the temporary bridge. The length of time to construct the project would be increased in order to construct and remove the temporary bridge and approaches. There would be additional costs associated with the additional Right of Way acquisition, historic and archaeological clearance and temporary bridge construction.

Option 2: Phased Construction

Phased construction is the maintenance of one lane of two-way traffic on the existing bridge while building one lane at a time of the proposed structure. This allows the road to remain open during construction, while having minimal impacts to archaeological and historic reources and adjacent property owners.

As mentioned previously, it is reasonable to close one lane of traffic and maintain alternating traffic in the other lane without traffic signals during construction at this location. However, the existing bridge is narrow and it would be necessary to keep more than half of the existing bridge

in place to maintain traffic during the first phase of construction. Any new bridge or superstructure would either have to be shifted or widened beyond that required by the standards to allow traffic to be maintained on the new structure during the second phase of construction.

The time required to develop a phased construction project is the same as that required to develop a project which is not phased. However, the time required to complete a phased construction project increases because some of the construction tasks have to be performed multiple times. This increase in the length of construction along with the inconvenience of working around traffic and the effort involved in coordinating the joints between the phases causes the construction costs for phased construction to be larger than construction which is not phased. 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.

Advantages: The advantage of phased construction is similar to that for construction with a temporary bridge. Traffic can be maintained along the corridor during construction. The added benefits of phasing construction in this location over a temporary bridge are the reduced impacts to adjacent property owners and historic and archaeologically sensitive areas along with some savings in cost and time for development of the project.

Disadvantages: It costs more to construct a bridge in phases than it does to construct a bridge without phasing since many construction activities have to be performed two or more times and additional activities need to be performed such as joining the components constructed during the different phases. Widening the superstructure to maintain traffic during construction would cost more than constructing a standard width bridge in this location. Similar to a temporary bridge, there would be a reduction in safety to the traveling public and construction personnel because they would be in close proximity to each other during construction. There would be additional delays and disruption to traffic while construction vehicles enter and exit the site.

Option 3: Off-Site Detour

This option entails utilizing accelerated construction materials and methods to reduce the length of construction to one construction season and reduce the length of time that the road is closed to a 4 week period. Based on input from the Town, the optimal time for a road closure would be between May and August. Since the bridge is located on a Class 2 town highway, an official detour would be determined by the Town, who would also be responsible for installing, maintaining and paying for all necessary signing and traffic control. One possible detour route would divert VT 132 traffic onto TH-4 (Mine Road) to TH-39 Tyson Road, both Class 3 highways, and back to VT 132 for an equivalent through distance and an end to end distance of 1.6 miles.

Advantages: This option would eliminate the need for phasing or a temporary bridge, which would significantly decrease cost and time of construction. This option would not require the acquisition of additional rights from the adjacent property owners for a temporary bridge. It would reduce the impacts to the archaeologically and historically sensitive areas. It would reduce the time required to construct the project because actions would not need to be done multiple

times for phasing and only one bridge would need to be built. All of these reductions would result in a savings of time and money for the execution of any project at this location.

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

III. Alternatives Discussion

No Action

This alternative would involve leaving the bridge in its current condition. A good rule of thumb for the "No Action" alternative is whether the bridge can stay in place without any work being performed on the bridge in the next 10 years. The bridge is listed as structural deficient with a deck rating of 4 and reinforcing steel exposed on the underside of the deck. Since the deterioration accelerates once it reaches this stage, it is unlikely that the bridge will last another 10 years without at least requiring deck patching. Thus, the No Action alternative will not be considered further in this report.

Alternative 1a: Rehabilitation – Patching

This alternative would include some deck and substructure patching coupled with some cathodic protection to mitigate the ionic deterioration that occurs around patched concrete. Performing some minor preventative maintenance of this sort should extend the useful life of the bridge another 10 to 20 years.

Advantages: This alternative would address the structural deficiencies of the existing bridge quickly and with minimal upfront costs. It would have the least impacts to archaeologically and historically sensitive areas and adjacent property owners, and would not require Right-of-Way acquisition.

Disadvantages: Performing this maintenance would only address the structural deficiency of the bridge and would not address any of the other substandard features, including the hydraulic inadequacy.

Alternative 1b: Rehabilitation – Superstructure Replacement

By replacing the entire superstructure with a wider structure, the structural deficiency, substandard width and railing could be rectified. The hydraulic opening and roadway alignment would not be modified with this alternative.

The bridge would need to be widened 3' on each side for a total of 6'. The wing walls on the northern abutment run parallel to the road, therefore widening to the extent required to meet the standard would require the addition of substructure extensions to support the exterior beams and hold the extra roadway fill. The southeastern corner is relatively flat off the bridge and the wing wall extends perpendicular to the road, so no additional substructure work would need to be performed there. However, based on the steep drop and wing wall geometry at the southwestern corner of the bridge, substructure work would need to be performed on this side to meet the width standards as well.

Superstructure replacement costs are around $110,000. This would only vary slightly based on the width required. Placing a new superstructure on an existing substructure makes economic sense if the substructures are in good condition. However, the existing substructures are 90+ years old and in fair condition. In addition, extra work would have to be done to extend the existing abutments to support a wider bridge. In 20 years when the patched portions of the abutments need to be replaced, there is little chance of saving any of this work because the bridge will have to be lengthened to meet the hydraulic standards at that time.

Advantages: This alternative would address the structural, width and railing deficiencies of the existing bridge with less upfront costs than a complete replacement.

Disadvantages: A similar width superstructure replacement would not require any additional Right-of-Way, while widening the bridge will require similar temporary easements and impacts as a complete replacement. The hydraulic opening and roadway geometry would not be improved with this alternative.

Alternative 1: Rehabilitation Summary

Based on the constraints at this site, it does not make economic sense to improve the bridge width without improving the hydraulic opening, i.e. Alternative 1b: Rehabilitation – Superstructure Replacement. However, Alternative 1a: Rehabilitation – Patching will be considered further as a relatively quick and inexpensive fix for the structural deficiencies of the bridge.

Alternative 2: Complete Bridge Replacement

The intent of this option would be to remedy all of the substandard attributes at this site. As mentioned previously, any new structure will be placed on the existing alignment. The roadway geometry deficiencies can be rectified with minor grade changes and appropriate superelevation rates. This option would include a new 60 foot long, 26 foot wide (rail to rail) superstructure with no skew. Based on the initial geotechnical evaluation, it is assumed that the substructure will consist of integral abutments on a single row of drilled or driven piles.

IV. Alternatives Summary

Based on the existing site conditions, bridge condition, recommendations from hydraulics and the previous discussion, the two alternatives that will be considered further are: Alternative 1a: Rehabilitation – Patching with traffic controlled by providing temporary lane closures when necessary and Alternative 2: Complete Bridge Replacement with traffic maintained by phasing, temporary bridge and offsite detour.

A cost evaluation is provided below for each of these alternatives.

V. Cost Matrix

Strafford BF 0177(10)		Do Nothing	Alt 1a	Alt 2a	Alt 2b	Alt 2c
			Rehabilitation - Patching	Complete Replacement		
				Offsite Detour	Temp Bridge	Phased
COST[1]	Bridge Cost	$0	$91,000	$434,000	$434,000	$525,000
	Removal of Structure	$0	$0	$36,000	$36,000	$50,000
	Roadway	$0	$63,000	$380,000	$397,000	$420,000
	Maintenance of Traffic	$0	$25,000	$25,000	$200,000	$50,000
	Construction Costs	$0	$179,000	$875,000	$1,067,000	$1,045,000
	Construction Engineering + Contingencies	$0	$53,700	$218,800	$266,800	$261,300
	Total Construction Costs w CEC	$0	$232,700	$1,093,800	$1,333,800	$1,306,300
	Preliminary Engineering[2]	$0	$62,700	$218,800	$266,800	$261,300
	Right of Way	$0	$0	$54,000	$85,400	$69,700
	Total Project Costs	$0	$295,400	$1,366,600	$1,686,000	$1,637,300
	Town Share	$0	$14,770	$68,330	$168,600	$163,730
SCHEDULING	Project Development Duration[3]	N/A	1 year	4 years	4 years	4 years
	Construction Duration	N/A	4 months	6 months	18 months	18 months
	Closure Duration (If Applicable)	N/A	N/A	4 weeks	N/A	N/A
ENGINEERING	Typical Section - Roadway (feet)	1-10-10-1	1-10-10-1	3-10-10-3	3-10-10-3	3-10-10-3
	Typical Section - Bridge (feet)	0.3-10-10-0.3	0.3-10-10-0.3	3-10-10-3	3-10-10-3	3-10-10-3
	Geometric Design Criteria	No Change	No Change	Meets Criteria	Meets Criteria	Meets Criteria
	Traffic Safety	No Change	New Guardrail	Improved	Improved	Improved
	Alignment Change	No	No	Slight vertical	Slight vertical	Slight vertical
	Bicycle Access	No Change	No Change	Improved	Improved	Improved
	Hydraulic Performance	No Change	No Change	Improved	Improved	Improved
	Pedestrian Access	No Change	No Change	Improved	Improved	Improved
	Utility	No Change	No Change	Relocation	Relocation	Relocation
OTHER	ROW Acquisition	No	No	Yes	Yes	Yes
	Road Closure	No	No	Yes	No	No
	Design Life	<10 years	20 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 start from the end of the Project Definition Phase.

VI. Conclusion

The recommendation is to proceed with Alternative 2a: Complete Bridge Replacement with traffic maintained during construction on an Offsite Detour.

Discussion:
The Local and Regional Input mentioned that the existing bridge is too narrow; that bicycles and pedestrians use the bridge often; and that a wide shoulder or sidewalk should be included on a new structure. While it is a fiscally valid alternative to rehabilitate the deteriorated components of the existing structure, doing so will keep the existing narrow structure in place for a longer period of time. However, if work is done on the bridge, it is also reasonable to spend the extra money now to create a longer term fix that would also address the width, geometric and hydraulic deficiencies at this location.

Traffic Control:
The choice for maintenance of traffic during construction seems like the easiest decision for this structure. The recommendation is to close the bridge for 4 weeks, and maintain traffic on an offsite detour. There is a relatively short detour available around this bridge, and it would be the easiest, quickest, cheapest, safest and lowest impact option to maintain traffic.

Structure:
The proposed structure is a new 60 foot long, 26 foot wide (rail to rail), prefabricated single span superstructure on integral abutments on a single row of piles. If additional width were desired over the minimum recommended by the standards, one would expect to pay an additional $25,000 per foot width added to a structure of this length and type. The superelevation and vertical alignment would be modified slightly to meet the design standards. Doing this would rectify all of the deficiencies at this location, including the hydraulic standards, except provide the approved transition railing at the southern end of the bridge. The residential drives are too close to the end of the bridge to accommodate the appropriate railing at this location. Since extending the railing the recommended distance here would eliminate the property owners' access to the VT 132, it was not considered in this report.

VII. Appendices

- Site Pictures
- Town Map
- Bridge Inspection Report
- Hydraulics Memo
- Preliminary Geotechnical Information
- Natural Resources Memo
- Archaeology Memo
- Historic Memo
- Hazardous Waste Map
- Utility Information
- Local Input
- Plans
    - Existing Conditions
    - Proposal
        - Typical Sections
        - Layout
        - Profile
    - Maintenance of Traffic
        - Upstream Temporary Bridge
        - Downstream Temporary Bridge
        - Phasing Plans

Looking South over the Bridge

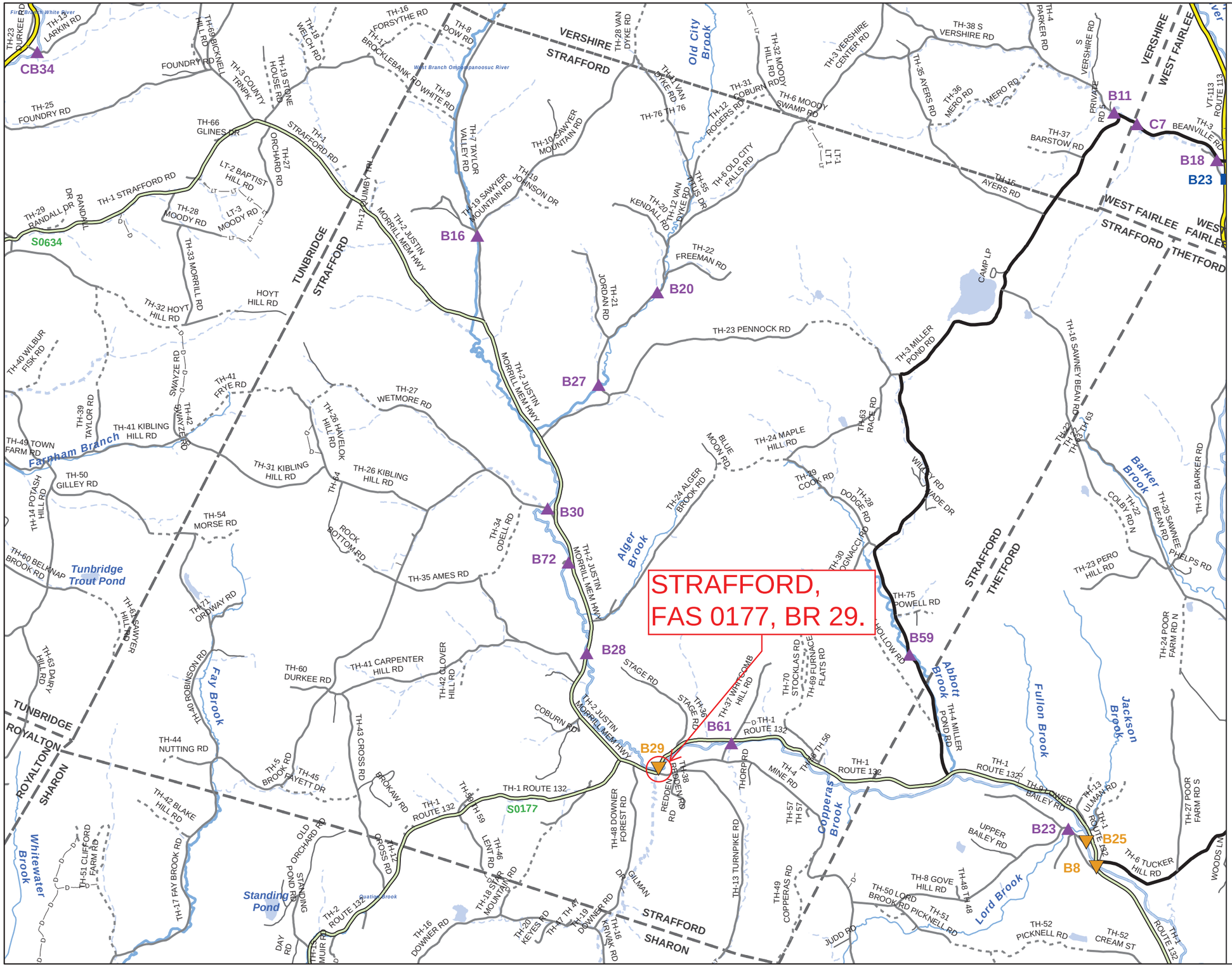
Looking North over the bridge

Deterioration on Northern Abutment

Deterioration on Southern Abutment

Deterioration of deck and Tee beams

Deterioration and Discontinuity of Railing



Scale 1:51,818

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

STRAFFORD
ORANGE COUNTY
DISTRICT # 4

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for STRAFFORD **bridge no.:** 00029 **District:** 4

Located on: TR 01 FAS 177 **ove** W BR. OMPOMPANOO **approximately** 0.4 MI S JCT. VT.132 W **Owner:** 03 TOWN-OWNED

CONDITION

Deck Rating: 4 POOR

Superstructure Rating: 7 GOOD

Substructure Rating: 5 FAIR

Channel Rating: 6 SATISFACTORY

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200177002909102

Federal Sufficiency Rating: 039.8

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1923 **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): 28

ADT: 000830 **% Truck ADT:** 06

Year of ADT: 1995

GEOMETRIC DATA

Length of Maximum Span (ft): 0046

Structure Length (ft): 000052

Lt Curb/Sidewalk Width (ft): 0

Rt Curb/Sidewalk Width (ft): 0

Bridge Rdwy Width Curb-to-Curb (ft): 20.6

Deck Width Out-to-Out (ft): 23.2

Appr. Roadway Width (ft): 022

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 T-BEAM

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

Kind of Material and/or Design: 1 CONCRETE

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane 0 NONE

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 1 MEETS CURRENT STANDARD

Transitions: 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail Ends: 0 DOES NOT MEET CURRENT STANDARD

Structural Evaluation: 4 MEETS MINIMUM TOLERABLE CRITERIA

Deck Geometry: 3 INTOLERABLE, CORRECTIVE ACTION NEEDED

Underclearances Vertical and Horizontal: N NOT APPLICABLE

Waterway Adequacy: 7 SLIGHT CHANCE OF OVERTOPPING BRIDGE & ROADWAY

Approach Roadway Alignment: 8 EQUAL TO DESIRABLE CRITERIA

Scour Critical Bridges: 8 STABLE FOR SCOUR

DESIGN VEHICLE, RATING, and POSTING

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

Posting Status: A OPEN, NO RESTRICTION

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 10 NO LOAD POSTING SIGNS ARE NEEDED

Posted Vehicle: POSTING NOT REQUIRED

Posted Weight (tons):

Design Load: 1 H 10

INSPECTION and CROSS REFERENCE

X-Ref. Route:

Insp. Date: 072013 **Insp. Freq. (months)** 12 **X-Ref. BrNum:**

INSPECTION SUMMARY and NEEDS

7/9/2013 The deck and substructure continue to deteriorate. There is deep spalling along the base of the stemwalls and at the ends that penetrates as much as 6"+/-. The concrete remains saturated w/ scaling. The soffit has saturation throughout w/ large delams and minor staining of efflorescence. There are some large spalled areas w/ exposed rebar, up to the second layer. A rehabilitation project will be needed sometime in the future. JWW/JDM

06/07/2012 The stemwall of abutment No.2 is need of an added kneewall or anti-abrasion repair. The right upstream stone retaining wall is in need of added anti-erosion protection or realignment. PLB

06/24/2010 - Bridge has served well for close to 90 years but is showing it's age with advanced(ing) deterioation of the deck and substructure. Aside from full replacement option, consider a possible rehabilitation with rigid deck overlay and concrete substructure repair. ~ MJ/DS

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Chris Williams, Structures Project Manager

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

DATE: June 11, 2013

SUBJECT: Strafford – BF-0177(10) – FAS 177 BR 29 over W. Br. of Ompompanoosuc 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 1923 based on inscription on the bridge and the bridge inspection reports. There were no record drawings. The bridge appears to be owned by the Town based on the bridge inspection reports, but is located on FAS 177 (also VT 132) near South Strafford village. The bridge is a 2-lane single span cast-in-place concrete T-Beam and deck bridge. The bridge has an asphalt pavement surface. The bridge is only slightly askew (i.e. 5°±) to the river and located at the downstream end of a small river bend. The abutments appear to be normal to the stream. There is also a tributary to the W. Branch of the Ompompanoosuc that has its confluence approximately 200 feet upstream of the bridge structure. The total width of bridge is approximately 23.2 feet normal to the roadway (21' curb to curb). The total clear span along the roadway is approximately 45.25 feet. The superstructure depth for the spans is approximately 4.5 feet (19" deck and 35" T-Beam). The approximate height to the bottom of the superstructure to the streambed varies since the bridge is located at the downstream of a curve, but the average height is approximately 10 feet.

The existing bridge does not meet the hydraulic standard for the Q_{50} design storm event. The bridge is located on the W. Branch of the Ompompanoosuc River. The structure is located on a section of the river having a well-defined channel having a sandy-gravelly streambed with small stones. We did not evaluate the scour for the existing conditions or any proposed bridge configurations as part of the preliminary design. Scour calculations will be performed during final hydraulics since the foundations have not been fully evaluated or selected at this time.

Recommendations

The bridge option selection criteria should be to provide a bridge opening that does not restrict the bank full width, nor provide an unrealistic widening of the existing channel, or create any worse backwater flooding conditions than the existing conditions. The VANR Bank Full Width (BFW) Equation estimates the width to be approximately 62 feet, but the actual field conditions have varying natural bank full stream widths within the study reach between 45 to 50 feet.

It has been assumed a replacement structure will be located in the existing roadway alignment having the same basic geometry. For a replacement structure, we have anticipated that the proposed abutments will be vertical face concrete abutments with 3H:2V sloped stone fill placed to provide scour protection in front of the abutments.

Based on our analysis, we have reviewed a couple of viable replacement bridges. Both a 50-foot clear span (normal to the stream channel (between the abutment faces) and 60-foot clear span are viable options that pass the design storm event through the structure and meet the VTrans hydraulic standards. As anticipated and based on the modeling, the longer span will have lower velocities in the area of the bridge, but the shorter span does not have considerably larger velocities which would create a significant erosion potential. Both options will also allow for approximately 1 feet of freeboard at the Q_{50} design storm event and meet the hydraulic design standard. Although the 60-foot clear span option Water Surface Elevation just upstream of the bridge is slightly lower than the 50-foot clear span option (<0.1 feet), the same low beam elevation is being proposed for both options to be conservative. Thus each option will require a minimum low beam elevation of at least 885.0 feet. Both options are also recommended to have approximately 4' - 4.5' height of 3H:2V sloped stone fill for scour protection in front of both abutments. It is anticipated that this stone fill will be blended back to the existing banks along wing walls. If additional stone fill height is determined to be necessary during further bridge design, the low beam elevation will need to be evaluated further and possibly raised slightly. Refer to the attached sketches showing the limits of the stone fill slopes and bridge opening cross section configuration.

It is noted with the stone fill that the 60-foot option provides better width through the structure with approximately 44 feet of channel width at the toe, rather than only 34 feet of channel width at the toe. While the proposed 50-foot single span structure with the stone fill slopes does not appear to create a significant constriction the stream channel's upstream bank full width from the current BFW field conditions, the 60-foot clear span structure does not appear to unrealistically widened as evidenced by the VANR Bank Full Width estimate of 62 feet for a watershed of this magnitude. The existing opening width is approximately 45 feet and the 60-foot option represents this width better. Therefore, the 60-foot clear span structure is the preferred option hydraulically, but the 50-foot clear span structure also is also considered to be viable option.

Temporary Bridge/Phasing

Based on pre-scoping information from the Structures Group, it has not been determined whether a detour or a temporary bridge will be used for this location, but it was noted that an off-site detour appears to be the preliminary choice.

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

MAH/BMB
cc: Hydraulics Project File via NJW
Hydraulics Chrono File

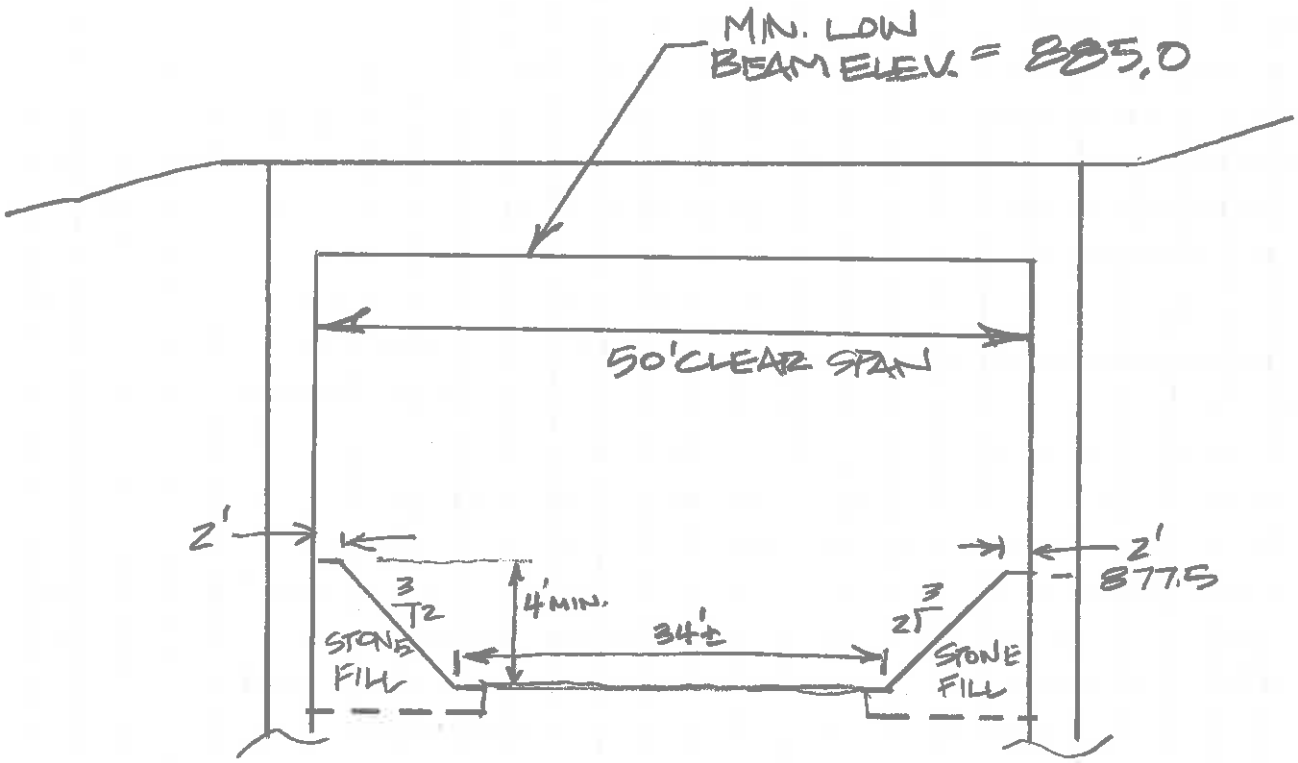
JOB STRAFFORD FAS 177(VT132) BR 29
13C088 - BF 0177(10)

CALCULATED BY MAH/BME DATE 5-31-13

CHECKED BY _____ DATE _____

SCALE N.T.S.

50-FT SPAN



ABUTMENT
FOUNDATION: TO BE DETERMINED.

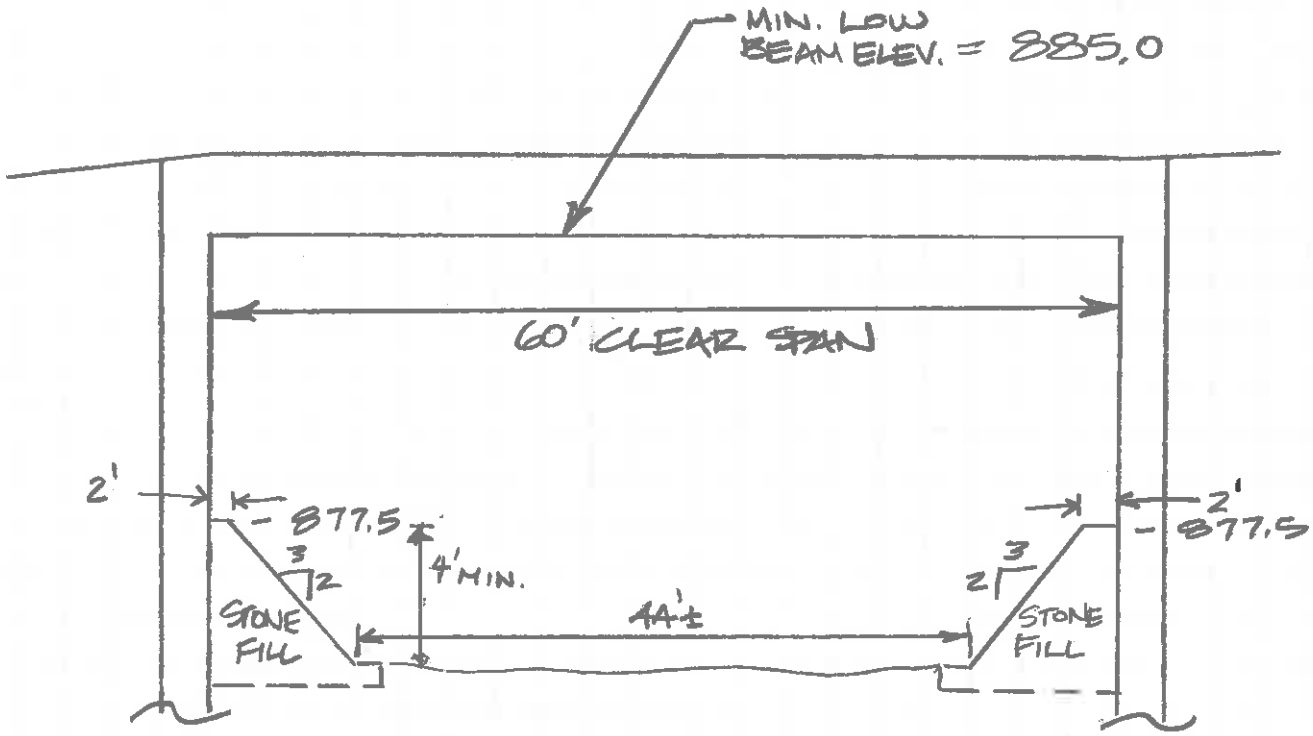
JOB STRAFFORD FAS 177 (VT132) BR29
13C088 - BF 0177(10)

CALCULATED BY MAH/EMB DATE 5-31-13

CHECKED BY _____ DATE _____

SCALE N.T.S.

60-FOOT SPAN



ABUTMENT
FOUNDATION: TO BE DETERMINED.

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Chris Williams, Project Manager, Structures

TDE CCB

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

Date: May 31, 2013

Subject: Strafford BF 0177(10) FAS 177, Br-29 Preliminary Geotechnical Information Report

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. 29 on VT-132 which crosses over the west branch of the Ompompanoosuc River in South Strafford, Vermont. Figures 1 and 2 show photographs taken of the approaches to the existing bridge.

Figure 1 View of Bridge No. 29 looking south.

Figure 2 View of Bridge No. 29 looking north.

This review included 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.

No boring log data were found in the Soils & Foundations project database or in-house historical boring log records.

Record plans from original construction of the current bridge (1932) were not found in the VTrans as-built plans digital print room.

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 Vermont Agency of Natural Resources On-Line Atlas provides the location of private wells linked to driller reports that detail information gathered during drilling. This atlas was reviewed for these purposes.

The Vermont Natural Resources Atlas shows eight water wells present in the immediate area of the subject project. Figure 3 shows the well locations with descriptions of the lithology encountered (with corresponding depths) as reported by the drilling contractor. It should be noted that these logs were developed and provided by the well drilling companies whose employees may have had little to no training in identifying soil and rock. During a site visit on

May 23, 2012, the author of this report observed that there is a water well in front of the house immediately southeast of the bridge within approximately 80 feet of the existing bridge (well head is visible in the photograph depicted in Figure 2). The atlas does not show this well.

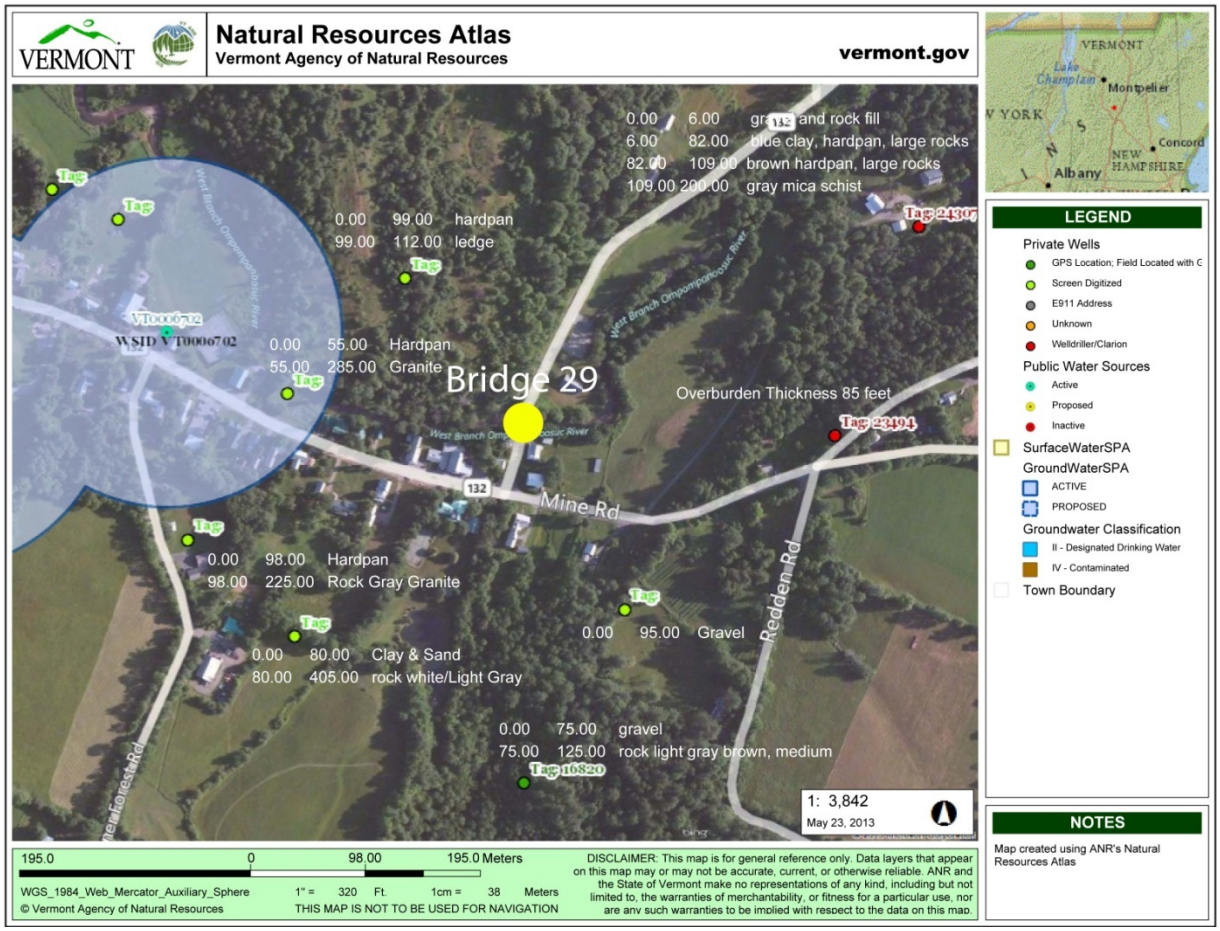


Figure 3 Private water wells in the vicinity of Bridge 29, Strafford.

Surficial mapping conducted for the 1970 Surficial Geologic Map of Vermont indicates that the subject area is underlain by glacial till. Glacial till is generally very dense and may contain varying amounts of gravel, cobbles and boulders in a silt to sandy silt matrix. Calcareous till overlies bedrock and non calcareous till in turn overlies the calcareous till. In addition, recent quaternary alluvium deposits associated with the Ompompanoosuc River are present in the river bed.

According to the 2011 bedrock map of Vermont, the project area overlies bedrock consisting of Waits River Formation rocks described as "Dark-gray to silvery-gray, lustrous, carbonaceous muscovite-biotite-quartz (+/-garnet) phyllite containing abundant beds of punky-brown-weathering, dark-bluish-gray micaceous quartz-rich limestone in beds ranging from 10 cm to 10 m thick". Based on a review of water well logs, bedrock is expected to lie about 100-feet below ground level (BGL) in the area of the project.

USDA Natural Resources Conservation soil survey records indicate that surficial soils in the area of the bridge consist of “Winooski” very fine sandy loam on the northern side of the river and “Buckland” stony loam with 3 to 8 percent slopes south of the river.

With the exception of overhead power/communications lines, no evidence of any utilities were observed at or near the bridge. Access for drilling borings appears favorable.

As a result of this background investigation, it is expected that dense till soils with varying amounts of gravel and cobbles are present in the subsurface at the project location. Bedrock is expected to be present at depths approaching 100 feet BGL. Standard geotechnical practices recommended for assessing the subsurface for structures of this size consist of the completion of one boring at each planned abutment location. This will allow the geotechnical Unit to verify subsurface conditions and allow for the collection of engineering data necessary to develop recommendations.

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

c: WEA/Read File
CCB/Project File

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

TO: James Brady, Environmental Specialist

FROM: John Lepore, Transportation Biologist

DATE: May 1, 2013

SUBJECT: Strafford B_F 0177 (10)
FAS 0177, Bridge 29
Natural Resource ID & Comments

The purpose of this memo is to let you know that I completed my initial resource identification for this project, which involves a crossing of the West Branch of the Ompompanoosuc River. In this location, the river is the only regulated natural resource in the immediate area.

As for a temporary bridge, either side of the existing bridge would work for natural resources, particularly if the new bridge (and temporary crossing) are constructed entirely outside of the limits of Ordinary High Water.

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

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, VTrans Environmental Specialist

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

Date: 5/13/2013

Subject: Strafford BF 0177(10) – Archaeological Resource ID

James,

A site visit was conducted on 4/25/2013 to assess the archaeological sensitivity of the area surrounding Bridge 29 on VT 132 in Strafford, Orange County, Vermont. One quadrant of the project area contains the remains of a structure identified on the 1850s map as a grist mill and the1867 map as being the J.L. Barrett Mill. A dam and raceway are also identified on the map. This area is likely to yield archaeological data related to early small-scale waterpowered mill technology. If the site cannot be avoided during construction, it's suggested that a Ph1 survey and historic research be conducted.

Sincerely,

Brennan

Brennan Gauthier
VTrans Archaeologist
Vermont Agency of Transportation
Program Development Division
Environmental Section
1 National Life Drive
Montpelier, VT 05633
tel. 802-828-3965
fax. 802-828-2334
Brennan.Gauthier@state.vt.us

VTrans Working to Get You There
Vermont Agency of Transportation

Strafford BF 0177(10)
Arch Resouce ID
1:831
0 10 20 40 60 80
Feet
N
Site of 1860s J.L Barrett Milll
bing
© 2010 Dig
Map created by BCG,
PDD-Environmental Section
on 5/13/2013.

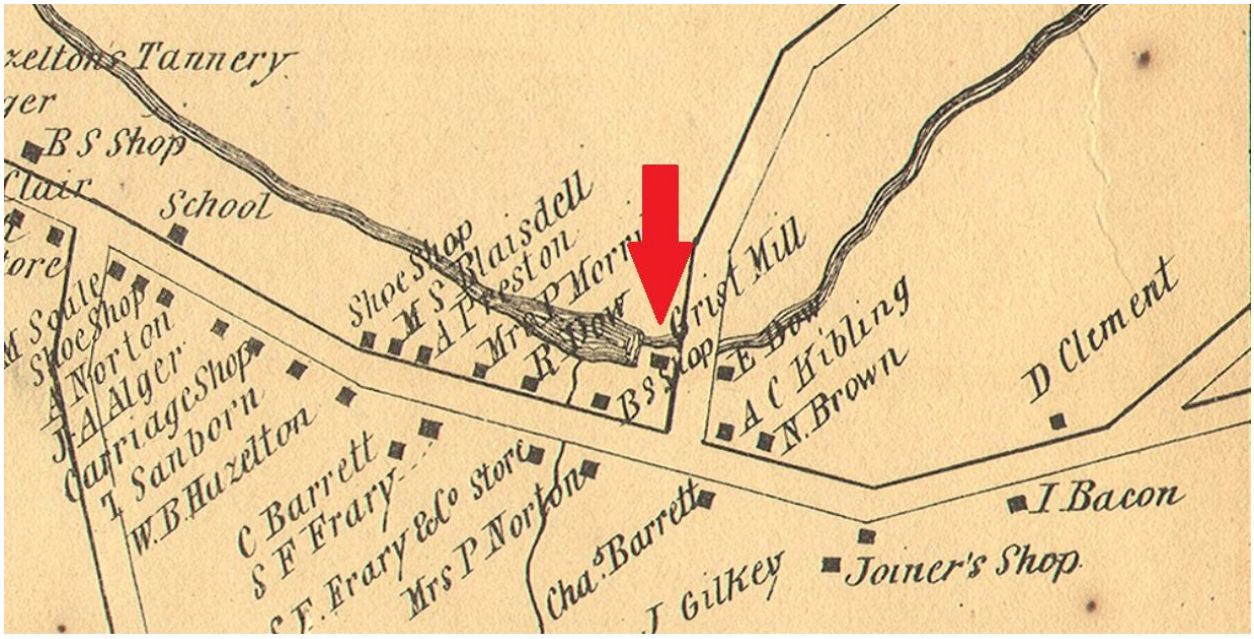


Figure 1 1850s Map Showing Grist Mill

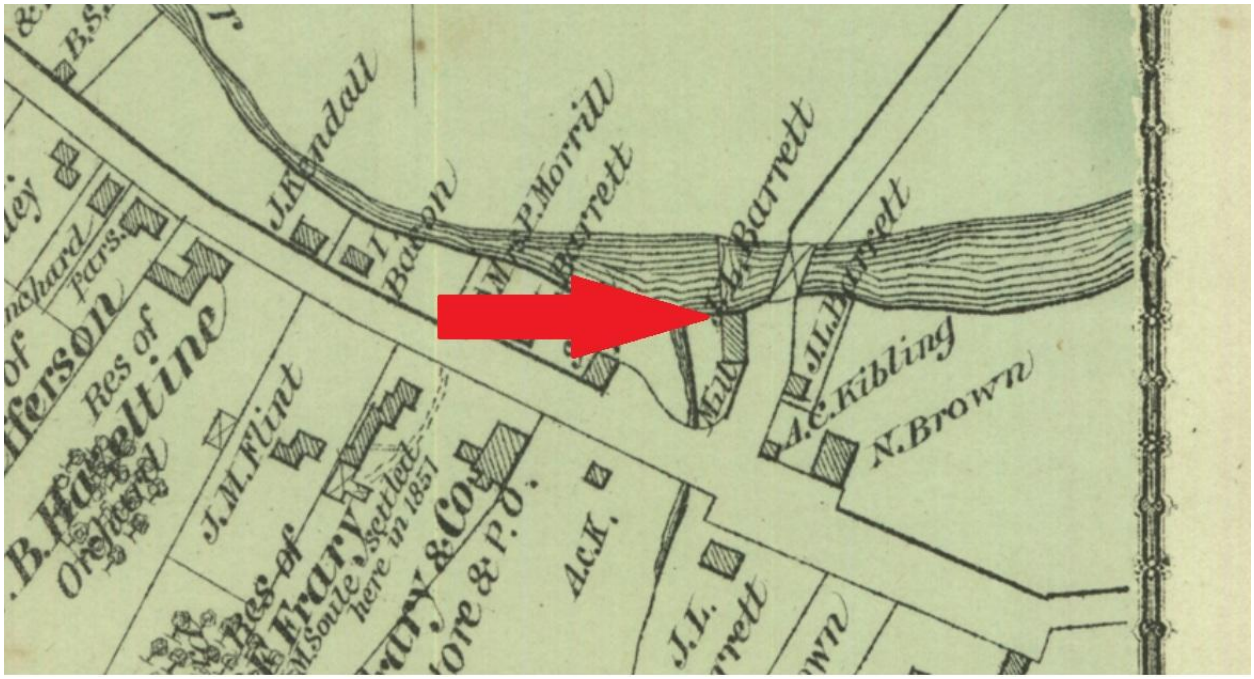


Figure 2 1860s Map Showing Mill

Brady, James

From: O'Shea, Kaitlin
Sent: Wednesday, May 08, 2013 2:53 PM
To: Brady, James
Cc: Newman, Scott; Williams, Chris
Subject: Strafford BF0177(10) Historic Resource ID

Hi James,

The historic resource ID for Bridge 29 in Strafford is complete. Bridge 29, although not a historic structure, serves as a gateway to the Strafford Village Historic District. The adjacent historic properties have been identified on ArcMap (bookmarked under the project name), as well as the beginning of the historic district.

As Bridge 29 is not historic, there are no concerns about the existing structure. However, if this bridge calls for replacement, the railing will be of concern to historic resources, as are any impacts to adjacent historic properties.

Let me know if you have any questions or need additional information.
Thanks,
Kaitlin

Kaitlin O'Shea
Historic Preservation Specialist
Vermont Agency of Transportation

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

Natural Resources Atlas

Vermont Agency of Natural Resources

vermont.gov

LEGEND

Landfills
- OPERATING
- CLOSED

Hazardous Waste Site

Hazardous Waste Generators

Brownfields

Underground Storage Tank (w

VT Wastewater Treatment Fac

Wastewater System & Potable Permits

Sewer Service Area

Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

427.0 0 214.00 427.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 700 Ft. 1cm = 84 Meters

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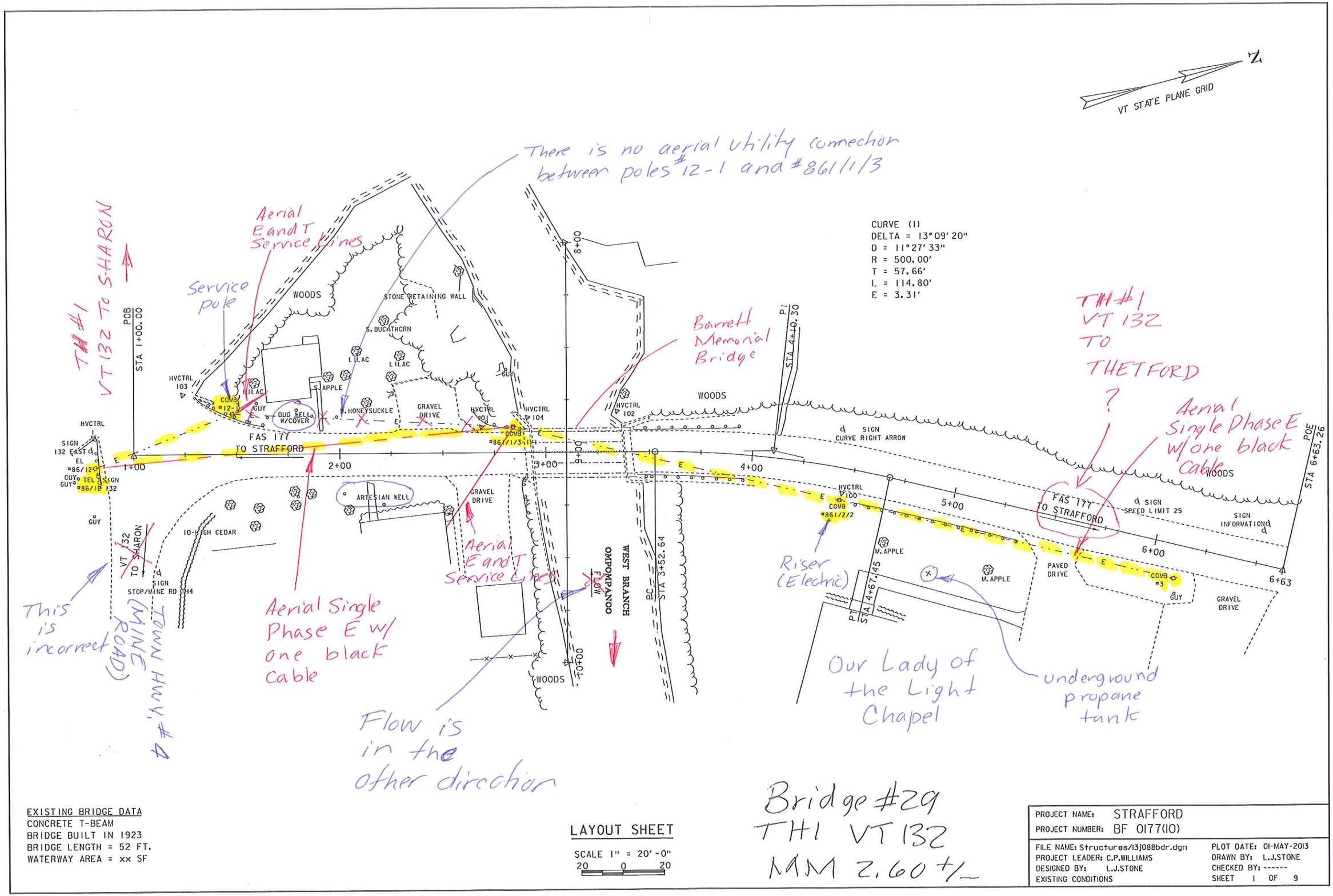
THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.



EXISTING BRIDGE DATA
CONCRETE T-BEAM
BRIDGE BUILT IN 1923
BRIDGE LENGTH = 52 FT.
WATERWAY AREA = xx SF

LAYOUT SHEET

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

Bridge #29
TH1 VT 132
MM 2.60 +/-

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BF 0177(10)	
FILE NAME: Structures/13J088bdr.dgn	PLOT DATE: 01-MAY-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: L.J.STONE	CHECKED BY: ------
EXISTING CONDITIONS	SHEET 1 OF 9

Local & Regional Input Questionnaire

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
2. Is there a "slow season" or period of time from May through October where traffic is less? Slow season would be may through August.
3. Please describe the location of emergency responders (fire, police, ambulance) and emergency response routes. Volunteer Fire Department location are: 149 VT Rt 132 and 241 Justin Morrill Highway, Rt 132 and Justin MorrillHighway run through South Strafford to Strafford.
4. Where are the schools in your community and what are their schedules? 243 VT Rt 132 School in session end of August through middle of June, Monday – Thursday 8:00-3:00 pm Friday's 8:00-12:30 pm
5. Is the proposed project on an established or planned school bus or public transit route(s)? Yes
6. Are there any businesses (including agricultural operations) that would be adversely impacted either by a detour or due to work zone proximity? NO
7. Are there any important public buildings (town hall or community center) or community facilities (recreational fields or library) in close proximity to the proposed project? No
8. Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road? No
9. Are there any other municipal operations that could be adversely impacted if the bridge is closed during construction? If yes, please explain. No
10. Please identify any local communication channels that are available—e.g. weekly or daily newspapers, blogs, radio, public access TV, Front Porch Forum, etc. Also include any unconventional means such as local low-power FM. Strafford News; monthly town news. Strafford List Serve; daily delivery by e-mail. Strafford WEB page at Straffordvt.org.
11. Is there a local business association, chamber of commerce or other downtown group that we should be working with? No

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? No

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

3. What is the current level of bicycle and pedestrian use on the bridge? This is a main route in and out of town used by bicycles often.

4. If a sidewalk or wide shoulder is present on the existing bridge, should the new structure have one? Yes

5. Is there a need for a sidewalk or widened shoulder if one does not currently exist? Please explain. Yes, the Lions club have constructed a walkway to the ball field, however additional sidewalk is needed before the bridge and after.

6. Does the bridge provide an important link in the town or statewide bicycle or pedestrian network such that bicycle and pedestrian traffic should be accommodated during construction? No

7. Are there any special aesthetic considerations we should be aware of? No

8. Are there any traffic, pedestrian or bicycle safety concerns associated with the current bridge? If yes, please explain. The narrow bridge does slow traffic with two vehicles approaching at the same time. Example, two full size truck, or a tractor tailor truck cannot pass at the same time on the bridge.

9. Does the location have a history of flooding? If yes, please explain. No

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. N/A

3. Are there any existing, pending or planned development proposal that would impact future transportation patterns near the bridge? If so please explain. No

4. Is there any planned expansion of public transit service in the project area? If not known please contact your Regional Public Transit Provider. No

Village Designation

South Strafford
Strafford, Vermont

Designated by the
Vermont Downtown Board
on September 25, 2006

Use

- Commercial
- Public
- Village District Boundary

Zoning District

- Village Center
- Rural Residential
- River Valley Conservation

0 75 150 300 Feet

N E S W

POLITICAL BOUNDARIES: Town Parcel Boundaries, VCGI, 2003.
ROADS: 1:5000 Digital Road Centerline Project, VAOT, 1991-1994 & E911 Board GPS Updates, 2003.
STRUCTURES: E911 Board GPS Updates, 2003.
SURFACE WATER: On-screen digitized from 1:5000 digital orthophotos using USGS 7 1/2' quadrangles and 1:20000 color infrared aerial photography as additional source material, VCGI for VHD-USGS, 2003.

State Plane Meters, NAD 83

GIS
for info & data
www.vcgi.org

For planning purposes only.
Not for regulatory interpretation.

TWO RIVERS-OTTAUQUECHEE
REGIONAL COMMISSION
GIS Service Center
3117 Rose Hill
The King Farm
Woodstock, VT 05091
802-457-3188
www.trorc.org

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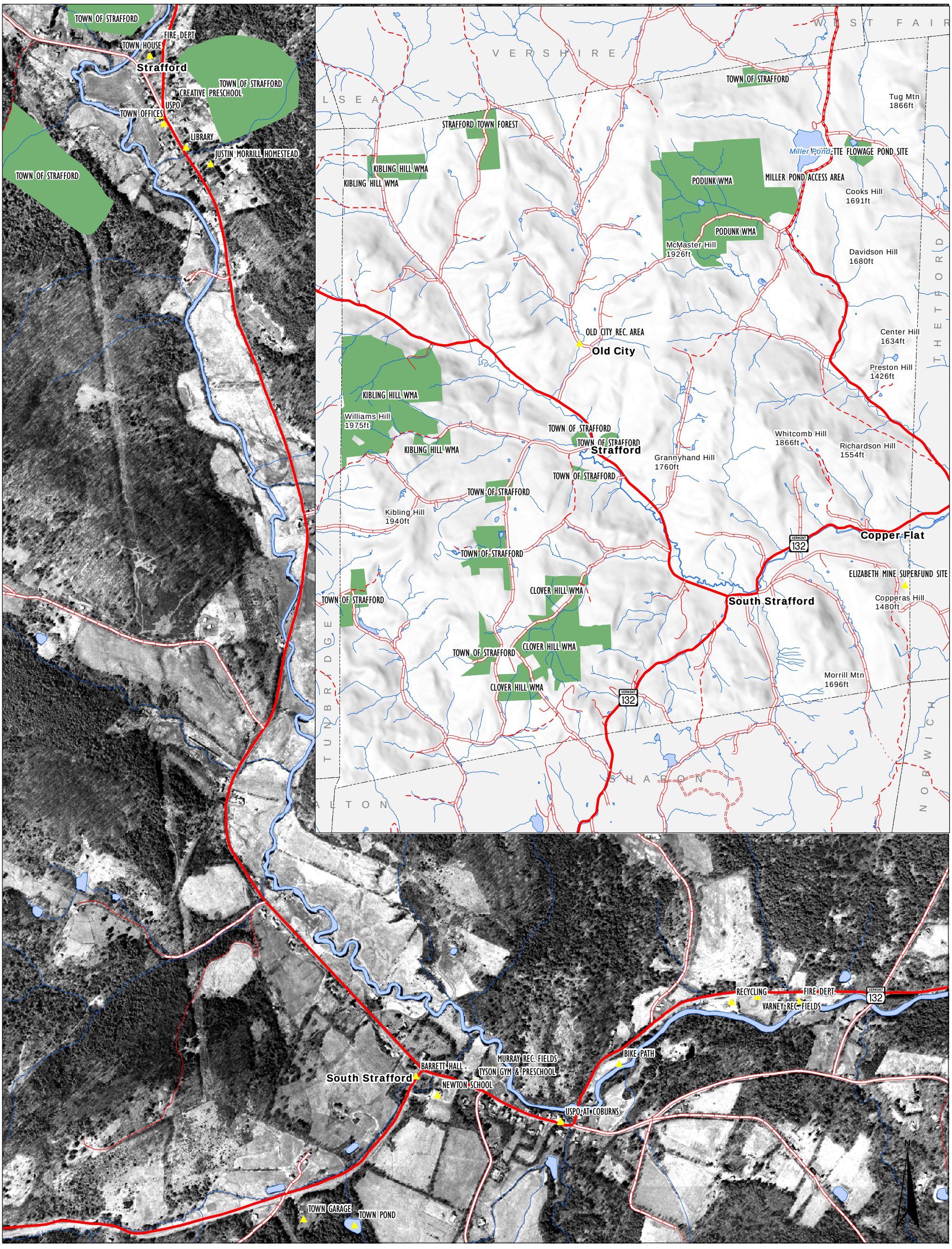

Town, Educational & Other Facilities

Strafford, Vermont

Town Plan 2011

Map 3 of 5

Adopted: August 10, 2011

1:12,000

1 inch = 1,000 feet

0 0.1 0.2

Miles

- VT route/TH cls 1
- TH cls 2
- TH cls 2 gravel
- TH cls 3
- TH cls 3 gravel
- TH cls 4
- trail
- private
- US route
- US interstate
- VT forest hwy

State Plane Meters, NAD 83

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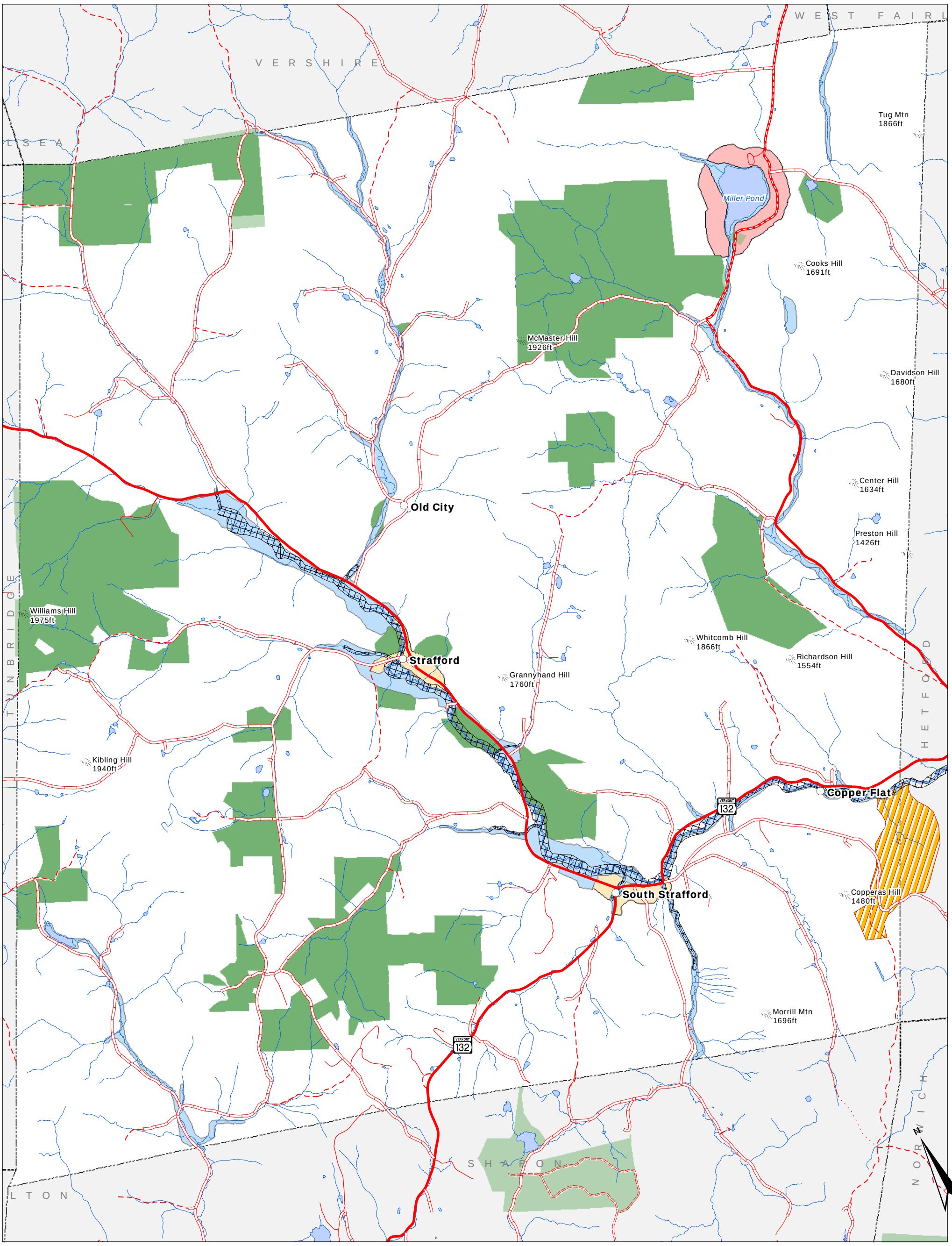

Current & Prospective Land Use

Strafford, Vermont

Town Plan 2011

Map 1 of 5

Adopted: August 10, 2011

1:40,000

1 inch = 3,333 feet

0 0.5 1

Miles

- VT route/TH cls 1
- TH cls 2
- TH cls 2 gravel
- TH cls 3
- TH cls 3 gravel
- TH cls 4
- trail
- private
- US route
- US interstate
- VT forest hwy
- 911 structure

Future Land Use Areas

- RIVER VALLEY CONSERVATION
- MILLER POND SHORELINE
- VILLAGE CENTERS
- LAND FOREST CONSERVATION
- Fluvial Erosion Hazard Area
- Elizabeth Mine Possible Groundwater Hazard Zone

State Plane Meters, NAD 83

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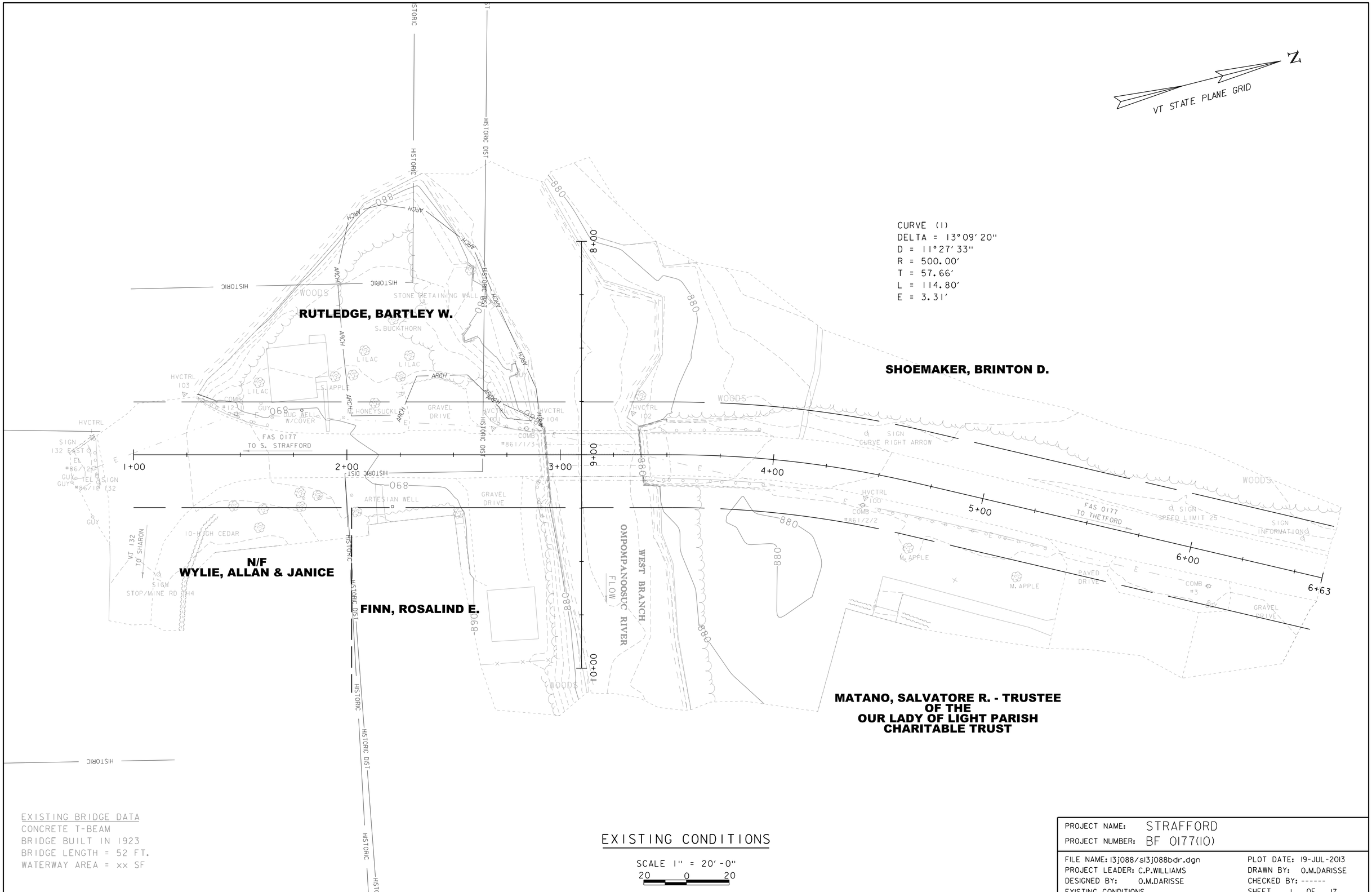
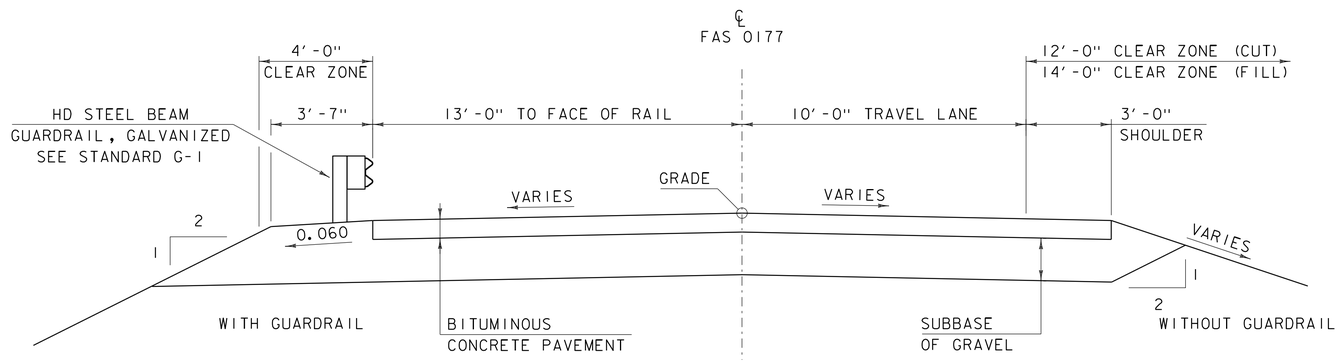


EXISTING BRIDGE DATA
CONCRETE T-BEAM
BRIDGE BUILT IN 1923
BRIDGE LENGTH = 52 FT.
WATERWAY AREA = xx SF

EXISTING CONDITIONS

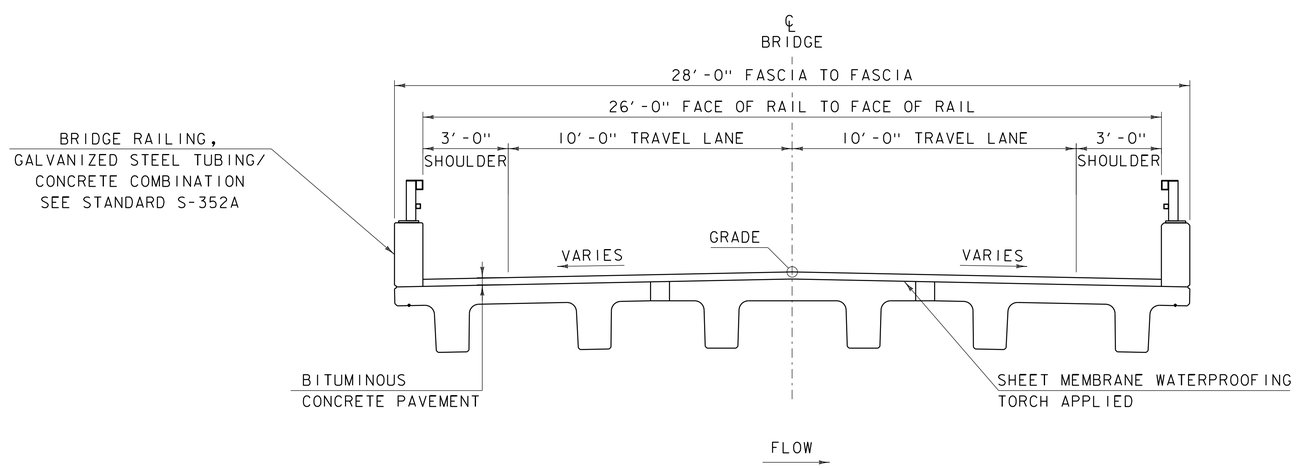
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BF 0177(10)	
FILE NAME: 13j088/s13j088bdr.dgn	PLOT DATE: 19-JUL-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: O.M.DARISSE
DESIGNED BY: O.M.DARISSE	CHECKED BY: ------
EXISTING CONDITIONS	SHEET 1 OF 17



PROPOSED FAS 0177 TYPICAL SECTION

SCALE 3/8" = 1'-0"



PROPOSED BRIDGE TYPICAL SECTION

SCALE 3/8" = 1'-0"

MATERIAL TOLERANCES

(IF USED ON PROJECT)

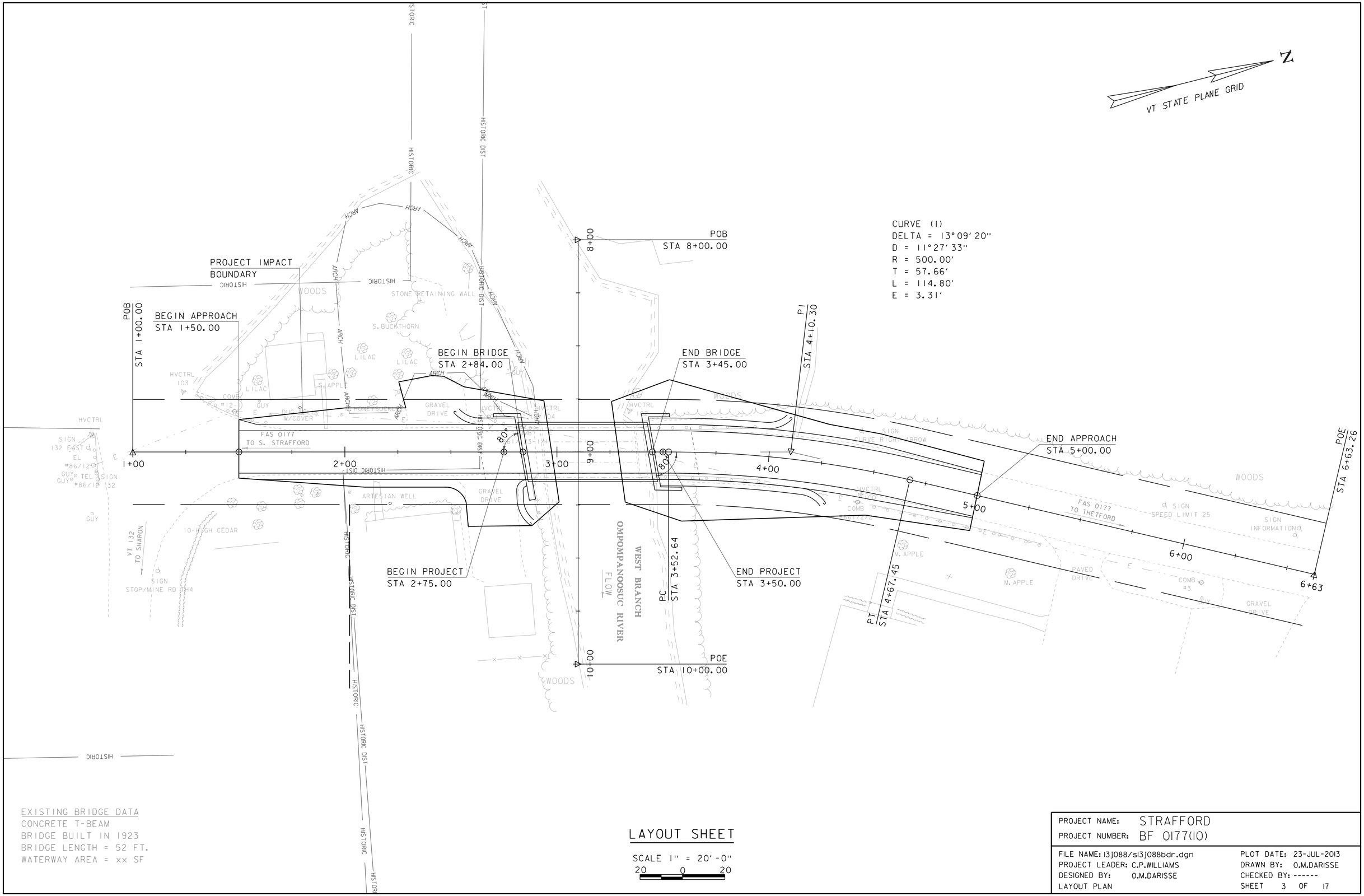
SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- 1/4"
- AGGREGATE SURFACE COURSE	+/- 1/2"
SUBBASE	+/- 1"
SAND BORROW	+/- 1"

SUPERSTRUCTURE NOT DESIGNED.
CONCEPTUAL STRUCTURE SHOWN.

PROJECT NAME: STRAFFORD
PROJECT NUMBER: BR 0177(10)

FILE NAME: 13J088\s13J088typical.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ----------
TYPICAL SECTIONS

PLOT DATE: 23-JUL-2013
DRAWN BY: O.M.DARISSE
CHECKED BY: ------
SHEET 2 OF 17

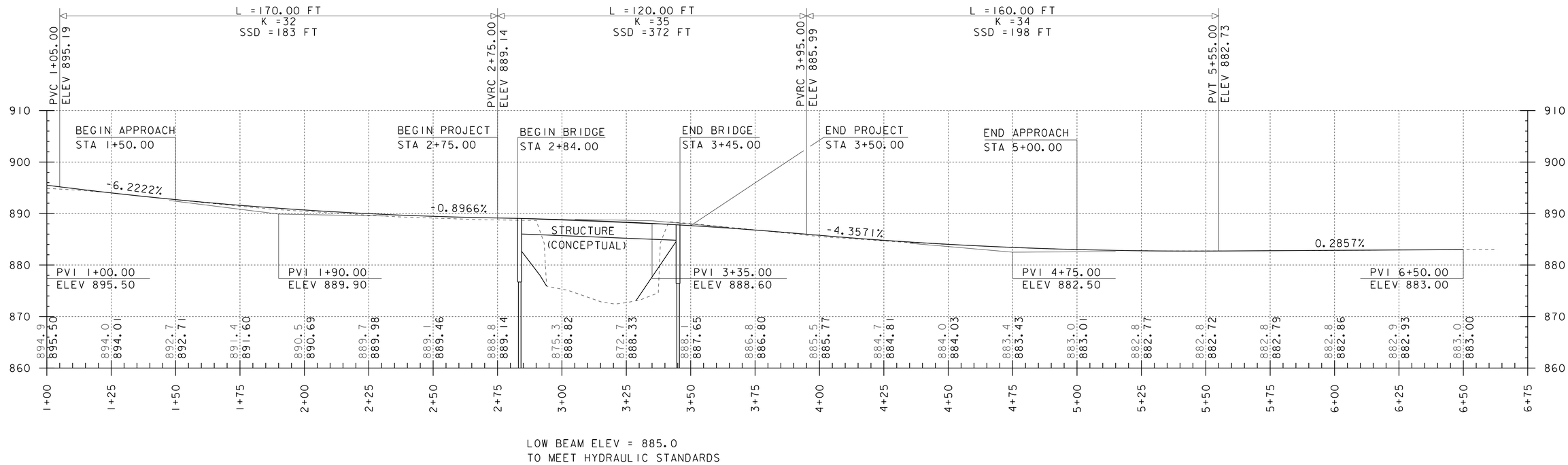


EXISTING BRIDGE DATA
CONCRETE T-BEAM
BRIDGE BUILT IN 1923
BRIDGE LENGTH = 52 FT.
WATERWAY AREA = xx SF

LAYOUT SHEET

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

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BF 0177(10)	
FILE NAME: 13j088/s13j088bdr.dgn	PLOT DATE: 23-JUL-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: O.M.DARISSE
DESIGNED BY: O.M.DARISSE	CHECKED BY: ------
LAYOUT PLAN	SHEET 3 OF 17



LOW BEAM ELEV = 885.0
TO MEET HYDRAULIC STANDARDS

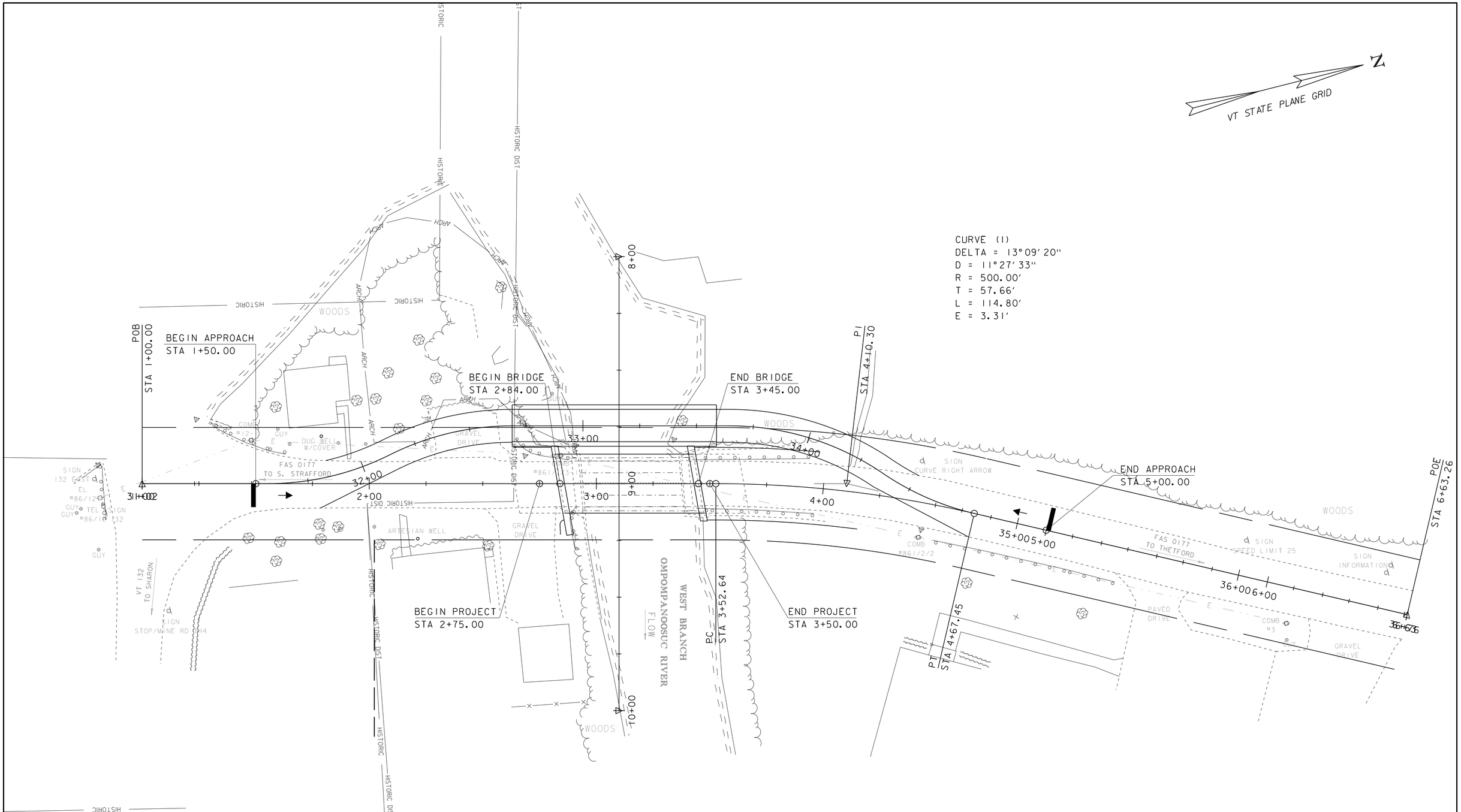
FAS 177 PROFILE

NOTE:

GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BF 0177(10)	
FILE NAME: Structures/13j088pro.dgn	PLOT DATE: 19-JUL-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: O.M.DARISSE
DESIGNED BY: O.M.DARISSE	CHECKED BY: ------
PROFILE	SHEET 4 OF 17



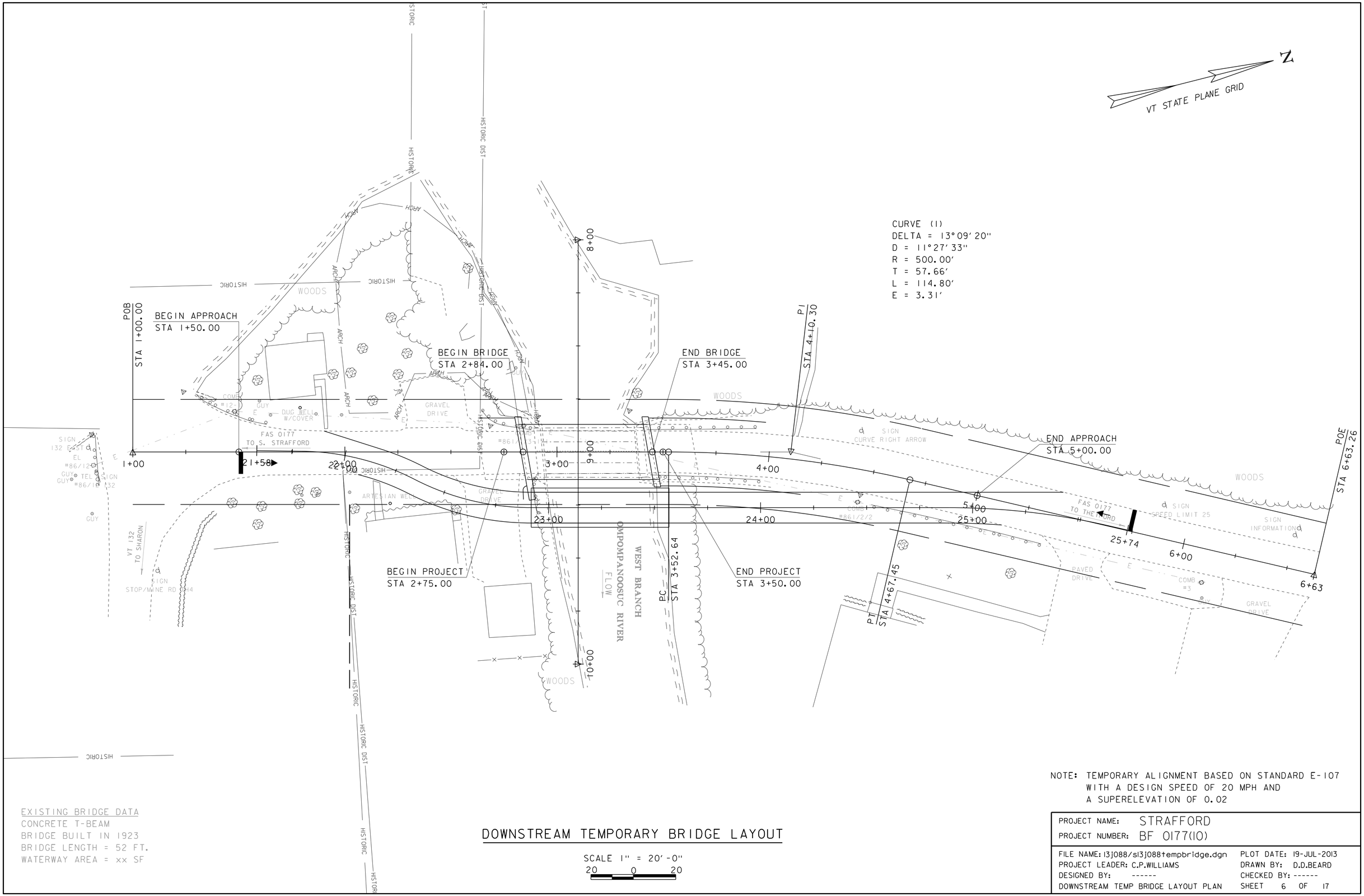
EXISTING BRIDGE DATA
CONCRETE T-BEAM
BRIDGE BUILT IN 1923
BRIDGE LENGTH = 52 FT.
WATERWAY AREA = xx SF

NOTE: TEMPORARY ALIGNMENT BASED ON STANDARD E-107
WITH A DESIGN SPEED OF 20 MPH AND
A SUPERELEVATION OF 0.02

UPSTREAM TEMPORARY BRIDGE LAYOUT

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

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BF 0177(10)	
FILE NAME: 13J088/s13J088tempbridge.dgn	PLOT DATE: 19-JUL-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
UPSTREAM TEMP BRIDGE LAYOUT PLAN	SHEET 5 OF 17



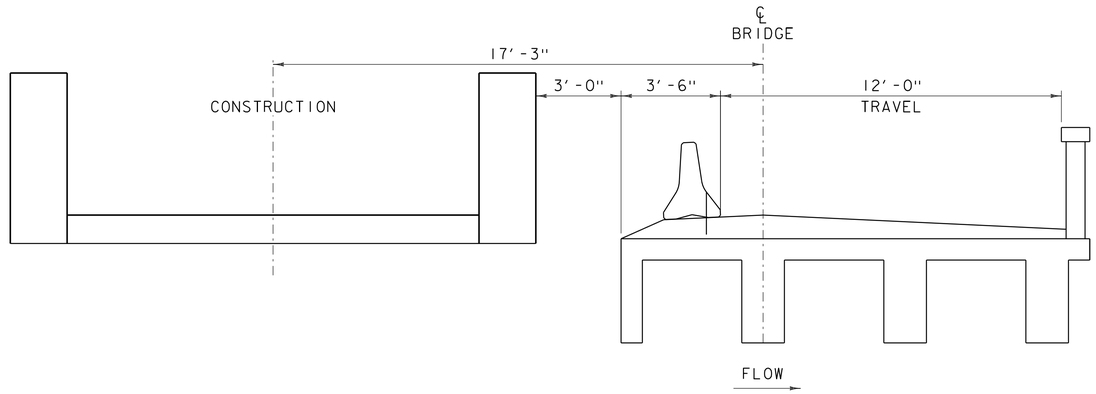
NOTE: TEMPORARY ALIGNMENT BASED ON STANDARD E-107
WITH A DESIGN SPEED OF 20 MPH AND
A SUPERELEVATION OF 0.02

EXISTING BRIDGE DATA
CONCRETE T-BEAM
BRIDGE BUILT IN 1923
BRIDGE LENGTH = 52 FT.
WATERWAY AREA = xx SF

DOWNSTREAM TEMPORARY BRIDGE LAYOUT

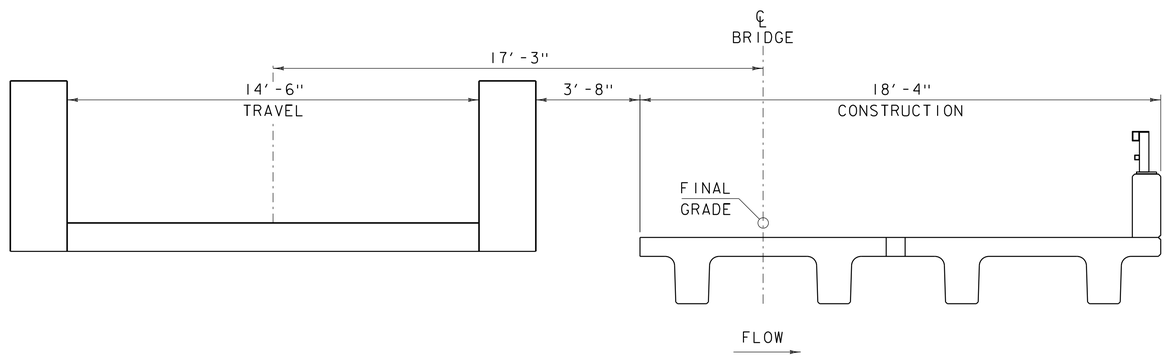
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BF 0177(10)	
FILE NAME: 13j088/s13j088tempbridge.dgn	PLOT DATE: 19-JUL-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
DOWNSTREAM TEMP BRIDGE LAYOUT PLAN	SHEET 6 OF 17



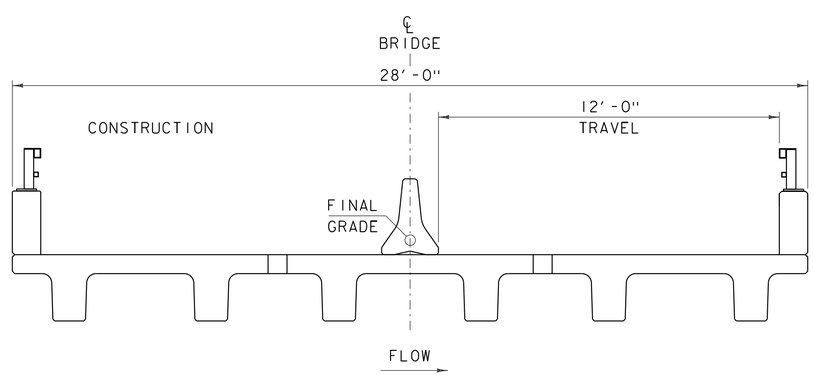
PHASE 1 TYPICAL SECTION

SCALE 3/8" = 1'-0"



PHASE 2 TYPICAL SECTION

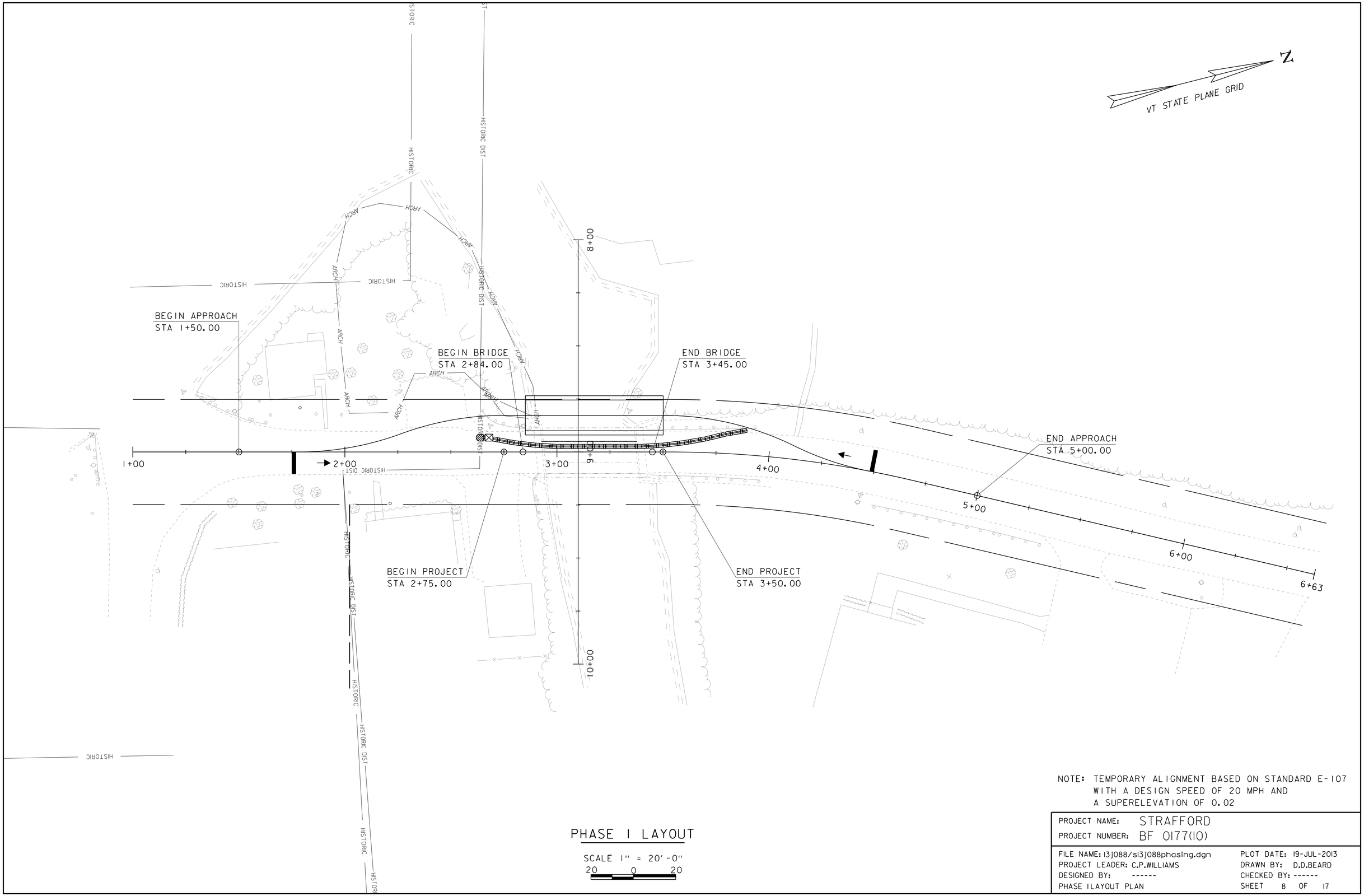
SCALE 3/8" = 1'-0"



PHASE 3 TYPICAL SECTION

SCALE 3/8" = 1'-0"

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BR 0177(10)	
FILE NAME: 13j088\s13j088phasing.dgn	PLOT DATE: 19-JUL-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ----------	CHECKED BY: ------
PHASING TYPICAL SECTIONS	SHEET 7 OF 17



NOTE: TEMPORARY ALIGNMENT BASED ON STANDARD E-107
WITH A DESIGN SPEED OF 20 MPH AND
A SUPERELEVATION OF 0.02

PHASE 1 LAYOUT

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

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BF 0177(10)	
FILE NAME: 13J088/s13J088phasing.dgn	PLOT DATE: 19-JUL-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 1LAYOUT PLAN	SHEET 8 OF 17

VT STATE PLANE GRID

BEGIN APPROACH
STA 1+50.00

BEGIN BRIDGE
STA 2+84.00

END BRIDGE
STA 3+45.00

END APPROACH
STA 5+00.00

BEGIN PROJECT
STA 2+75.00

END PROJECT
STA 3+50.00

1+00 2+00 3+00 4+00 5+00 6+00 6+63

8+00 9+00 10+00

HISTORIC DIST

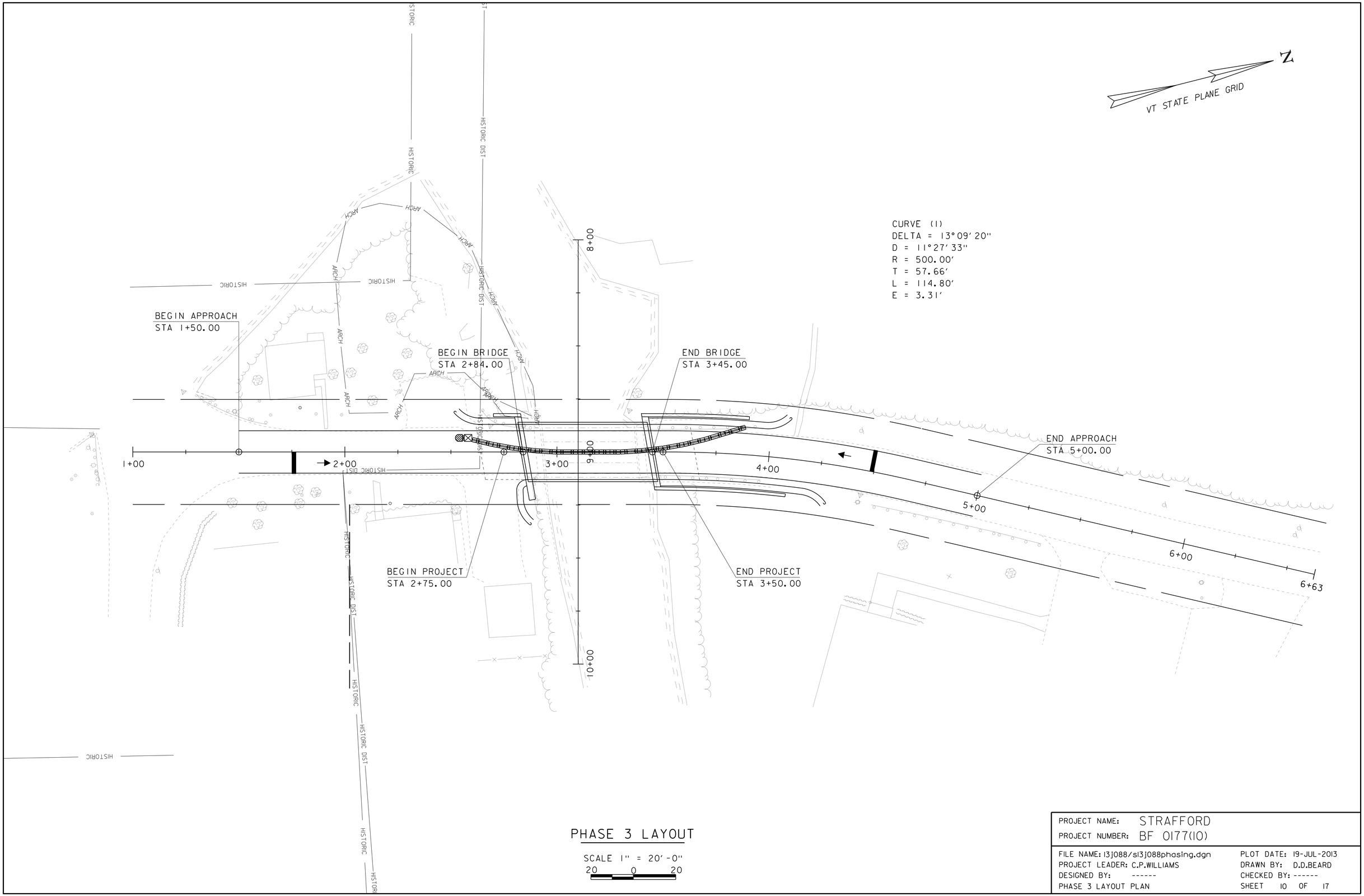
ARCH

NOTE: TEMPORARY ALIGNMENT BASED ON STANDARD E-107
WITH A DESIGN SPEED OF 20 MPH AND
A SUPERELEVATION OF 0.02

PHASE 2 LAYOUT

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

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BF 0177(10)	
FILE NAME: 13j088/s13j088phasing.dgn	PLOT DATE: 19-JUL-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT PLAN	SHEET 9 OF 17



PHASE 3 LAYOUT

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

PROJECT NAME: STRAFFORD	
PROJECT NUMBER: BF 0177(10)	
FILE NAME: 13j088/s13j088phasing.dgn	PLOT DATE: 19-JUL-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 3 LAYOUT PLAN	SHEET 10 OF 17