ALIGNMENT STUDY

FOR

STOWE BHF 0235(15)

VT ROUTE 108, BRIDGE 3 OVER WEST BRANCH OF THE LITTLE RIVER

Prepared for:

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I. EXISTING STRUCTURE

The existing structure is a two-span non-continuous steel rolled beam bridge with a cast-in-place concrete deck that was reconstructed in 1975. The beams are straight while the deck curves to match the roadway geometry. The curb-to-curb width is approximately 27 feet and carries two 11-foot travel lanes with 2'-6" shoulders. The out-to-out bridge width is approximately 28.3 feet.

The abutments and pier are skewed approximately 45 degrees to the roadway. The clear span between abutments is approximately 162 feet measured along the roadway alignment chord.

II. PURPOSE AND NEED STATEMENT

Purpose

The purpose of this project is to provide a safe highway crossing on VT 108 over the West Branch of the Little River that is capable of supporting all of the anticipated vehicular loads.

Need

Bridge 3 is considered structurally deficient and has a sufficiency rating of 56.9 (of a possible 100). The deck is rated 4 and the superstructure and substructure are rated 6 (of a possible 10) by Vermont Agency of Transportation bridge inspectors. The deck has been repaired by placing steel plates over holes that extend through the full depth of the deck.

The deck rating of 3 out of 10 indicates that the deck is in serious condition. Per the Inspection Report, the deck shows advanced deterioration with full-depth failures. The underside of the deck shows numerous cracks with evidence of leaking. In addition to the poor condition of the deck, the deck geometry is defined as intolerable, which is most likely due to the narrow width.

The superstructure consists of 5 rolled beams in each span. The superstructure rating of 6 out of 10 indicates a satisfactory condition. The beams exhibit corrosion with some section loss, which is predominately located at the abutment locations. In addition, several of the bearing anchor bolts are bent.

The substructure rating of 6 out of 10 indicates a satisfactory condition. The abutments show signs of leaking between the concrete diaphragm and the bearing seat. There are

several delaminated areas of the bearing seats. The pier appears to be in good condition; however, there is debris buildup on the upstream side.

III. SITE INFORMATION

The bridge is located just outside of the urban areas of Stowe with multiple businesses in the immediate area. The Town has indicated that there are approximately 24 businesses in the area that may be affected by the construction and/or closure of the road. VT 108 is considered a major collector route.

Areas along the edges of the West Branch of the Little River are primarily wooded.

Hydraulics

The existing bridge is well centered on the channel, with a clear span of 121 feet measured face-to-face of abutment. All flows, including the Q500, pass through the existing opening area. There is approximately 10 feet of freeboard for the Q50 flood event.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2014, 2034, and 2054.

TRAFFIC DATA	2014	2034	2054
AADT	8200	8700	~
DHV	1100	1200	~
ADTT	480	780	~
%T	5.7	8.6	~
%D	52	52	~
FLEXIBLE ESAL	~	**2014~2034** 1,920,000	**2014~2054** 4,446,000

Utilities

There are overhead utility lines that cross over the roadway at either end of the bridge, and pass over the river on the upstream side. There is also a water main attached to the upstream (south) fascia, and a two-duct utility attached to the downstream fascia. The 6-inch utility line located just inside the southern exterior girder is believed to be an abandoned waterline. The utilities attached to the bridge will have to be temporarily relocated off the bridge during construction. The overhead power lines are located approximately 20 feet behind the existing western abutment and depending on equipment/crane placements, may not need to be relocated for the bridge construction. A temporary bridge detour would definitely require relocation of several utility poles mentioned above.

There is an underground sewer main that crosses VT 108 to the west of the bridge and crosses the river further downstream.

Right-of-Way

All portions of the existing superstructure and substructure, as well as the temporary bridge alignment, are anticipated to be within the existing right-of-way.

Environmental Resources

An archeological resource has been identified adjacent to the pedestrian path in the northwest quadrant. The anticipated construction should have no impacts in this area.

The Gables Inn & Restaurant, located on the southern side of TH 38, has been identified as a historical resource area. The bridge is not considered historic, and the anticipated construction should have no impacts in the historic area.

The pedestrian path has been identified as a 4(f) resource. In addition, some statewide and prime agricultural soils have been identified in the project area, all located to the northern side of the bridge.

Design Criteria

Existing Bridge:

Design Speed = 30 mph

Lane/Shoulder Width = 11’-0”/2’-0”

New Bridge:

The design standards for this project are the latest Vermont Agency of Transportation Standards, AASHTO Green Book and the AASHTO Roadside Design Guide.

Design Speed = 30 mph

Lane/Shoulder Width = 11’-0”/4’-0”

Banking = 0.040 max.

Bridge Capacity = HL-93

Hydraulic Requirement = 733.2’ min. average low-chord elevation

See Plan Sheet 1 for Proposed Approach Roadway Typical Sections and Plan Sheet 2 for Existing and Proposed Bridge Typical Sections.

IV. MAINTENANCE OF TRAFFIC

Option 1: Temporary Bridge Upstream (See Plan Sheet 5)

This option involves installing a 130-foot, two-way temporary bridge upstream of the existing structure. This will allow passenger car and truck traffic through the project area while allowing for bridge construction on the existing alignment.

Advantages: This option would allow passenger car and truck traffic to continue through the area during construction; thereby, minimizing impacts to local businesses by allowing for truck traffic for deliveries and patron business.

Disadvantages: There are several disadvantages to this option. The use of a temporary bridge will limit the available construction staging areas and the areas that can be used for access to the pier and abutments. The temporary bridge will be located in the vicinity of the stone abutments from the previous bridge. Although these abutments have not been identified as historically significant, they will be impacted by the construction of the temporary bridge. The temporary bridge option will also be more expensive than the detour option, and would extend the construction time of the project in order to build the temporary bridge and the temporary access roads to the bridge.

The temporary alignment would impact existing overhead utility poles with a significant amount of equipment on them. The cost of these temporary relocations (which would likely be permanent) could be significant.

The geometry of the temporary facility at Meadow Lane would be substandard. Temporary geometric improvements to Meadow Lane and its intersection with VT Route 108 would need to be incorporated, increasing the cost of the temporary bridge option. Additionally, these improvements would be adjacent to the historic properties along Meadow Lane and would impact business while construction of these temporary improvements are being made, which would not be necessary with the detour option.

Placing the temporary bridge on the downstream side of the existing bridge was also reviewed; however, due to the location of the pedestrian bridge and path, there is insufficient space available.

Option 2: Off-Site Detour (See Plan Sheet 6)

This option involves maintaining traffic by the use of an off-site detour. It is anticipated that the construction duration will be one to two months, similar to the Chester BRF-1(37) project.

Advantages: This option would eliminate the need for a temporary bridge, which would decrease cost and time of construction. The need to temporarily relocate the overhead utility lines would also be eliminated as relocation is not likely required for the bridge construction, but will be required for the use of a temporary bridge.

Disadvantages: This option would have the largest impact on the traveling public; particularly the local residents. The two potential alternative routes considered have challenges and drawbacks. One alternative route experiences many crashes at several different locations within the route. Adding more traffic may not be advised as it would likely contribute to the crash issue. The Cape Cod Road route is a shorter detour and a safer route; however, its geometry was not designed for larger turning radii for truck traffic.

A drawing is included in the Appendix that provides additional information for impacts with detour routes associated with this option.

V. ALTERNATIVES

Alternative A: No Action

The "no action" alternative would involve leaving the bridge as-is, and allowing the State to continue to inspect and repair the structure as needed.

Advantages: This alternative would have no immediate costs.

Disadvantages: This alternative does not address the deficiencies of the existing bridge. The deck will continue to deteriorate, producing additional full-depth failures. This poses a safety concern to the travelling public.

Maintenance of Traffic: This alternative would require no maintenance of traffic.

This alternative is not recommended since it does not address the purpose and need of the project. This alternative has no immediate costs, but has been included in the Evaluation Matrix as Combination 1 for comparison purposes.

Alternative B: Superstructure Rehabilitation

This alternative would consist of removing the existing deck and replacing it with full-depth precast panels. The structural steel would be cleaned and painted. In addition, the substructures would be repaired to address any deficient concrete areas.

Advantages: This alternative would cost the least of all viable alternatives.

Disadvantages: This alternative would not allow for the bridge deck to be widened as this would produce unacceptable deck overhang widths. Therefore, this alternative will perpetuate the existing intolerable deck geometry. In addition, cleaning and painting the existing steel may require a longer construction period.

Maintenance of Traffic: This alternative would utilize either option presented in the Maintenance of Traffic Section.

This alternative is not recommended, but has been included in the Evaluation Matrix as Combination 2 and 3.

Alternative C: Superstructure Replacement Without Widening

This alternative would consist of replacing the concrete deck and the steel beams in a similar configuration as the existing bridge. The substructures would be repaired to address any deficient concrete areas.

Advantages: This alternative will eliminate the need to clean and paint the structural steel which will reduce construction time. With the replacement of the structural steel, the

bridge life span will be increased; and with the use of weathering steel, the maintenance costs will be decreased.

Disadvantages: Similar to Alternative B, this alternative would not allow for any widening so that the abutments and piers can be re-used in their current configuration. As such, this will perpetuate the existing intolerable deck geometry.

Maintenance of Traffic: This alternative would utilize either option presented in the Maintenance of Traffic Section.

This alternative is not recommended and is not included in the Evaluation Matrix.

Alternative D: Superstructure Replacement With Widening

This alternative would consist of replacing the concrete deck and the steel beams in a similar configuration as the existing bridge; however, the beam spacing would be increased to widen the bridge to be 30 feet curb-to-curb, see Typical Bridge Section, Sheet 2. The substructures would be widened and repaired to address any deficient concrete areas.

Advantages: This alternative will eliminate the need to clean and paint the structural steel which will reduce construction time. In addition, the deck geometry will be improved. With the replacement of the structural steel, the bridge life span will be increased, and with the use of weathering steel the maintenance costs will be decreased.

Disadvantages: This alternative will require that the substructures each be widened. This will mean the pier will need to be widened approximately 3 feet to each end which may be time-consuming. This alternative would also keep the pier footing at the current elevation instead of lowering the footing as recommended in the Hydraulics Report.

Maintenance of Traffic: This alternative would utilize either option presented in the Maintenance of Traffic Section.

This alternative is not recommended, but has been included in the Evaluation Matrix as Combination 4 and 5.

Alternative E: New Single-Span Structure

This alternative consists of replacement of the superstructure and substructure. The superstructure would be a single-span curved girder, and the center pier would be removed. The replacement structure would be placed on the existing horizontal alignment, with an improvement of the vertical profile by slightly lowering the roadway over the bridge. There are several replacement options that are discussed in detail in the next section.

Advantages: This alternative would eliminate the existing intolerable geometry by widening the bridge to provide 30 feet curb-to-curb; see Typical Bridge Section, Sheet 2.

It would also avoid time-consuming rehabilitation work to the substructures, and eliminate the center pier in the river, which will eliminate debris buildup.

Disadvantages: This alternative is more costly than rehabilitating the structure.

Maintenance of Traffic: This alternative would utilize either option presented in the Maintenance of Traffic Section.

This alternative is recommended and is included in the Evaluation Matrix as Combination 6 and 7.

Alternative F: New Two-Span Structure

This alternative consists of replacement of the superstructure and substructure. The superstructure would be straight girders, similar to the existing. The replacement structure would be placed on the existing horizontal alignment, with an improvement of the vertical profile by slightly lowering the roadway over the bridge. The center pier would be replaced to allow the footing to be lower than the existing per the hydraulic recommendations. There are several replacement options that are discussed in detail in the next section.

Advantages: This alternative would eliminate the existing intolerable geometry by widening the bridge to provide 30 feet curb-to-curb; see Typical Bridge Section, Sheet 2. It would also avoid timely rehabilitation work to the substructures.

Disadvantages: This alternative would be the most costly and full replacement of the pier will add construction time over the single-span alternative.

Maintenance of Traffic: This alternative would utilize either option presented in the Maintenance of Traffic Section.

This alternative is not recommended, but has been included in the Evaluation Matrix as Combination 8 and 9.

VI. VERTICAL AND HORIZONTAL ALIGNMENT

The existing horizontal and vertical geometry of VT Route 108 are acceptable for the given design speeds; however, there is an intersection with Meadow Lane (TH 38) located approximately 150 feet east of the existing east abutment. This intersection has undesirable geometry due to the relatively high elevation of the main roadway and the presence of guardrail up to the intersection. All bridge alternatives have been assumed to remain on the existing horizontal and vertical alignment for cost estimate purposes, and are reflected in the included plan sheets.

The recommended single-span alternative allows for the potential for lowering the roadway profile, which could provide improved geometry at the adjacent intersection. Lowering the profile would improve the existing roadway and the visibility and vertical geometry at the intersection. Altering the profile would increase construction cost to the

project and is beyond the purpose and need of the project. Additionally, it would be more impactive to the adjacent businesses. If the temporary bridge option is selected, then the lower profile should be considered since the temporary bridge option would require temporary modifications to the roadway and the intersection.

VII. BRIDGE REPLACEMENT OPTIONS

Two replacement options have been evaluated: a single-span structure and a two-span structure. Three configurations have been evaluated for both the single-span and the two-span options; a reduced span with the proposed abutments constructed in front of the existing abutments, the same span as the existing with the abutments in the same location, and a longer span with the proposed abutments constructed behind the existing.

Single-Span

The longest span has a chord length of approximately 225 feet with the abutments placed a minimum of 10 feet behind the existing abutments to avoid potential pile conflicts and orientated in a radial direction. This long span, in conjunction with the curvature of the girders, produces a required girder depth of approximately 11 feet. This girder depth will require a significant amount of the existing abutments be removed for clearance. As there are no hydraulic concerns at this crossing, and the only benefit during construction appears to be ease of access for the proposed abutments, this longer-span option is not recommended.

The second-span option would place the abutments in their existing location and create a chord length of 167 feet. This abutment location would require either re-using and widening or completely removing and replacing the existing abutments. If the existing abutments are rehabilitated and widened, they would have to be analyzed for the increased loading of the single span. In addition, the widened portion would have the same geometry as the existing, which would require matching into the existing bottom of footing, which is approximately 13 feet below grade. If replaced, new integral abutments could be constructed; however, the existing abutments would have to be removed in their entirety which would likely require cofferdams and would be time-consuming. This option is not recommended due to the length of construction.

The third-span option places the proposed abutments in front of the existing, and decreases the skew angle by altering the abutment orientation. This option has the shortest chord length of 137.5 feet. The existing abutment will be removed to an appropriate elevation that is below both the approach slab and the roadway subbase materials. As this option decreases the span length, it has been reviewed for hydraulic concerns, and it was found that this abutment location does not encroach on the existing channel or the majority of the embankment configuration. The recommended low-chord elevation is 733.2 feet; the proposed low-chord elevation is approximately 739.6 feet; therefore, this option addresses the hydraulic requirements. This option is recommended as it has the shortest span and, therefore the least cost. This option is included in the Evaluation Matrix as Combination 6 and 7.

Two-Span

The two-span options are the same as the single span, but with a center pier constructed in the river. Per the hydraulics recommendations, the existing pier will be completely removed and replaced. This will allow the top of the footing to be at or below the stream bed elevation instead of being exposed as the current pier is.

The two-span superstructure would consist of two simple spans with a continuous deck. This will allow the girders to be straight while the deck curves with the roadway geometry.

The longest-span option places the proposed abutments approximately 10 feet behind the existing to avoid potential pile conflicts. The span lengths would be 96 feet and 100 feet. Similar to the single span, this option would require the deepest girder section, compared to the other two-span options, and would require additional abutment removal for clearance. Like the longest single-span option, the only benefit during construction appears to be ease of access for the proposed abutments; therefore, this option is not recommended.

The second-span option would match the existing with two 84-foot spans. Similar to the single-span option, this abutment location would require either re-using and widening or completely removing and replacing the existing abutments. Due to the expected construction time, this option is not recommended.

The third-span option is the shortest, with two 74-foot spans. The abutments would be constructed in front of the existing in the same orientation. This option will address the hydraulic requirements with the low chord at approximately 742.4 feet. This option is not recommended due to the additional costs and construction time for the pier. This option is included in the Evaluation Matrix as Combination 8 and 9.

VIII. SUBSTRUCTURE TYPES

Several substructure types were examined for this project; integral and semi-integral abutments on piles and conventional abutments on spread footings.

Integral/Semi-Integral Abutments

The integral and semi-integral abutments have similar cross-section geometry; however, the integral abutment provides a jointless bridge which reduces maintenance cost and is the preferred abutment type. Both of these abutment types have a narrow width and can easily be constructed in front of the existing abutments without requiring deep excavation and removal of a large portion of the existing abutment.

This bridge does not meet two of the requirements for the Simplified Design Method for the VTrans' "Integral Abutment Bridge Design Guidelines." The skew of the bridge is approximately 34 degrees for the single-span option and 45 degrees for the two-span option. The recommended skew is only 20-degrees. In addition, the single-span option is a curved girder, and the two-span option has a tapered girder spacing, neither of which is

allowed under the Simplified Design. Although these criteria are not meet, an integral abutment is the recommended abutment type and the design will be completed in the next design phase utilizing a refined analysis. If this analysis determines integral abutments will not work, the use of a semi-integral abutment will be evaluated.

Conventional Abutments

Conventional abutments on spread footings or piles are also a viable option for this project. For cost comparisons, it has been assumed that a spread footing will meet the geotechnical requirements and can be used. Due to the size of the footing, the footprint of this abutment would overlap with the footprint of the existing abutment requiring significantly more removal of the existing. To avoid conflict between the existing and proposed abutments, an alternative would be to decrease the span and move the proposed abutment further in front of the existing. This will locate the abutments away from the top-of-bank area and into the embankment slope and may encroach the existing channel. In addition, the bottom-of-footing elevation will be significantly lower which will increase the costs of the abutment and associated items, such as cofferdams. Although the superstructure costs will be decreased, the increase in substructure costs would negate any costs savings, and would likely cost more.

Although this abutment type with spread footings would avoid the use of piles, the cost for the abutment alone is $240,000, assuming that it is precast. This cost is based on setting the bottom of the footing 6 feet below the slope elevation in front of the abutment, if the bottom of footing is to be 6 feet below the streambed elevation the size of the abutment and, subsequently, the cost will increase significantly. The cost for the integral abutment with piles is approximately $110,000.

This abutment type is not recommended as it will take longer to construct, require more excavation and abutment removal, and is more expensive.

IX. ACCELERATED CONSTRUCTION OPTIONS

In order to reduce the construction duration, accelerated construction techniques can be used, such as full-depth precast deck panels and precast pile caps for the abutments. Although these options may be more expensive than traditional construction methods, the time savings can be significant. The use of full-depth precast deck panels, precast approach slabs, and precast substructure elements has been included in the cost estimates. With the use of these precast elements, the duration for construction is anticipated to be one to two months.

To accommodate the utilities on the bridge, the full-depth precast panels could be detailed to include inserts for hanger support attachment. An alternative would be to attach the utilities to steel supports that are connected to the girders instead of the deck.

X. PEDESTRIAN PATHWAY

The Town has expressed interest in future re-routing of the pedestrian path under the bridge on the western side. The approximate elevation of the existing pathway is 740 feet,

and the existing bottom of steel elevation at abutment A is approximately 743.5 feet. The bottom-of-steel elevation for the recommended single-span option is approximately 740.9 feet at abutment A. In addition, there is very little existing clearance from the bottom-of-steel to the top-of-slope. Therefore, the existing grade would have to be lowered significantly, up to 9 or 10 feet, depending on the pathway clearance requirements. This would place the elevation of the path between 730 to 732 feet, which appears to be fairly close to the water surface elevation. An elevation change of 8 to 10 feet in the pathway will require extensive retaining walls and steep pathway grades from 8% to 10%, or steeper if additional clearance is desired.

If a longer span is chosen to accommodate the width of a potential pathway, then the structure depth will also increase and the pathway elevation under the bridge will have to be lowered even further. The longest single-span option will not allow for the placement of a pathway, as the approximate bottom-of-steel elevation is 735.6 feet and the pathway elevation would be below the streambed elevation.

If a pathway is to be accommodated, the two-span option would provide the highest bottom-of-steel elevations. An alternate abutment type, like a conventional abutment, could be used to allow for the grade in front of the abutment to be lower than a semi-integral abutment would allow. Allowances for a pedestrian pathway have not been included in this submission, as it could significantly increase the cost of the project.

XI. COST ESTIMATES

The following cost estimates are preliminary in nature, prepared using applicable reference material and CLD's best engineering judgment. The estimates will be subject to future modification as more information becomes available, such as subsurface borings and right-of-way requirements, and as the design is updated and refined. These cost estimates are considered reliable for the purposes of planning and decision-making.

Cost estimates have been calculated for nine combinations, as shown below.

1. No Action.....$0
2. Rehabilitation Without Widening With Detour.....$1,460,709
3. Rehabilitation Without Widening With Temporary Bridge $1,968,359
4. Superstructure Replacement With Detour $2,238,117
5. Superstructure Replacement With Temporary Bridge.....$2,745,767
6. Full Replacement With Single-Span With Detour.....$2,311,779
7. Full Replacement With Single-Span With Temporary Bridge.....$2,819,429
8. Full Replacement with Two-Span with Detour $2,840,342
9. Full Replacement With Two-Span With Temporary Bridge.....$3,347,992

A breakdown of the costs for each alternative is given in the Evaluation Matrix on the next page. The breakdown includes roadway, structure, temporary structure, traffic and safety, mobilization/demobilization costs, and right-of-way acquisition costs. The items included in each of these sections are defined below.

Roadway covers the cost of rebuilding the existing road, signs, drainage, and new approach rail within the project limits.

Structure includes the costs of the complete removal and replacement of the existing superstructure and substructure.

Temporary Structure includes all costs associated with installing and removing the temporary bridge, including the roadway approaches, guardrail, temporary barriers, etc.

Traffic and Safety includes the cost of traffic control items such as signage, barrier, changeable portable message signs, officers, flaggers, and temporary traffic signal systems.

Mobilization/Demobilization includes the costs of preparatory work and operations for the project, for the establishment and removal of the Contractor's field offices, buildings, etc., and any other costs incurred prior to beginning work and upon completion of the Contract items. It also includes project cleanup, establishment of vegetation, and the completion of all work not associated with a specific pay item.

Right-of-Way Acquisition includes the cost associated with acquiring the necessary land and/or rights for construction of the project. These costs are extremely variable and will be unknown until the acquisition process commences. However, CLD approximated some numbers based on the amount of temporary and/or permanent acquisition for each option in attempt to obtain reasonable comparisons between them.

Evaluation Matrix - Bridge No. 3, VT Route 108 over the West Branch of the Little River

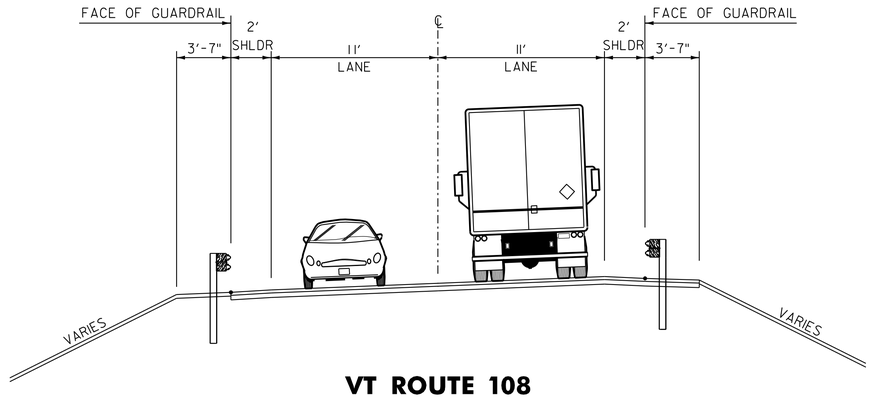
The following evaluation matrix contains a list of all potential issues and concerns with all possibly affected parties who may have a concern with a proposed alternative. A "No" in a space indicates that there are no concerns, impacts, or permits required. A "Yes" indicates that there is a concern associated with the alternative or a permit is required.

Stowe BHF 0235(15)		COMBINATION 1	COMBINATION 2	COMBINATION 3	COMBINATION 4	COMBINATION 5	COMBINATION 6	COMBINATION 7	COMBINATION 8	COMBINATION 9
		No Action	Rehabilitation without Widening with Detour	Rehabilitation without Widening with Temporary Bridge	Superstructure Replacement with Widening with Detour	Superstructure Replacement with Widening with Temporary Bridge	Single Span Curved Girder with Detour	Single Span Curved Girder with Temporary Bridge	2-Span Straight Girder with New Pier with Detour	2-Span Straight Girder with New Pier with Temporary Bridge
COST	Roadway	$ -	$ 79,205	$ 79,205	$ 79,205	$ 79,205	$ 93,182	$ 93,182	$ 93,182	$ 93,182
	Structure	$ -	$ 927,270	$ 927,270	$ 1,470,912	$ 1,470,912	$ 1,508,447	$ 1,508,447	$ 1,878,071	$ 1,878,071
	Temporary Structure	$ -	$ -	$ 360,000	$ -	$ 360,000	$ -	$ 360,000	$ -	$ 360,000
	Traffic and Safety	$ -	$ 15,000	$ 10,000	$ 15,000	$ 10,000	$ 15,000	$ 10,000	$ 15,000	$ 10,000
	Mobilization/Demobilization (10%)	$ -	$ 102,148	$ 137,648	$ 156,512	$ 192,012	$ 161,663	$ 197,163	$ 198,625	$ 234,125
	Construction Cost	$ -	$ 1,123,623	$ 1,514,123	$ 1,721,629	$ 2,112,129	$ 1,778,292	$ 2,168,792	$ 2,184,878	$ 2,575,378
	Design Engineering (15%)	$ -	$ 168,543	$ 227,118	$ 258,244	$ 316,819	$ 266,744	$ 325,319	$ 327,732	$ 386,307
	Right-Of-Way Acquisition	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	C.E. and permits (5%)	$ -	$ 56,181	$ 75,706	$ 86,081	$ 105,606	$ 88,915	$ 108,440	$ 109,244	$ 128,769
	Contingencies (10%)	$ -	$ 112,362	$ 151,412	$ 172,163	$ 211,213	$ 177,829	$ 216,879	$ 218,488	$ 257,538
	PROJECT TOTAL	$ -	$ 1,460,709	$ 1,968,359	$ 2,238,117	$ 2,745,767	$ 2,311,779	$ 2,819,429	$ 2,840,342	$ 3,347,992
ENGINEERING	Typical Section (feet)	2-11-11-2	2-11-11-2	1-11-11-1	4-11-11-4	4-11-11-4	4-11-11-4	4-11-11-4	4-11-11-4	4-11-11-4
	Traffic Safety	No Change	No Change	No Change	Improved	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No	No	No	No	No	No	No	No	No
	Bicycle Access	No	No	No	No	No	No	No	No	No
	Hydraulic Performance	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Utility	No Change	No Change	No Change	Temporary Relocation	Temporary Relocation	Temporary Relocation	Temporary Relocation	Temporary Relocation	Temporary Relocation
IMPACTS	Agricultural	No	No	No	No	No	No	No	No	No
	Archaeological	No	No	No	No	No	No	No	No	No
	Historic Structures, Sites, & Districts	No	No	No	No	No	No	No	No	No
	Hazardous Materials	No	No	No	No	No	No	No	No	No
	Floodplain/Floodway	No	No	No	No	No	No	No	No	No
	Fish & Wildlife	No	No	No	No	No	No	No	No	No
	Rare, Threatened & Endangered Species	No	No	No	No	No	No	No	No	No
	Public Lands - 4(f) Resources	No	No	No	No	No	No	No	No	No
	LWCF - Section 6(f)	No	No	No	No	No	No	No	No	No
	Noise	No	No	No	No	No	No	No	No	No
	Wetlands	No	No	No	No	No	No	No	No	No
LOCAL & REGIONAL	Addresses Concerns	Not Yet Available	Not Yet Available	Not Yet Available	Not Yet Available	Not Yet Available	Not Yet Available	Not Yet Available	Not Yet Available	Not Yet Available
	Community Character	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Economic Impacts	No	Yes	No	Yes	No	Yes	No	Yes	No
	Conformance to Regional Impact Plan	No change	No change	No change	No change	No change	No change	No change	No change	No change
	Satisfies Purpose & Need Statements	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
PERMITS	Act 250	No	No	No	No	No	No	No	No	No
	401 Water Quality Certification	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	404 US Army COE Permit	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Stream Alteration	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Conditional Use Determination	No	No	No	No	No	No	No	No	No
	Stormwater Discharge	No	No	No	No	No	No	No	No	No
	Lakes & Ponds	No	No	No	No	No	No	No	No	No
	T & E Species	No	No	No	No	No	No	No	No	No
	SHPO	No	No	No	No	No	No	No	No	No
	NEPA Categorical Exclusion	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OTHER	ROW Acquisition	No	No	No	No	No	No	No	No	No
	Road Closure	No	Yes	No	Yes	No	Yes	No	Yes	No

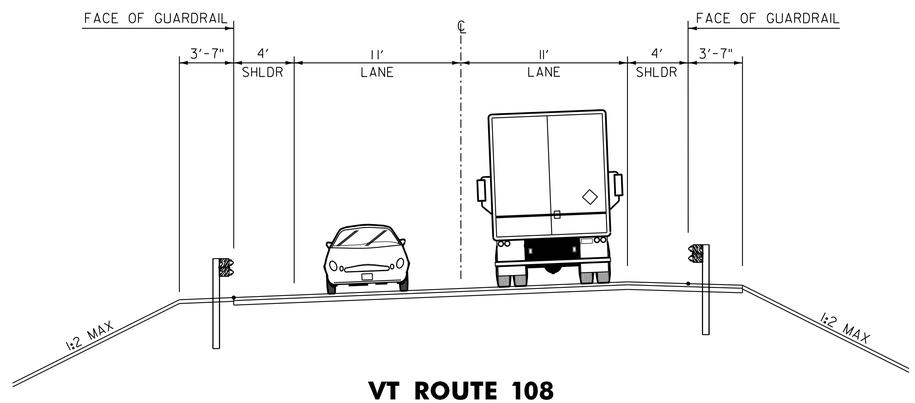
XII. CONCLUSION

Upon reviewing the proposed alternatives and options with respect to the purpose and need, cost-effectiveness, and all impacts, CLD recommends Combination 7, full replacement with a single-span structure and integral abutments.

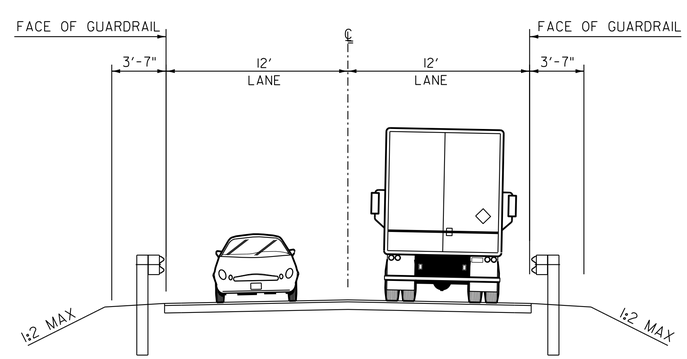
CLD also recommends the use of the temporary bridge as it is our understanding that the Town does not want to close the road during construction. In addition, the temporary bridge will avoid the longer detour route, which has a history of crash incidents, and the preferred detour of Cape Cod Road, which does not appear adequate for truck traffic.



VT ROUTE 108
EXISTING TYPICAL APPROACH ROADWAY SECTION

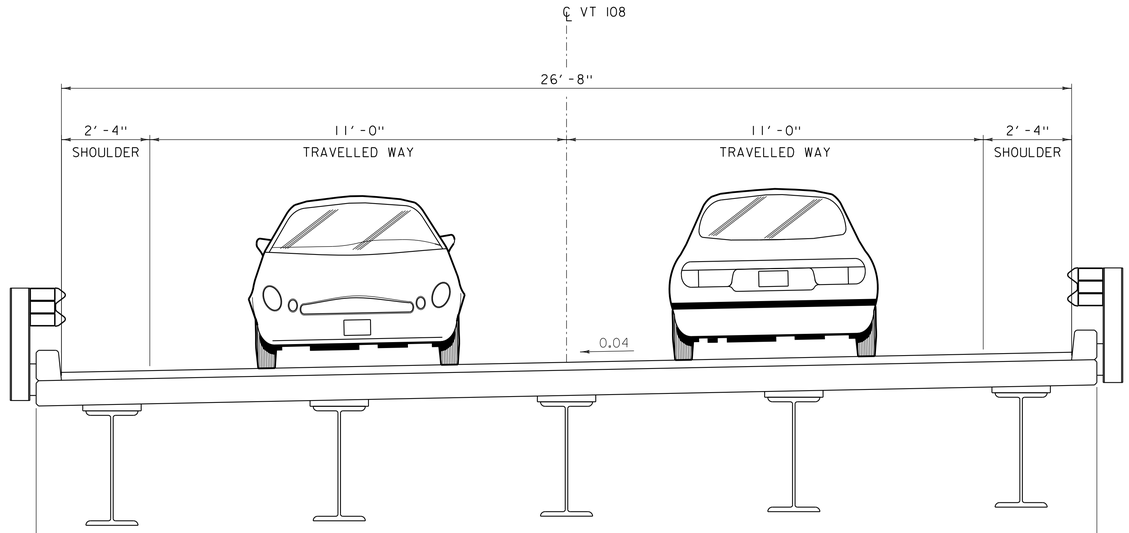


VT ROUTE 108
PROPOSED TYPICAL APPROACH ROADWAY SECTION



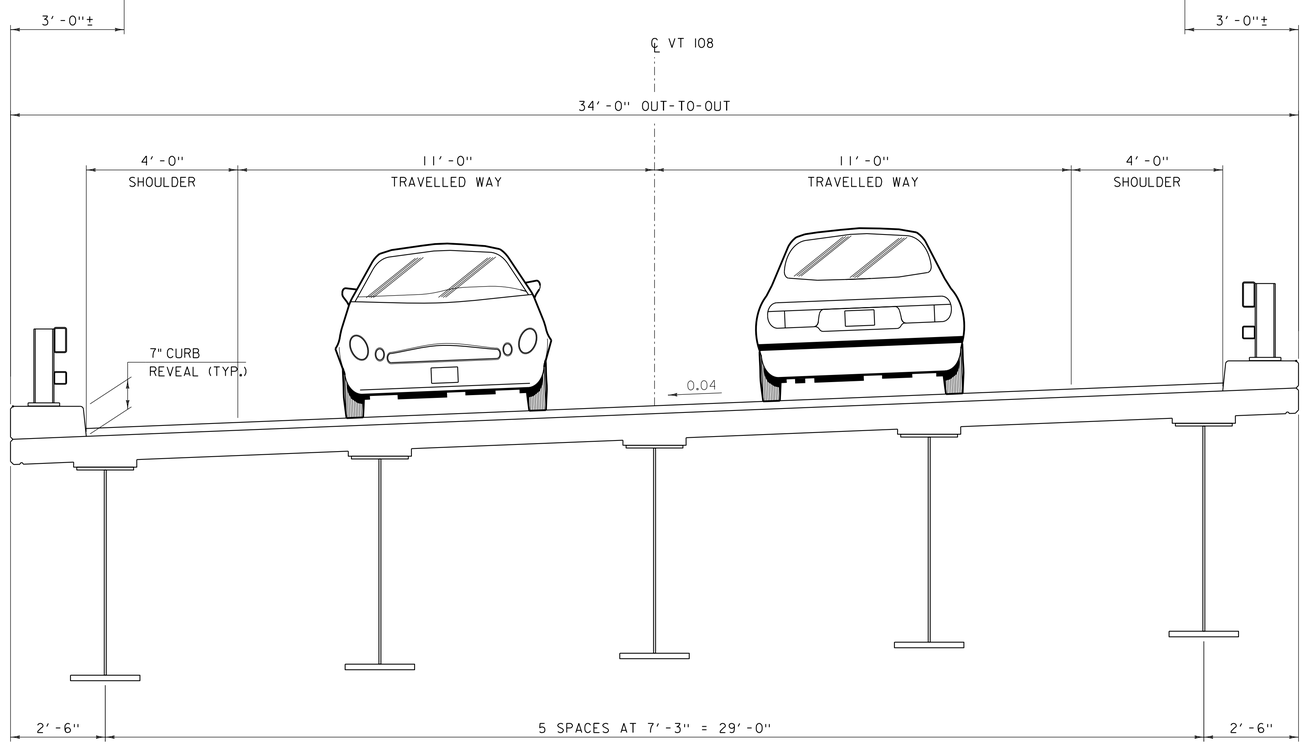
TYPICAL DETOUR ROADWAY SECTION

PROJECT NAME: STOWE	
PROJECT NUMBER: BHF 0235(15)	
FILE NAME: z88cl90s_typ.dgn	PLOT DATE: 5/25/2012
PROJECT LEADER: JPB	DRAWN BY: JLS
DESIGNED BY: JLS	CHECKED BY: CG
ROADWAY TYPICAL	SHEET 1 OF 6



EXISTING BRIDGE SECTION

SCALE: ½″ = 1′-0″



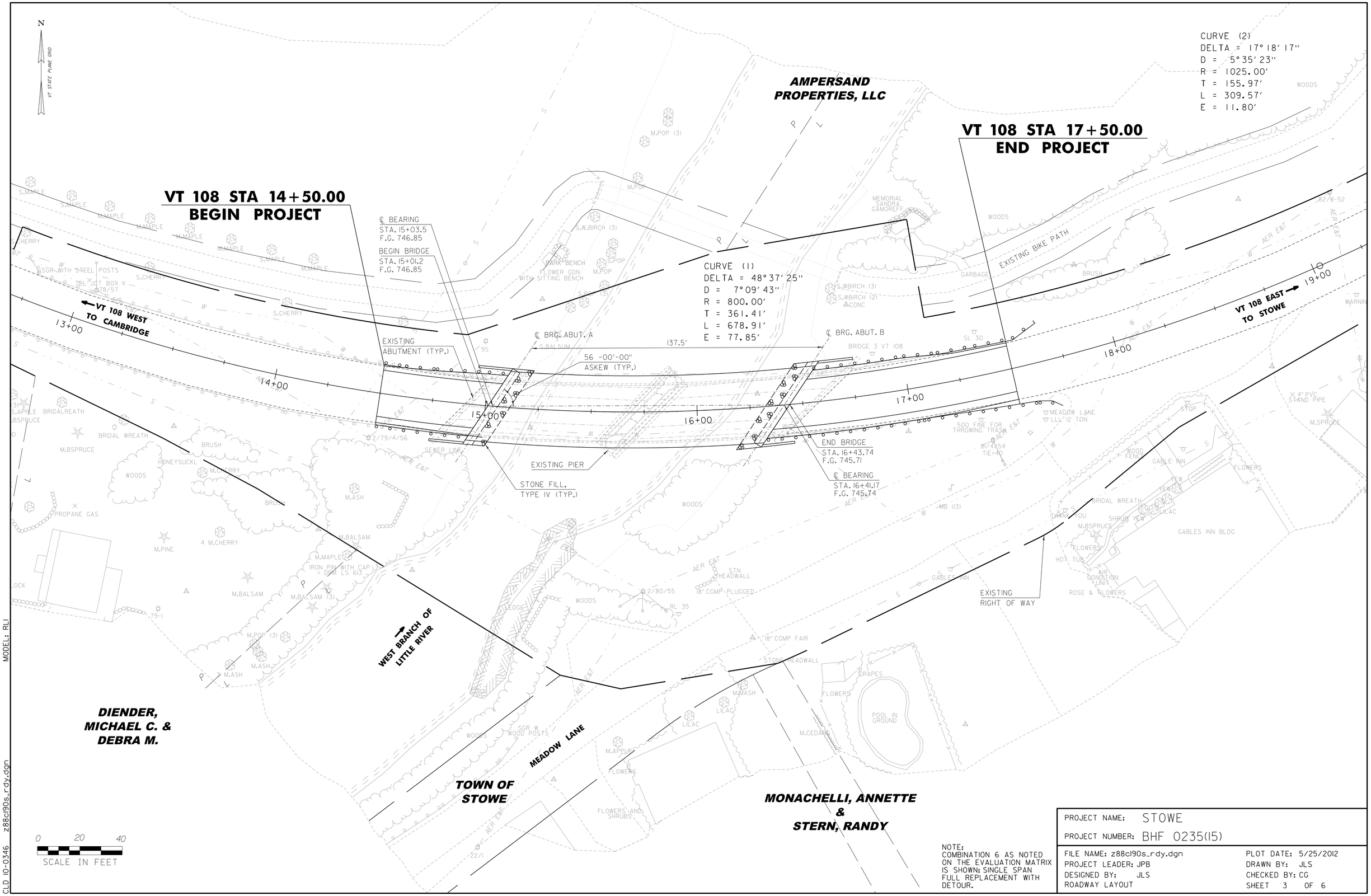
PROPOSED BRIDGE SECTION

SCALE: ½″ = 1′-0″

NOTE: DIMENSIONS FOR EXISTING BRIDGE ARE TAKEN FROM FIELD SURVEY, BRIDGE INSPECTION REPORTS, OR ARE ASSUMED

PROJECT NAME: STOWE	
PROJECT NUMBER: BHF 0235(15)	
FILE NAME: z88cl90s_sup.dgn	PLOT DATE: 5/25/2012
PROJECT LEADER: JPB	DRAWN BY: MWS
DESIGNED BY: JF	CHECKED BY: JPB
BRIDGE TYPICAL	SHEET 2 OF 6

CLD 10-0346 z88cl90s_sup.dgn MODEL: Untitled Sheet



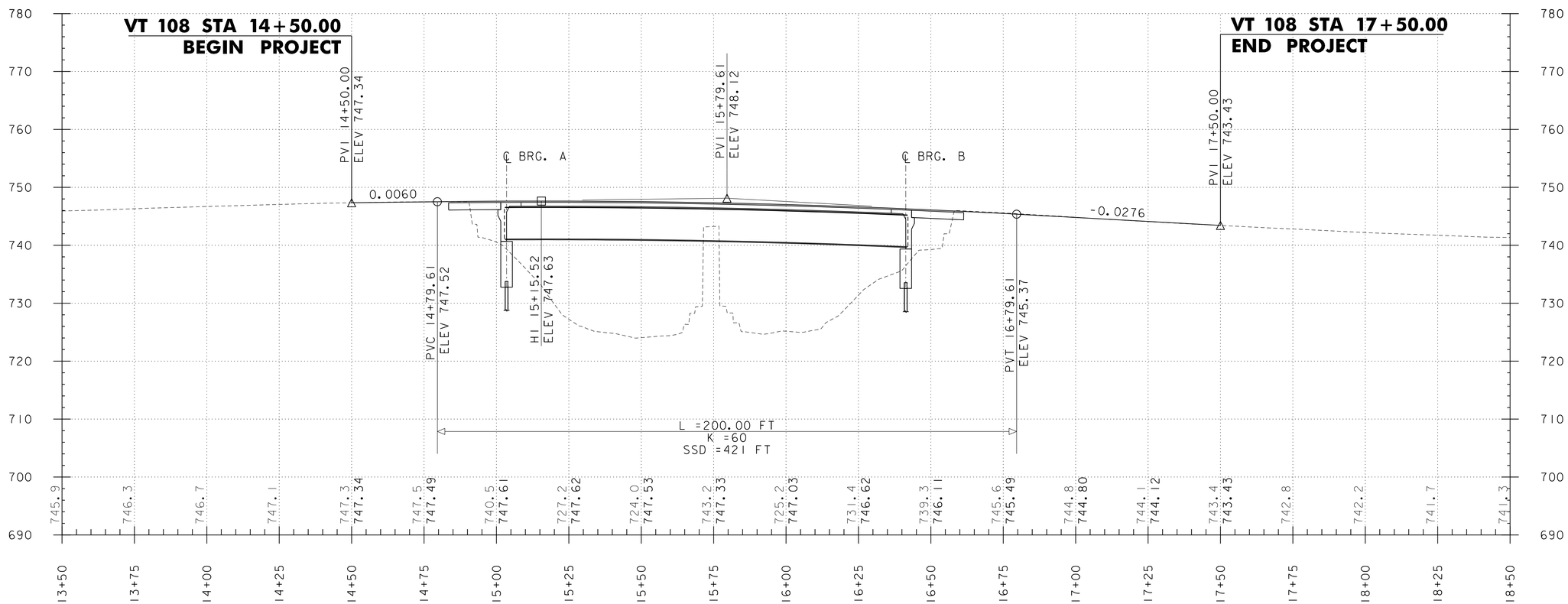
NOTE:
COMBINATION 6 AS NOTED ON THE EVALUATION MATRIX IS SHOWN: SINGLE SPAN FULL REPLACEMENT WITH DETOUR.

PROJECT NAME: STOWE	
PROJECT NUMBER: BHF 0235(15)	
FILE NAME: z88cl90s_rdy.dgn	PLOT DATE: 5/25/2012
PROJECT LEADER: JPB	DRAWN BY: JLS
DESIGNED BY: JLS	CHECKED BY: CG
ROADWAY LAYOUT	SHEET 3 OF 6

MODEL: RLI

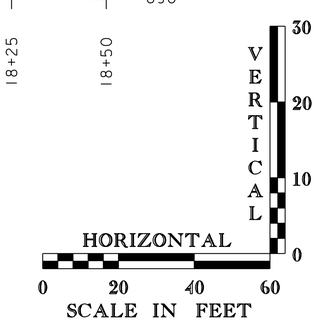
z88cl90s_rdy.dgn

CLD 10-0346

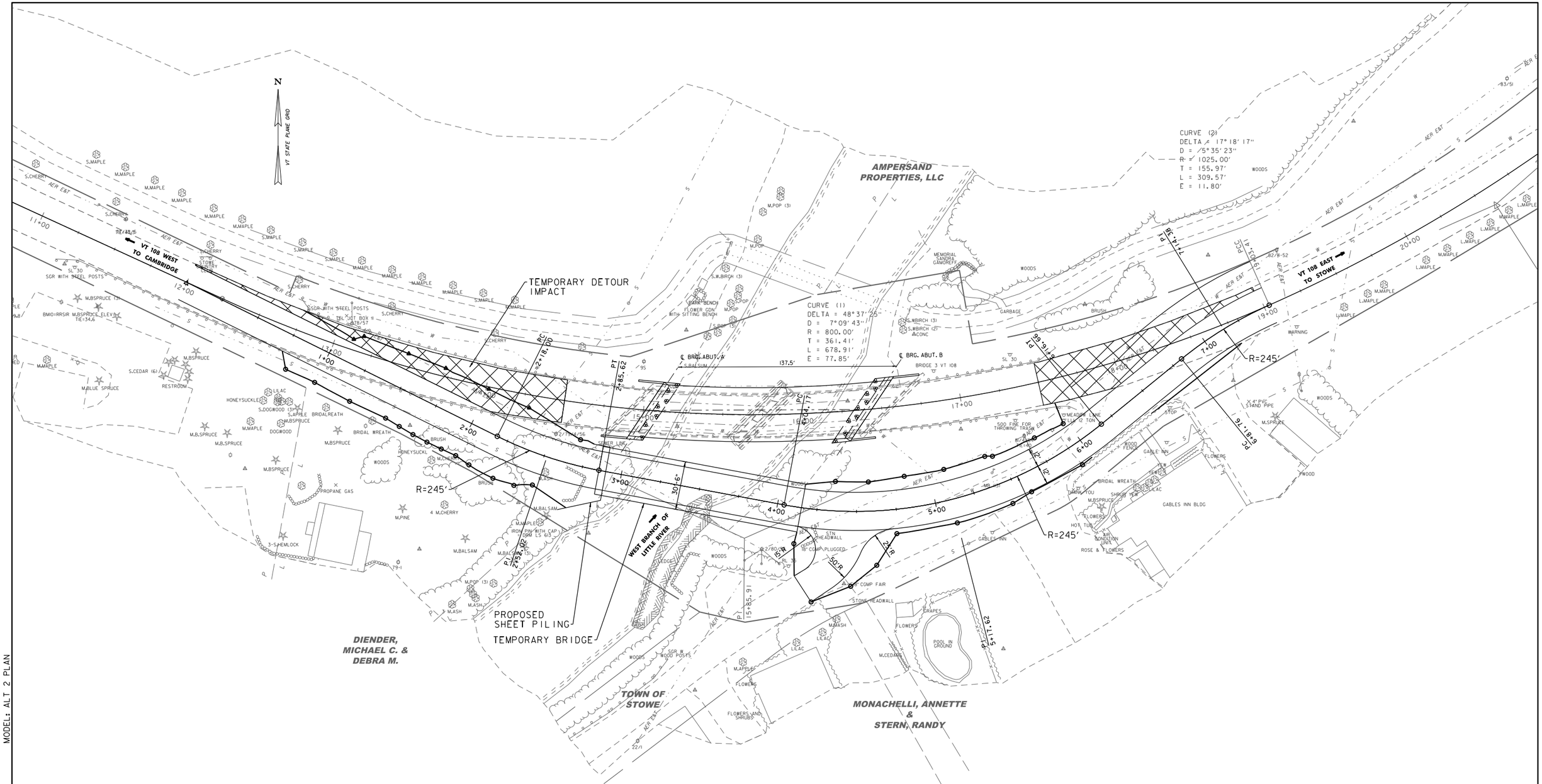


NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄.

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISHED GRADE ALONG ℄.



PROJECT NAME: STOWE	
PROJECT NUMBER: BHF 0235(15)	
FILE NAME: z88c190s_pro.dgn	PLOT DATE: 5/25/2012
PROJECT LEADER: JPB	DRAWN BY: JLS
DESIGNED BY: JLS	CHECKED BY: CG
PROPOSED PROFILE	SHEET 4 OF 6



PROJECT NAME: STOWE	
PROJECT NUMBER: BHF 0235(15)	
FILE NAME: z88c190s_tcp.dgn	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: JPB	DRAWN BY:
DESIGNED BY:	CHECKED BY:
TEMPORARY BRIDGE LAYOUT	SHEET 5 OF 6

CLD 12-0121 z88c190s_tcp.dgn MODEL: ALT 2 PLAN

DISTANCES

DETOUR ROUTE 1

INTERSECTION OF CAPE COD ROAD AND VT 108	
CAPE COD ROAD TO WEEKS HILL ROAD	1.2 MILES
WEEKS HILL ROAD TO VT 108	0.4 MILES
INTERSECTION OF VT 108 AND WEEKS HILL ROAD	
ADDED DISTANCE	0.5 MILES

DETOUR ROUTE 2

INTERSECTION OF CAPE COD ROAD AND VT 108	
VT 108 TO LUCE HILL ROAD	0.3 MILES
LUCE HILL ROAD TO BARROWS ROAD	0.6 MILES
BARROWS ROAD TO MOSCOW ROAD	1.8 MILES
MOSCOW ROAD TO VT 100	1.5 MILES
VT 100 TO VT 108	2.5 MILES
VT 108 TO WEEKS HILL ROAD	0.6 MILES
INTERSECTION OF WEEKS HILL ROAD AND VT 108	
ADDED DISTANCE	6.2 MILES

PROJECT NAME: STOWE

PROJECT NUMBER: BHF 0235(15)

FILE NAME: z88cl90s_detour.dgn	PLOT DATE: 5/25/2012
PROJECT LEADER: JPB	DRAWN BY: JLS
DESIGNED BY: JLS	CHECKED BY: CG
DETOUR LAYOUT	SHEET 6 OF 6

CLD 10-0346 z88cl90s_detour.dgn MODEL: Default