STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Sharon IM 089-1(64)

Interstate Route 89, Bridges 17 N/S over the White River

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1. SITE INFORMATION

The bridges carry Interstate Route 89 Northbound and Southbound over the Vermont Route 14 and the White River in the town of Sharon and are located 1.1 miles north of Exit 2. The existing conditions were gathered from a combination of a Site Visit, the Inspection Reports, and the existing Survey. See correspondence in the Appendix for more detailed information.

Roadway Classification	Principal Arterial - Interstate
Bridge Type	4-Span Continuous Welded Steel Plate Girder
Bridge Span	826 feet
Year Built	1968
Ownership	State of Vermont

1.1. Need

The following is a list of deficiencies of Sharon Bridges 17 Northbound and Southbound

1. Finger joints are plugged and vertically misaligned
2. Abutment backwalls need patching (deterioration caused by leaking finger joint)
3. Deck drip tubes causing progressive deterioration of steel lateral bracing

1.2. Traffic

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

	NORTHBOUND		SOUTHBOUND	
TRAFFIC DATA	2017	2037	2017	2037
AADT	6100	7300	6100	7300
DHV	850	1000	890	1100
ADTT	1200	2100	1200	2000
%T	13.7	19.1	14.3	19.8
%D	100	100	100	100

1.3. Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997 and AASHTO A Policy on Geometric Design of Highways and Streets (Green Book, 2011 edition). Minimum standards are based on an AADT of 7300 and a design speed of 65 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 3.3	2-12' Lanes 4' High Speed Shoulder 12' Low Speed Shoulder	2-12' Lanes 10' High Speed Shoulder[1] 10' Low Speed Shoulder[1]	
Bridge Lane and Shoulder Widths	VSS Section 3.7	2-12' Lanes 3' High Speed Shoulder 3' Low Speed Shoulder	At least the width of roadway approach travel way plus 2-foot clearance to face of rail on each side	Meets minimum tolerable criteria
Clear Zone Distance	VSS Table 3.4	No issues noted. Existing Guardrail at all bridge approaches.	26' fill / 16' cut 1:3, 20' cut 1:4	
Banking	VSS Section 3.13	Normal crown (Parabolic on bridges)	8% (max)	
Speed	VSS Section 3.3	65 mph (posted)	55 mph (design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	Tangent – No curves on the bridges	R(min)=1,480' @ 8.0%	
Vertical Grade	VSS Table 3.5	Bridges located on a 0.500% grade	7% (maximum) for mountainous terrain	
K Values for Vertical Curves	VSS Table 3.1	Bridge profiles are straight	150-220 crest / 100-130 sag	
Vertical Clearance Issues	VSS Section 3.8	No issues noted	16'-3"	
Stopping Sight Distance	VSS Table 3.1	Not limited by bridge	450'-500'	
Bicycle/Pedestrian Criteria		Bicycles/Pedestrians Prohibited on Interstate	Not Applicable	
Bridge Railing	Structures Manual Section 13	Steel 2 Rail Box Beam	TL-5	Existing bridge railing was installed in 1999
Hydraulics	VTrans Hydraulics Section	Adequate	Pass the Q50 flood + 1'. No overtopping during 50-yr flood. Consider effects of 100-year flood.	Slight chance over overtopping roadway, stable for scour (Insp. Reports)
Structural Capacity	SM, Ch. 3.4.1	Design Live Load: HS20 (Insp. Report)	Design Live Load: HL-93	Not shown on original plans

[1]Table 3.3 requires two feet to be added to shoulder width in guard rail areas where DHV is over 400. For this project (8' plus 2').

1.4. Inspection Report Summary

	Northbound	Southbound
Deck Rating	7 Good	7 Good
Superstructure Rating	5 Fair	5 Fair
Substructure Rating	5 Fair	6 Satisfactory
Channel Rating	8 Very Good	8 Very Good

From the Structure Inspection, Inventory, and Appraisal Sheet:

4/18/2012 – (Northbound) Finger joint above abutment No. 1 is in need of full clean out (heavily plugged with asphaltic material). Vertical misalignment occurs on both shoulder areas of this same joint which are in need of realignment. Concrete patching is needed on both backwall areas. Right side snow fence has two heavily bent posts and one horizontal bottom pipe missing and is in need of repairs. Surface drain grates and downspouts on both sides are in need of full replacement. PLB

4/18/2012 – (Southbound) Finger joint above abutment No. 2 is in need of full clean out (plugged with asphaltic material in certain sections). Surface drain grates and downspouts on both sides are in need of full replacement. PLB

4/7/2010 – (Northbound) Bent rail with leaning posts along the right side of approach No. 1 need repairs. PLB

4/7/2010 – (Southbound) The pavement overlay needs full replacement. Bent rail with leaning posts occurs along the left side of approach No. 2 is in need of repairs. PLB

4/7/2010 – (Northbound and Southbound) Both finger plate joints need vertical realignment. Several diagonal braces between G1 to G2 and G4 to G5 in all span areas are in need of significant repairs. The entire steel structure is in need of full paint recoat. The drain tubes along both lines of 1 and 5 need to be repaired or sealed off. Heavy leakage drips along all girders on lines 1 and 5 causing progressive heavy corrosion deterioration. PLB

1.5. Hydraulics

A Preliminary Hydraulics Report (PHR) was not prepared for these bridges.

1.6. Utilities

There are no utilities on the bridges or overhead along Interstate Route 89. There are overhead lines along Route 14 below the structures.

1.7. Right of Way

The existing Right-of-Way is shown on the Existing Conditions Layout Sheet. The bridges are located well within the Right-of-Way and it is anticipated that additional rights will not be needed.

1.8. Resources

The resources present at this project are summarized below, shown on the Existing Conditions Layout Sheet, and discussed in greater detail in the memos included in the Appendix.

1.8.1. Biological:

Wetlands/Watercourses

There are no mapped wetlands on the ANR Natural Resource Atlas within the project area and there were no observed wetlands during the VTrans Environmental Biologist's site visit.

The White River is an Essential Fish Habitat, therefore the VT Fish and Wildlife AOP guidelines will need to be followed to accommodate aquatic organism passage.

Wildlife Habitat

There is a mapped deer wintering area in the northwest quadrant of the project area and a worn game trial on the eastern slope below the eastern abutments. The area under the bridge is grassy and open, providing easy but unprotected movement. Therefore, it is recommended that any riprap placed under the bridge be grubbed and seeded to maintain wildlife travel corridors.

During the VTrans Site Visit with the Vermont Fish & Wildlife Biologist, six living and one dead Big Brown Bats were discovered under the eastern abutments of both bridges. The six live bats were assumed to be young-of-the-year and will likely move to a different location to overwinter. Subsequent site visits will be required to document the movement of these bats.

Rare, Threatened and Endangered Species

The Big Brown Bat is classified as a High Concern Regional Species of Greatest Conservation Need. It is likely that an exit survey and/or acoustic monitoring will be required during the bat's active season to determine if mitigation measures will be required prior to performing work on the bridges.

Additionally, the Northern Long-eared Bat is listed by the US Fish & Wildlife Service as threatened and by the Vermont Fish & Wildlife Department as endangered throughout the state of Vermont. Guidance from FHWA and FRA indicates that all trees greater than or equal to three inches in diameter that exhibit cracks, crevices, holes, and peeling bark are considered suitable roost trees. Therefore, a habitat assessment will be required before any necessary tree clearing, unless the clearing can be conducted from November 1st through April 15th.

Agricultural

There are three statewide significant soils in the project area: Hitchcock silt loam 8-25% slopes, Windsor loamy sand 0-8% slopes, and Hinckley sandy loam 0-8% slopes.

1.8.2. Archaeological:

Three areas of archaeological sensitivity were found within the project area. There are level knolls within three quadrants that are considered archaeologically sensitive – these areas are marked on the Arch Sensitive Lines map in the Appendix. There are trees visible on the site that are present in the 1960's photo of the bridges, indicating potentially intact soils within that area. Additionally, VT-WN-34, a known pre-historic archaeological site, is located about 871 meters from the project site at the confluence of Broad Brook and the White River.

1.8.3. Historic:

This project is considered exempt for above-ground resources per the Section 106 Exemption Regarding Effects to the Interstate Highway System (see correspondence included in Appendix).

1.8.4. Hazardous Materials:

There are no known hazardous materials in the project area.

1.8.5. Stormwater:

There are no known stormwater concerns for this project.

2. CONDITION ASSESSMENT

While the bridges are not coded structurally deficient, there are two existing conditions that should be addressed: the broken and leaking finger joints and the deteriorated lateral bracing should be replaced. The condition of the deck, high level bearings, and substructure were evaluated to determine additional repairs and develop appropriate combinations for rehabilitation alternatives. Additionally, a cursory seismic evaluation was performed to understand the anticipated performance and vulnerability of the structure for the design earthquake and the outcome of a seismic retrofit strategy.

2.1. Deck Patching

There is visible deterioration to the underside of the bridge deck, particularly near the joints, however the majority of the deck appears to be in fair to good condition, thus deck patching is a viable rehabilitation alternative. Deck patching involves removing and replacing deteriorated and loose concrete, cleaning and possibly supplementing reinforcing steel, applying patching material to cracks and areas of section loss, applying a new waterproofing membrane, and paving the bridge and a short distance of its approaches. For the purposes of this report, it was assumed that 10% of the bridge deck will require patching. If the deck is patched, the existing steel bridge rail on the concrete curb will remain.

There are 1" diameter plastic drip tubes through the deck at 10-ft spacing along each curbline (Figure 1). These tubes drain water that permeates through the wearing surface directly onto the lower lateral steel bracing, causing significant deterioration (Figure 2). All of the drip tubes should be cleaned and either filled with grout or extended below the steel. If they are filled with grout, new deck drains can be installed near the abutments.

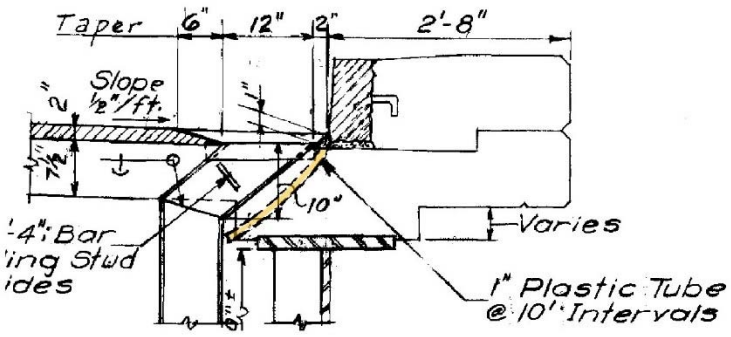


Figure 1: Detail of Drip Tubes from Record Drawings

2.2. Deck Replacement

Given that this appears to be the original deck from 1968, full deck replacement should be considered to increase the life span of the structure. Deck replacement would involve removing the existing deck in its entirety and placing a new deck on the existing steel girders. A concrete F-Shape TL-5 bridge barrier will be included with a full depth deck replacement alternative. The F-Shape barrier is narrower than the existing curb, which will increase the total roadway width by about two feet. Additionally, the scuppers will be replaced in kind and deck drains will be installed near the abutments.

2.3. Steel Repairs

The drip tubes in the deck are draining water directly onto the lower lateral wind bracing, causing severe section loss. The deteriorated gusset plates and bracing angles should be removed and replaced in kind in every location with a drip bar directly above. For the purposes of this report, it is assumed that half of the angles in each exterior bay will require replacement. These repairs are included in the Deck Patching and Deck Replacement alternatives. During the next design phase, when the extent and locations of deterioration is known, the structure can be evaluated for a condition with the deteriorated angles removed and not replaced, to potentially avoid unnecessary repairs.

Figure 2: Lateral Bracing Deterioration below Drip Tubes

2.4. Expansion Joint

The steel expansion finger joints at each abutment are leaking and vertically misaligned; they should be replaced as part of every rehabilitation alternative. The calculated range of thermal movement under a 150-degree temperature differential is 4.84". This is outside of the typical range of movement accommodated by the Fingerplate Vermont Joints, however it is possible that the finger configuration could be designed for this expansion. During the next design phase, products such as Emseal Bridge Expansion Joint System (BEJS), a product with which MassDOT has had recent success, will be investigated to find an appropriate system for this range of movement.

2.5. Bearing Replacement

The existing girders are supported by high level bearings, and a few of the expansion rocker bearings have extended beyond the adjacent bearings. While this is not an urgent matter and may indicate that they were originally set incorrectly, it could also suggest that the bearing lines are not moving uniformly and may be "walking". In that event it is likely that they will continue to shift and eventually will require replacement. It is not reasonable to jack the structure only to realign the dislocated bearings thus bearing repair has not been included with any of the rehabilitation alternatives. Instead, the alternatives either assume the bearings will remain or that the structures will be jacked and the bearings will be replaced with steel reinforced elastomeric bearing pads. It should also be noted that high level rocker bearings have a demonstrated history of being vulnerable to toppling in seismic events.

It is recommended that replacement bearings be designed according to AASHTO Method B. While bearings designed according to Method B require more extensive material and fabrication testing than Method A, this increased knowledge of the bearing's material properties permits Method B bearings to provide a more refined design. The additional testing, according to the fabricators and testing laboratories, does not significantly increase construction costs because many fabricators perform the testing as part of their normal QA/QC procedures. Method B design would be required if bearing replacement were to be used as part of a seismic retrofit strategy.

It is also recommended that the replacement bearings be designed to let the bridge "float". A "floating bridge" is a structure fully carried on elastomeric bearings without defined fixed or expansion bearings. This detail relies on keeper blocks or shear keys and backwalls to contain the required displacement that must be accommodated during a seismic event in the substructure, and these components are designed elastically to do so. This concept reduces the demand on individual "fixed" substructure units by distributing to all substructure units, and is an appropriate rehabilitation option for these bridges. The "floating bridge" concept also improves the expansion characteristics of the structure, by allowing expansion and contraction from its own center of stiffness, and not a defined fixed point.

2.6. Substructure

The substructures are in fair (northbound) and satisfactory (southbound) condition. Based on field observations, it is likely that this assessment is due to the condition of the backwalls. As previously discussed, the finger joints are leaking, resulting in significant staining and spalling on the front

faces of the backwall. When the finger joints are replaced, the deteriorated concrete will be removed and replaced, which will include a significant portion of the backwall. It is anticipated that after sounding the surfaces of the remaining substructure units, only minor repairs will be required. Each rehabilitation alternative includes a nominal quantity of shallow concrete patch repairs and pressure injection of cracks.

2.7. Preliminary Seismic Evaluation

The structures convey an interstate highway over the White River, and are thus considered critical essential bridges. A preliminary seismic analysis was performed to develop a basic understanding of how the bridges might perform during the design seismic event. The approach and assumptions of this analysis are discussed in detail in the Appendix, and proposed methods for addressing the anticipated deficiencies is discussed in Section 3.6.

Based upon the preliminary seismic analysis, the structure would suffer moderate to significant damage in a design earthquake depending on the performance of the footing. The analysis shows that the piers are stable for overturning and the reinforcement in the pier stems is adequate for flexure, however the reinforcing in the footings is inadequate for flexure. It should be noted that this analysis is very simplified and hence very conservative. For this structure a detailed seismic analysis should be performed to provide more refined seismic loads but is likely that seismic retrofitting is warranted although in limited applications.

Because the structure is on a Seismic Zone 1 site a simplified seismic analysis could be performed assuming a seismic load equal to 25% of the dead load. However as has been demonstrated from the preliminary analysis, because of the very long structure period due to the height of the pier a refined seismic analysis would be preferred as it will produce significantly lower design forces. We believe a single mode analysis would be appropriate for the structure on this site. Thus a strategy to confirm adequacy and assess any potential deficiencies would include a single-mode analysis of the entire structure.

Additionally, a seismic slope stability analysis should be performed to assess the bridge fore slopes, as their failure in an earthquake could have a significant impact on the four piers that are founded within them. The fact that the piers are within the soil mass can also be beneficial if it is confirmed the slopes are stable or can be made stable by pinning or some other means.

3. ALTERNATIVE DISCUSSION

3.1. No Action

This alternative leaves the bridge in its current condition, which means the deficiencies of the structure (deck joints, drip tubes, and steel repairs) would not be addressed. In the interest of preserving the structure and reducing future maintenance costs, the No Action alternative is not recommended. No cost estimate has been provided for this alternative since there are no immediate cost considerations.

3.2. Alternative 1: Deck Patching and Steel Repairs

This alternative would include the associated deck patching repairs discussed in Section 2.1. Additionally, the expansion joints and deteriorated steel bracing would be replaced, the drip tubes would be grouted, and surficial substructure repairs (patching and sealing cracks) would be performed. The high level bearings would remain and the superstructure steel would be blast cleaned and painted. Traffic can be maintained by any of the methods described in Section 4.

Advantages: This alternative addresses the maintenance needs of the bridge while keeping the cost to a minimum.

Disadvantages: Deck patching has a shorter lifespan; the deck could require additional repairs in 15 years.

3.3. Alternative 2: Full Depth Deck Replacement and Steel Repairs

This alternative would include the associated deck replacement repairs discussed in Section 2.2. Additionally, the expansion joints and deteriorated steel bracing would be replaced, the drip tubes would be grouted, and surficial substructure repairs (patching and sealing cracks) would be performed. The high level bearings would remain and the superstructure steel would be blast cleaned and painted. Traffic can be maintained by any of the methods described in Section 4, however it is understood that median crossovers would be preferred by VTrans for a deck replacement.

Advantages: Deck replacement provides a longer design life (about 40 years) and a lower per year maintenance cost, as compared to deck patching.

Disadvantages: Higher up front cost and longer project duration, as compared to deck patching.

3.4. Alternative 3: Superstructure and Bearing Replacement

This alternative would involve removing and replacing the existing superstructure and rocker bearings with a similar structure consisting of a concrete deck on continuous welded steel girders and steel reinforced elastomeric bearings. It is assumed that the replacement superstructure would be of similar width and cross section as existing, with an F-Shape TL-5 barrier. If the structure were to be widened to increase the shoulder widths, the substructures would require significant modifications and the interstate may require realigning. For these reasons, a wider superstructure is only considered for the Bridge Replacement Alternative below. Additionally, surficial substructure repairs (patching and sealing cracks) would be included in this alternative. This alternative may require relocation of the aerial utilities that are located below the bridges along Route 14. Traffic can be maintained by median crossovers or an off-site detour, as described in Section 4.

Advantages: This alternative addresses the deficiencies of the bridge and provides a new superstructure with a longer design life and seismic upgrades.

Disadvantages: This alternative has a higher cost and longer construction duration than the deck patching or replacement alternatives. Additionally, the condition of the superstructure does not warrant replacement.

3.5. Alternative 4: Bridge Replacement

This alternative would involve removing and replacing the bridge in its entirety on the same alignment. The new structure would be about 10-ft wider, to increase the shoulder at the low speed lane to 10-ft and the high speed lane to 4-ft, and to maintain both 2-ft offsets. This would require an additional girder and increased girder spacing. The new piers and abutments would be a similar type to existing and in the same locations, but wider to accommodate the wider superstructure. It is assumed that the existing steel H-piles at the abutments could be reused, and that additional steel H-Piles would be installed to accommodate the widening. This alternative would require relocation of the aerial utilities that are located below the bridges along Route 14. Traffic can be maintained by median crossovers or an off-site detour, as described in Section 4.

Advantages: This alternative provides a new structure with the longest design life, full shoulder widths that match the approaches, and inherent seismic robustness.

Disadvantages: This alternative has the highest cost and longest construction duration, thereby causing the greatest disturbance to the community. Additionally, the condition of the superstructure and substructure does not warrant replacement.

3.6. Seismic Retrofit Strategy

A seismic retrofit should be considered for this structure. Preliminary evaluation shows the pier footings to be seismically vulnerable and likely to suffer damage in the event of a design earthquake. The bridge fore slopes should also be assessed for seismic stability as four of the piers are buried within them and could suffer significant damage in the event of a slope failure. As seismic retrofits primarily affect the substructure they may be performed in conjunction with any of the preferred superstructure alternatives depending on the desired approach to the retrofit.

Bearing replacement would eliminate the potential loss of stability failure to the high level fixed and rocker bearings. Replacement bearings could also benefit the structure by redistributing forces more uniformly to the bridge substructure and reducing seismic forces in the lateral direction through isolation. The bridge pier footings should be strengthened and keeper blocks could be constructed at the abutments to restrain the structure transversely while reducing demands on the piers. The abutments could be upgraded to fully resist the seismic forces, or the potential damage to the abutments could be accepted as a tradeoff for reduced damage to the piers since the abutments are easier to repair after an earthquake.

The overall seismic retrofit strategy would begin with tailoring the approach to the desired superstructure rehabilitation program and a complete seismic analysis. The analysis would identify the specific seismic vulnerabilities of the structure and the best remedies for retrofitting. The retrofit work can be complete or partial depending on the outcomes of the evaluation and acceptable levels of risk for the various components that may fail in an earthquake.

Advantages: Improved resistance to earthquakes reduces risk for loss of the structure in the event of a design earthquake and reduced damage in lower level earthquakes. Once a complete evaluation is performed during design, a more comprehensive retrofit program can be developed and decisions made as to extent of the work compared to risk of failure.

Disadvantages: Depending on the results of the analysis and the desired retrofit program the work may be relatively simple and inexpensive to very complex and costly. As a minimum the structure should be analyzed so that risks may be specifically identified and more informed decisions may be made as to what deficiencies to address. A major disadvantage to not analyzing the structure seismically is all outcomes remain unknown.

4. MAINTENANCE OF TRAFFIC

The Vermont Agency of Transportation reviews each new project to determine suitability for the 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 sooner. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated 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.

In order to construct the project, traffic will need to be maintained. The following options have been considered:

4.1. Option 1: Off-Site Detour

This option would close the bridges to traffic during construction and reroute traffic from I-89, to VT Route 14, and back to I-89. Between I-89 Exit 2 and Exit 3, VT Route 14 would be the obvious detour route as the roadway parallels the existing I-89 alignment. The detour has an end-to-end distance of approximately 9.8 miles, takes 15 minutes to drive, and has an additional travel distance of 0.6 miles. A map of the detour routes, northbound and southbound, can be found in the Appendix.

	I-89 Northbound Detour Route	I-89 Southbound Detour Route
Through Route	9.2 miles	9.2 miles
Detour Route	9.8 miles	9.9 miles
Added Miles	0.6 miles	0.7 miles
Detour Travel Time	15 minutes	15 minutes

The VT Route 14 detour route includes two narrow railroad underpasses. Detoured traffic including trucks traveling at reduced speeds to navigate the underpasses would be subject to delay at these locations.

The community has expressed concern if I-89 traffic were to be detoured for this project, there would be traffic control concerns and increased traffic on VT Route 14 and River Road. It is also noted that the Stagecoach I-89 Commuter Route and Greyhound bus service between Boston and Montreal would be impacted by the detour.

Advantages: Utilizing an off-site detour would eliminate the need to use phase construction, use a temporary bridge, or construct median crossover roadways to maintain traffic. This option would decrease the cost and amount of time required to construct a project in this location. The impacts required to construct a project in this location would also be reduced for this option. Many times by decreasing the impacts, the length of time to develop the project can be decreased. The safety of both construction workers and the travelling public will be improved by removing traffic from the construction site.

Disadvantages: Traffic flow would not be maintained through the project site during construction resulting in a disruption to Interstate I-89 regional and long haul traffic. Added traffic volume including heavy truck traffic would be directed to use VT Route 14 and will impact the operations of the at grade intersections, narrow railroad underpasses and the I-89 Exit 2 Park & Ride, municipal, school, residential, commercial, and retail business driveways along the detour route. Public transit that uses I-89 would be impacted and the local community has expressed traffic control concerns due to the increased traffic associated with an off-site detour.

4.2. Option 2: Phased Construction

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

Based on the current traffic volumes, it is acceptable to close one lane of traffic, and maintain one lane of traffic in both the northbound and southbound directions. Additionally, based on the existing bridge widths, it is possible to phase traffic without widening the bridge beyond the standard or shifting the horizontal alignment.

Advantages: Traffic flow would be maintained through the project site during construction. Also, this option would have minimal impacts to the existing median and land beyond the limits of the existing paved surface.

Disadvantages: Phased construction generally involves higher costs and complexity of construction. Costs could be higher and construction duration could be longer since many construction activities in this case would have to be performed twice. Additionally, since cars are traveling near construction activity, there is decreased safety. There would be some delays and disruption to traffic since the roadways would be reduced to a single lane.

4.3. Option 3: Temporary Bridge

A temporary bridge would allow the existing bridges to be closed to traffic without the need to divert traffic to an off-site detour. A temporary bridge would be placed between the two bridges within the existing median. Additional costs would be incurred to use a temporary bridge including the cost of the bridge itself, installation and removal, and restoration of the disturbed area. Additional studies would be triggered by potential impacts to sensitive areas within the median at the crossing over the White River.

Advantages: Traffic flow can be maintained along the I-89 corridor. Lane reductions would not be required.

Disadvantages: This traffic control option would be costly and time consuming as construction activities would take an additional construction season in order to set up the temporary bridge. This option would have adverse environmental impacts to and along the banks of the White River.

This option for traffic management is a major construction project by itself. Since a detour route is available, and the traffic volumes are such that median crossovers (described below in Section 4.4) are feasible, a temporary bridge is not reasonable and will not be developed further in this report.

4.4. Option 4: Median Crossovers

The implementation of temporary median crossover detour roadways would allow the project to be constructed with the bridges closed, one at a time. The travel lanes on both I-89 northbound and I-89 southbound would be reduced from two lanes to one lane each and allow the opposing direction to crossover the median and use the opposite bridge to cross the White River. Based on the current traffic volumes, it is acceptable to close one lane of traffic and maintain a single travel lane of traffic in both the northbound and southbound directions.

To the north of the project site, I-89 bridges over River Road and Broad Brook Road present a constraint to the layout of temporary median crossover roadways. Therefore, the single lane crossover roadways would be located immediately to the south of the project and to the north of the Broad Brook Road structures. The length of the crossover roadway would be slightly more than 1 mile in length each. Full access to Exit 2 and Exit 3 would be maintained. It should be noted that if median crossovers are in place over the winter season, a minimum width of 14-ft is required. The existing bridge geometry can provide a maximum width of 14-ft curb-to-curb.

Advantages: Utilizing median crossover detour roadways would eliminate the need to use a temporary bridge or phase construction to maintain traffic. Traffic flow would be maintained through the project site during construction.

Disadvantages: There would be some delay and disruption to traffic, since the roadways would be reduced to a single lane. There would be added cost to construct the median crossover roadways and to remove them after use.

5. ALTERNATIVE SUMMARY

- **Alternative 1**: Deck Patching and Steel Repairs
  Traffic maintained by phased construction

- **Alternative 2**: Deck Replacement and Steel Repairs
  Traffic maintained by median crossovers

- **Alternative 3:** Superstructure Replacement
  Traffic maintained by median crossovers

- **Alternative 4:** Bridge Replacement
  Traffic maintained by median crossovers

5. COST MATRIX[1]

Sharon IM 089-1 (64)		Do Nothing	Alt 1 Deck Patching *Phasing*	Alt 2 Deck Replacement *Median Crossover*	Alt 3 Superstructure Replacement	Alt 4 Bridge Replacement	Bearing Replacements for Alt 1 and 2
COST	Bridge Cost	$0	$2,800,000	$7,540,000	$40,390,000	$57,610,000	$2,200,000
	Clean & Paint Exist. Structure	$0	$6,470,000	$6,470,000	$0	$0	
	Removal of Structure	$0	$0	$730,000	$9,180,000	$10,970,000	
	Roadway	$0	$100,000	$250,000	$300,000	$500,000	
	Maintenance of Traffic	$0	$500,000	$1,500,000	$1,500,000	$1,500,000	$50,000
	Construction Costs	$0	$9,870,000	$16,490,000	$51,370,000	$70,580,000	$2,250,000
	Construction Engineering + Congintencies	$0	$1,020,000	$3,006,000	$15,411,000	$21,174,000	$675,000
	Total Construction Costs with CEC	$0	$10,890,000	$19,496,000	$66,781,000	$91,754,000	$2,925,000
	Preliminary Engineering[2]	$0	$442,000	$1,302,600	$6,010,290	$7,340,320	$731,250
	Right-of-Way	$0	$0	$0	$0	$0	
	Total Project Costs	**$0**	**$11,332,000**	**$20,798,600**	**$72,791,290**	**$99,094,320**	**$3,656,250**
	Total Project Costs w/o Clean & Paint	**$0**	**$4,862,000**	**$14,328,600**	**$72,791,290**	**$99,094,320**	**$3,656,250**
SCHEDULING	Project Development Duration[3]	NA	2 years	2 years	2 years	2 years	
	Construction Duration	NA	8 months	8 months	24 months	24 months	
	Closure Duration (If Applicable)	NA	NA	NA	NA	NA	
ENGINEERING	Typical Section - Roadway (feet)	4-12-12-10	4-12-12-10	4-12-12-10	4-12-12-10	4-12-12-10	
	Typical Section - Bridge (feet)	3-12-12-3	3-12-12-3	(2) 2-12-12-2 (2)	(2) 2-12-12-2 (2)	(2) 4-12-12-10 (2)	
	Geometric Design Criteria	meets minimum tolerable criteria	meets minimum tolerable criteria	meets minimum tolerable criteria	meets minimum tolerable criteria	Improved	
	Traffic Safety	No Change	No Change	Improved	Improved	Improved	
	Alignment Change	No	No	No	No	No	
	Bicycle Access	No Change	No Change	No Change	No Change	No Change	
	Hydraulic Performance	No Change	No Change	No Change	No Change	No Change	
	Pedestrian Access	No Change	No Change	No Change	No Change	No Change	
	Utility	No Change	No Change	No Change	No Change	No Change	
OTHER	ROW Acquisition	No	No	No	No	No	
	Road Closure	No	No	Yes	Yes	Yes	
	Design Life	< 10 years	15 years	40 years	50 years	80 years	

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

7. CONCLUSION

We recommend **Alternative 1**; to patch the deck, replace the joints, and replace the deteriorated steel bracing.

We also recommend a detailed seismic evaluation be performed during the next design phase and a comprehensive seismic retrofit program be developed for the structure. A more informed decision may be made at that time as to the extent of the upgrades that should be performed.

Structure:

This alternative will address the maintenance needs of the structure. While deck patching does not have the longest design life, the condition of the deck does not warrant the added cost of a full replacement. The existing substructures are in good condition and will receive surficial repairs, and the new expansion joints will prevent further deterioration.

The superstructure replacement and bridge replacement options are not appropriate for this project since the bridges are in good condition and their geometry meets the minimum tolerable criteria. Due to the size of this structure and the magnitude of the associated superstructure or bridge replacement costs, continued maintenance will provide the lowest life cycle cost.

Traffic Control:

The recommended method of traffic control is to phase construction. This was chosen as the most appropriate means of maintaining traffic due to limitations and impacts associated with the detour route and the costs and impacts related to median crossovers or a temporary bridge.

Median crossovers would allow each bridge to be shut down, one at a time, but the added cost and time to construct the crossover roadways and the disturbance to the medians outweighs the benefits. Thus, the implementation of median crossover roadways has been discounted over phased construction.

The AADT for I-89 northbound is 6,100 with over 13% trucks. The AADT for I-89 southbound is 6,100 with over 14% trucks. An off-site detour/closure of I-89 would result in interstate traffic on VT Route 14 for the duration of the project causing delay along the detour route and traffic and safety concerns in the community. The detour route is undesirable for this volume of traffic and the high percentage of trucks, thus this option is not appropriate for this project.

The temporary bridge option would allow I-89 to maintain 2 lanes in both directions but brings added impacts, costs, and project duration. This option is not appropriate for this project.

APPENDIX

8.1. Site Photographs

17S Facing South

17N Facing North

From Span 3, Bridge 17S (VT Route 14 below)

From Span 3, Bridge 17S - facing Abutments 3 and 4

Lateral Bracing Angle Deterioration below Deck Drip Tube (Bridge 17N shown)

Typical Deck Drip Tube

From embankment in front of Abutment #1 looking toward Pier #1, #3, and #5 (Below Bridge 17S)

Condition of Abutment and Backwall (Bridge 17N shown)

Exposed Finger Joint (Bridge 17N shown)

Tilted Bearing (Bridge 17N shown)

Vertically Misaligned Finger Joint (Bridge 17N shown)

Underside of Bridge (Bridge 17S shown)

Wingwall and End of Deck (Bridge 17N shown)

APPENDIX

8.2. Town Map and Bridge Location

SHARON BR 17 N&S
IM 089-1(64)

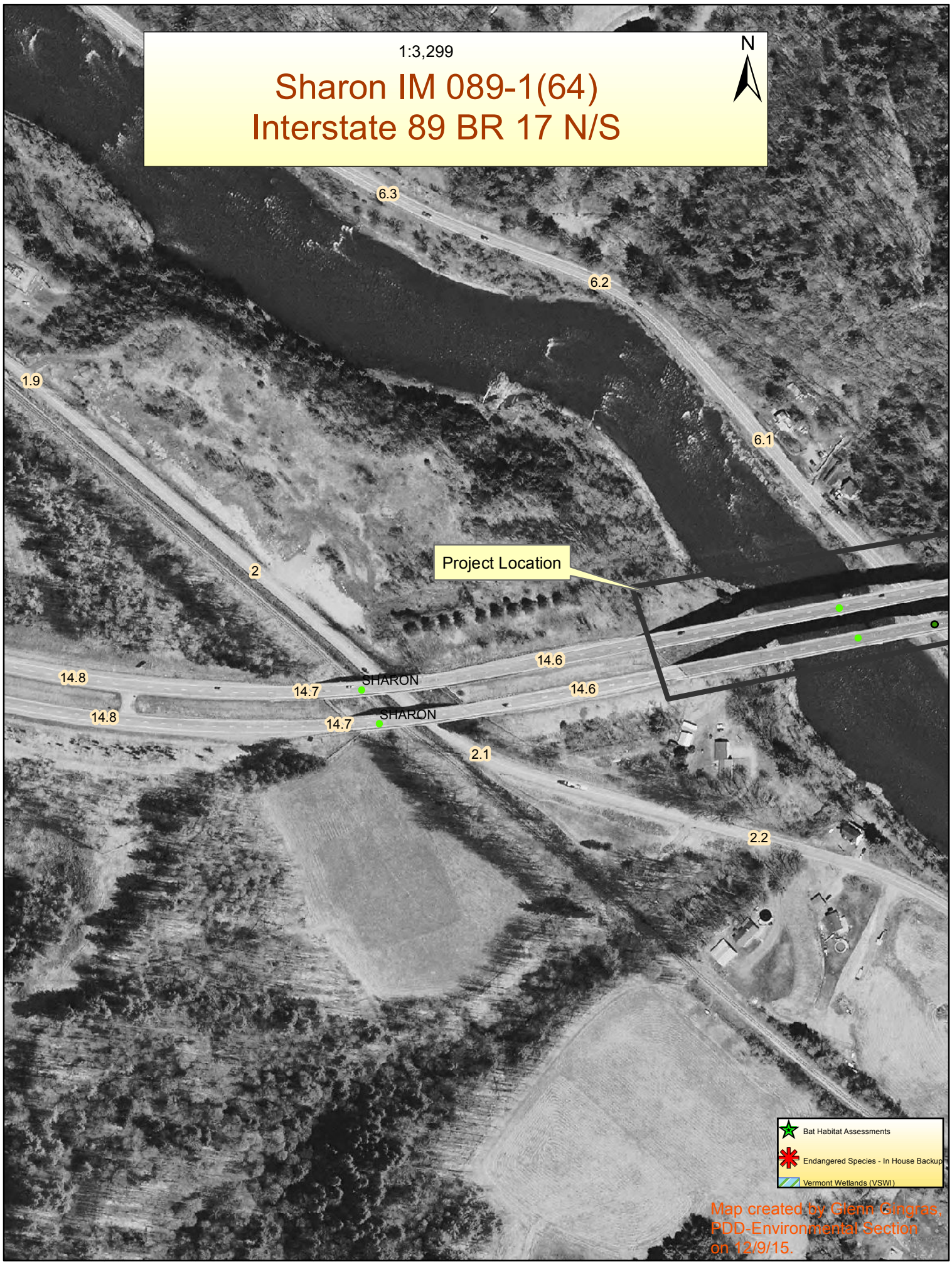
Scale 1:50,224

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

SHARON
WINDSOR COUNTY
DISTRICT # 4


1:3,299
Sharon IM 089-1(64)
Interstate 89 BR 17 N/S
N
6.3
6.2
1.9
6.1
Project Location
2
14.8
14.7
SHARON
14.6
14.8
14.7
SHARON
14.6
2.1
2.2
Bat Habitat Assessments
Endangered Species - In House Backup
Vermont Wetlands (VSWI)
Map created by Glenn Gingras, PDD-Environmental Section on 12/9/15.

APPENDIX

8.3. Bridge Inspection Reports

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for SHARON **bridge no.:** 0017N **District:** 4

Located on: I 00089 ML **over** I 89 OVER VT14&WHT **approximately** 1.1 MI N EXIT 2 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 7 GOOD

Superstructure Rating: 5 FAIR

Substructure Rating: 5 FAIR

Channel Rating: 8 VERY GOOD

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200089017N14172

Federal Sufficiency Rating: 066.9

Deficiency Status of Structure: ND

AGE and SERVICE

Year Built: 1968 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 6 HIGHWAY-WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 02

Bypass, Detour Length (miles): 01

ADT: 005800 **% Truck ADT:** 13

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0239

Structure Length (ft): 000834

Lt Curb/Sidewalk Width (ft): 0.8

Rt Curb/Sidewalk Width (ft): 0.8

Bridge Rdwy Width Curb-to-Curb (ft): 30

Deck Width Out-to-Out (ft): 35.5

Appr. Roadway Width (ft): 038

Skew: 34

Bridge Median: 1 OPEN MEDIAN

Min Vertical Clr Over (ft): 99 FT 99 IN

Feature Under: HIGHWAY BENEATH STRUCTURE

Min Vertical Underclr (ft): 83 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: 4 SP CONT WELDED GIR

Number of Approach Spans 0000 **Number of Main Spans:** 004

Kind of Material and/or Design: 4 STEEL CONTINUOUS

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: 1 MEETS CURRENT STANDARD

Approach Guardrail 1 MEETS CURRENT STANDARD

Approach Guardrail Ends: 1 MEETS CURRENT STANDARD

Structural Evaluation: 5 BETTER THAN MINIMUM TOLERABLE CRITERIA

Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal 7 BETTER THAN MINIMUM CRITERIA

Waterway Adequacy: 8 SLIGHT CHANCE OF OVERTOPPING 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: 5 HS 20

INSPECTION and CROSS REFERENCE

X-Ref. Route: VT14

Insp. Date: 042012 **Insp. Freq. (months)** 24 **X-Ref. BrNum:** 0017B

INSPECTION SUMMARY and NEEDS

04/18/2012 Finger joint above abutment No.1 is in need of full clean out (heavily plugged with asphaltic material). Vertical misalignment occurs on both shoulder areas of this same joint which are in need of realignment. Concrete patching is needed on both backwall areas. Right side snow fence has two heavily bent posts and one horizontal bottom pipe missing and is in need of repairs. Surface drain grates and downspouts on both sides are in need of full replacement. PLB

04/07/2010 Bent rail with leaning posts along the right side of approach No.1 need repairs. Both finger plate joints need vertical realignment. Several diagonal braces between G1 to G2 and G4 to G5 in all span areas are in need of significant repairs. The entire steel structure is in need of full paint recoat. The drain tubes along both lines of 1 and 5 need to be repaired or sealed off. Heavy leakage drips along all girders on lines 1 and 5 causing progressive heavy corrosion deterioration. PLB

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for SHARON **bridge no.:** 0017S **District:** 4

Located on: I 00089 ML **over** I 89 OVER VT14&WHT **approximately** 1.1 MI N EXIT 2 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 7 GOOD

Superstructure Rating: 5 FAIR

Substructure Rating: 6 SATISFACTORY

Channel Rating: 8 VERY GOOD

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200089017S14172

Federal Sufficiency Rating: 066.9

Deficiency Status of Structure: ND

AGE and SERVICE

Year Built: 1968 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 6 HIGHWAY-WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 02

Bypass, Detour Length (miles): 01

ADT: 005800 **% Truck ADT:** 13

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0239

Structure Length (ft): 000834

Lt Curb/Sidewalk Width (ft): 0.8

Rt Curb/Sidewalk Width (ft): 0.8

Bridge Rdwy Width Curb-to-Curb (ft): 30

Deck Width Out-to-Out (ft): 35.5

Appr. Roadway Width (ft): 038

Skew: 34

Bridge Median: 1 OPEN MEDIAN

Min Vertical Clr Over (ft): 99 FT 99 IN

Feature Under: HIGHWAY BENEATH STRUCTURE

Min Vertical Underclr (ft): 83 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: 4 SP CONT WELDED GIR

Number of Approach Spans 0000 **Number of Main Spans:** 004

Kind of Material and/or Design: 4 STEEL CONTINUOUS

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: 1 MEETS CURRENT STANDARD

Approach Guardrail 1 MEETS CURRENT STANDARD

Approach Guardrail Ends: 1 MEETS CURRENT STANDARD

Structural Evaluation: 5 BETTER THAN MINIMUM TOLERABLE CRITERIA

Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal 7 BETTER THAN MINIMUM CRITERIA

Waterway Adequacy: 8 SLIGHT CHANCE OF OVERTOPPING 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: 5 HS 20

INSPECTION and CROSS REFERENCE

X-Ref. Route: VT14

Insp. Date: 042012 **Insp. Freq. (months)** 24 **X-Ref. BrNum:** 0017A

INSPECTION SUMMARY and NEEDS

04/18/2012 Finger joint above abutment No.2 is in need of full clean out (plugged with asphaltic material in certain sections). Surface drain grates and downspouts on both sides are in need of full replacement. PLB

04/07/2010 The pavement overlay needs full replacement. Bent rail with leaning posts occurs along the left side of approach No.2 is in need of repairs. Both finger plate joints need vertical realignment. Several diagonal braces between G1 to G2 and G4 to G5 throughout all span areas are in need of repairs. The entire structure is in need of full paint recoat. The drain tubes along lines of 1 and 5 are in need of repairs. Heavy leakage occurs along all girders on lines 1 and 5 causing heavy progressive corrosion deterioration. PLB

APPENDIX

8.4. Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Chris Williams, P.E., Structures Project Manager

END

From: Eric Denardo, Geotechnical Engineer, via Christopher C. Benda, P.E., Geotechnical Engineering Manager

CCB

Date: August 13, 2014

Subject: Sharon IM 089-1(64) Preliminary Geotechnical Information

1.0 INTRODUCTION

We have completed our preliminary geotechnical investigation for the replacement of Bridges 17 N and S on Interstate 89 in Sharon, which cross over Vermont Route 14 and the White River. The existing structures are continuous, 4 span welded girder bridges with cast in place concrete decks. This review included observations made during a site visit, the examination of historical in-house bridge boring files, as-built record plans, USDA Natural Resources Conservation soil survey records, published surficial and bedrock geologic maps, and water well logs on-file at the Agency of Natural Resources.

2.0 SUBSURFACE INFORMATION.

2.1 Previous Projects

The record plans were available for the existing structure. The plans show that the bridge abutments are supported on steel piles and the piers are supported on spread footings on bedrock. Boring logs were attached to the plans. The logs contained soil descriptions, blow counts, and descriptions of the rock encountered. Two borings were completed in the locations of each abutment and pier. Additional borings were taken at pier locations where shallow bedrock was encountered. Bedrock depths ranged from 4 feet to 85 feet. The overlying soil was reported as sand and silt with some gravel and the bedrock was reported as quartz-muscovite phyllite or schist.

The Geotechnical Engineering Section maintains a GIS based historical record of subsurface investigations, which contains electronic records for the majority of borings completed in the past 10 years. An exploration of this database revealed no nearby projects. Physical in-house bridge boring files were also searched. No nearby projects were found.

2.2 Water Well Logs

Figure 1 contains the subject project as well as surrounding well locations found using the ANR Natural Resources Atlas. Published online, the logs can be used to determine general characteristics of soil strata in the area. The soil description given on the logs is

done in the field, by unknown personnel, and as such, should only be used as an approximation. Five water wells within an approximate 1500 foot radius were used to get an estimate of the depth to bedrock likely to be encountered for BR 17. The specific wells used to gain information on the subsurface conditions are highlighted by a red box.

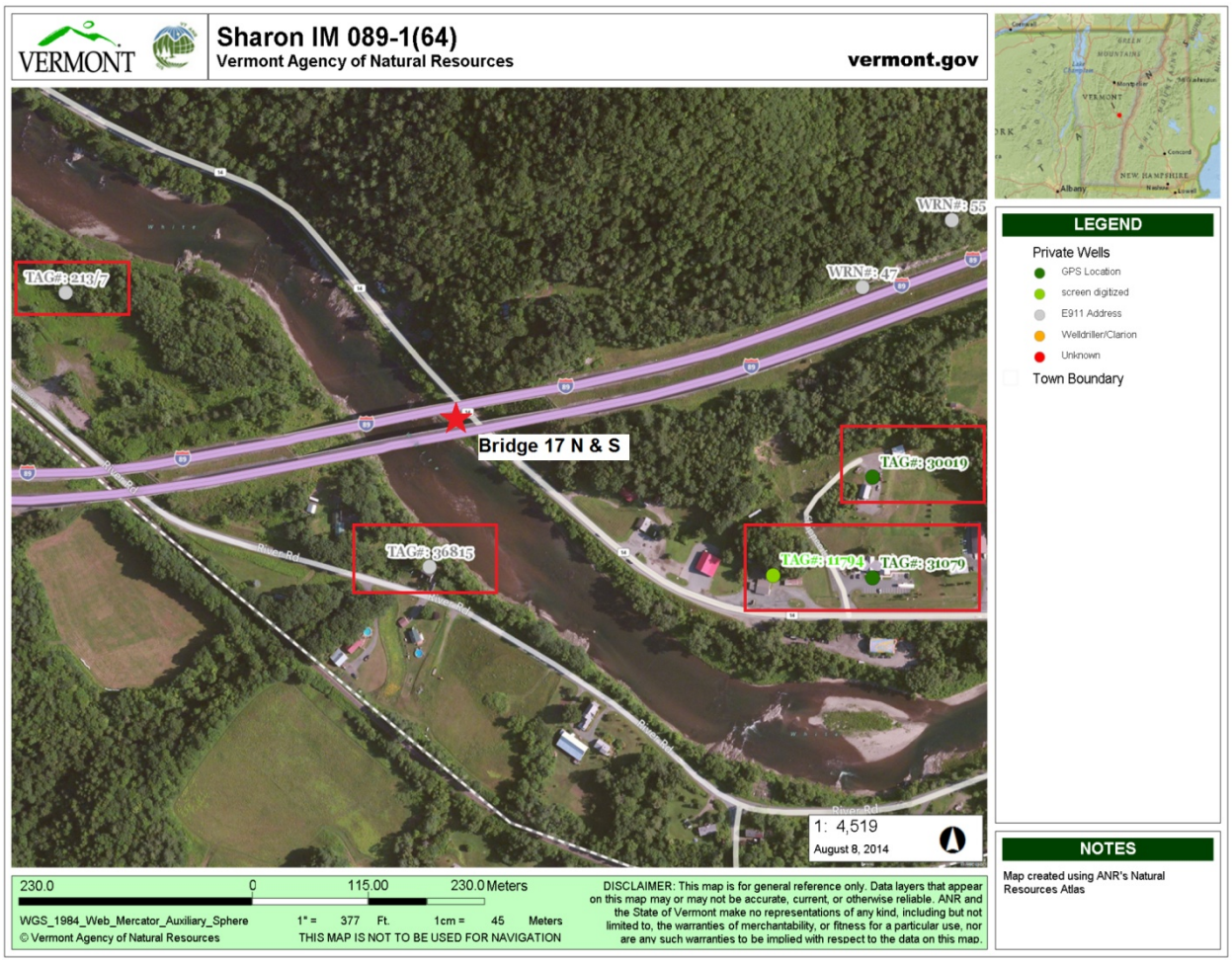


Figure 1. Highlighted Well Locations near Subject Project

Table 1 lists the well sites used in gathering the surrounding information. Wells are listed with the distance from the bridge project, depth to bedrock, and overlying soils encountered.

Table 1. Well Information Including Depths to Bedrock

Well Number	Approximate Distance From Project (feet)	Approximate Depth To Bedrock (feet)	Overlying Strata
36815	400	38	Sand
213/7	1000	4	Not Specified
11794	1100	17	Sand and Gravel
30019	1200	1	Gravel
20249	1300	10	Not Specified

2.3 USDA Soil Survey

The United States Department of Agriculture Natural Resources Conservation Service maintains a surficial geology map of the United States, which is available online. According to the Web Soil Survey, the strata directly underlying the project site consists of excessively drained Hinckley sandy loam 0 to 8% slopes, Windsor Loamy fine sand 0 to 8% slopes, and well drained Hitchcock Silt Loam 8 to 15% slopes all with depths to bedrock of greater than 80 inches and depths to groundwater of greater than 80 inches.

2.4 Geologic Maps of Vermont

Mapping conducted in 1970 for the Surficial Geologic map of Vermont shows that the project area is underlain by kame terrace and alluvium.

According to the 2011 Bedrock Map of Vermont, the project site is underlain by quartz-mica schist and feldspathic quartzite.

3.0 FIELD OBSERVATIONS

A preliminary site visit was conducted on July 25, 2014 to determine possible obstructions inhibiting boring operations and to make any other pertinent observations about the project. Overhead utilities run underneath the bridges on the eastern side of RT 14 in close proximity to two of the piers. The power lines can be seen in Figure 2.

Figure 2: Bridge Piers Looking East

Figure 3: Bedrock in the River

During the site visit, exposed bedrock was observed in the river. The bedrock can be seen in Figure 3. According to record plans from previous construction, the existing piers are founded directly on bedrock. No visible bedrock was seen in the areas of the abutments during the site visit. If deep foundations are contemplated for the abutments, additional borings advanced to bedrock may be required.

4.0 RECOMMENDATIONS

Based on the site visit and a review of the bridge inspection report and photos, the existing foundations appear to be in fair to good condition. For this reason, reuse of the existing foundations and replacement of the superstructure should be considered. If this is not the preferred option, possible foundation alternatives for a bridge replacement include the following:

Abutments

- Pile caps on a single row of H-Piles
- Reinforced concrete abutments on spread footings
- Reinforced concrete abutments founded on mechanically stabilized earth (MSE) walls

Piers

- Reinforced concrete abutments on spread footings

Prior to the development of project plans, we recommend that a thorough geologic assessment of the bedrock on this project be performed. This assessment should include an evaluation of the quality of the rock as well as other critical design parameters such as orientation and condition of any jointing or other discontinuities which may have an impact on the design of the pier footings. We recommend that this work be performed in conjunction with borings being performed. When

a preliminary alignment has been chosen, the Geotechnical Engineering Section should be contacted to help determine a subsurface investigation that efficiently gathers the most information.

5.0 CONCLUSION

If you have any questions or would like to discuss this report, please contact us by phone at (802) 828-2561.

cc: DJH/Read File
CCB/Project File
END

Z:\Highways\ConstructionMaterials\GeotechEngineering\Projects\Sharon IM 089-1(64)\REPORTS\Sharon IM 089-1(64) Preliminary Geotechnical Information.docx

APPENDIX

8.5. Resource ID Checklist

OFFICE MEMORANDUM

AOT - PDB - ENVIRONMENTAL SECTION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Jennifer Fitch, Project Manager
FROM: Lee Goldstein, Environmental Specialist
DATE: January 25, 2016
PIN: **13a250**

Project: **Sharon IM 0889-1(64)-Bridges Nos.17 N/S over VT Route 14 and White River**

ENVIRONMENTAL RESOURCES:

Wetlands:	___ Yes	_X_ No	
Historic/Historic District:	___ Yes	_X_ No	'Exempt Status'
Archaeological Site:	_X_ Yes	___ No	adjacent
4(f) Property:	___ Yes	_X_ No	
6(f) Property:	___ Yes	_X_ No	
Agricultural Land:	_X_ Yes	___ No	two statewide significant soils
Fish & Wildlife Habitat:	_X_ Yes	___ No	White River is Essential Fish Habitat
Endangered Species:	_X_ Yes	___ No	bats
Hazardous Waste:	___ Yes	_X_ No	ANR Atlas checked 1/25/16
Contaminated Soils:	___ Yes	_X_ No	ANR Atlas checked 1/25/16
Stormwater:	___ Yes	_X_ No	prior to scope and footprint, it is unknown
USDA-Forest Service Lands:	___ Yes	_X_ No	
Wildlife Habitat Connectivity:	_X_ Yes	___ No	existing and need to enhance; rated 7 and 5 for habitat blocks; deer wintering area identified NW quad;
Scenic Highway/Byway:	___ Yes	_X_ No	
Act 250 Permits:	___ Yes	_X_ No	
FEMA Floodplains:	_X_ Yes	___ No	Special flood Hazard Area A
Flood Hazard Area/ River Corridor:	_X_ Yes	___ No	White
Invasive Species:	___ Yes	___ No	most likely exists
Coast Guard:	_X_ Yes	___ No	Navigable
Landscaping:	___ Yes	_X_ No	
Environmental Justice:	___ Yes	_X_ No	
Source Protection Area:	___ Yes	_X_ No	
Other:	___ Yes	_X_ No	

Thanks,
Lee

cc: Jennifer Fitch
Project File

APPENDIX

8.6. Stormwater Correspondence

Goldstein, Lee

From: Armstrong, Jon
Sent: Monday, January 25, 2016 3:00 PM
To: Goldstein, Lee
Subject: RE: SHARON IM 089-1(64)-resource ID requested--Interstate bridge project

I can't really tell without a scope whether a stormwater permit would be triggered. I think N/A is ok for now, thanks.

Jonathan B. Armstrong, PE
Stormwater Management Engineer
Environmental Services Section
VTrans - Highway Division - Project Delivery Bureau
Web: Environmental Stormwater Engineer
Phone: (802) 828-1332

From: Goldstein, Lee
Sent: Monday, January 25, 2016 1:59 PM
To: Armstrong, Jon <Jon.Armstrong@vermont.gov>
Subject: FW: SHARON IM 089-1(64)-resource ID requested--Interstate bridge project

HI Jon—could you let me know if you want an n/a for resource ID on this one, or if you have a comment?
Thanks,
Lee

From: Goldstein, Lee
Sent: Tuesday, October 20, 2015 1:13 PM
To: Armstrong, Jon <Jon.Armstrong@vermont.gov>; Brady, James <James.Brady@vermont.gov>; Gauthier, Brennan <Brennan.Gauthier@vermont.gov>; Obenauer, Kyle <Kyle.Obenauer@vermont.gov>; Ehrlich, Judith <Judith.Ehrlich@vermont.gov>
Cc: Fitch, Jennifer <Jennifer.Fitch@vermont.gov>
Subject: SHARON IM 089-1(64)-resource ID requested--Interstate bridge project

Hello resource team!
We have two interstate bridges requesting resource ID. This first one is on I-89 in Sharon—please see the town map linked below for location:
M:\Projects\13a250\Structures\Correspondence\2013\Sharon Town Map Interstate Br 17 NS.pdf
The existing conditions plans are linked below as well:
M:\Projects\13a250\Structures\Plots\1 - Submittals\1 - Conceptual Plans\Existing Conditions-June 2014\13a250_Existing Conditions_20140612.pdf
As is typical for resource ID, we don't have a SOW, or project limits.

Please place your ID docs in the project file here:
M:\Projects\13a250\Environmental\ResourceIDandClearances\ResourceID
Thanks everyone—the second one will follow…
Lee

From: EnterpriseSQL@state.vt.us [mailto:EnterpriseSQL@state.vt.us]
Sent: Tuesday, October 20, 2015 10:20 AM
To: Goldstein, Lee; Goldstein, Lee; Ramsey, Jeff; Slesar, Chris; Wright, Andrea
Cc: Spencer, Lisa
Subject: Environmental Request NOTIFICATION: SHARON IM 089-1(64)

Please do not reply to this email.

NOTIFICATION EMAIL

The following Environmental\Hydraulic Request has been successfully submitted:

Date Requested: Oct 20 2015 10:19AM

Project Request Type: Capital Program

Pin: 13A250

Project Name and Number: SHARON IM 089-1(64)

Request Activity: Arch\Hist\Bio Resource Identification

Other Request Activity Description: N/A

File(s): M:\Projects\13a250\Structures\Plots\1 - Submittals\1 - Conceptual Plans\Existing Conditions-June 2014\13a250_Existing Conditions_20140612.pdf

Work Outside of ROW: No

Work Outside of ROW Details: N/A

Public Meetings: No

Public Meeting Dates: N/A

Comments: Existing Conditions plan set attached. We have set a target due date of January 20th, 2016 in artemis. Let us know if there is anything else you need, or if you will be unable to meet this date.

Contact Information:

Name: FITCH, JENNIFER (Structures)
Phone Number: (802) 828-3042
Email: jennifer.fitch@vermont.gov
Additional Contact(s):

APPENDIX

8.7. Natural Resources Memo

VERMONT

State of Vermont
Program Development Division
One National Life Drive
Montpelier, VT 05633-5001
www.aot.state.vt.us

Agency of Transportation

[phone] 802-279-2562
[fax] 802-828-2334
[ttd] 800-253-0191

To: Lee Goldstein, VTrans Environmental Specialist
From: James Brady, VTrans Environmental Biologist

Date: December 30, 2015

Subject: Sharon IM 089-1 (64) - Natural Resource ID

I have completed my natural resource report for the above referenced project. My evaluation has included wetlands, wildlife habitat, agricultural soils, and rare, threatened and endangered species.

Project Sharon IM 089-2 (64) will include the rehabilitation or replacement of bridges 17 North and South on Interstate 89 in the town of Sharon over the White River and VT Route 14.

Wetlands/Watercourses
This project is located over the White River. There are no mapped wetlands on the ANR Natural Resource Atlas within the project area. No wetlands were observed during the site visit to the project.

Wildlife Habitat
This project is located in an area with limited suitable wildlife habitat. There is a mapped deer wintering area to the northeast of the subject bridges. There is a worn game trail on the eastern slope below the eastern abutments. The area under the bridge is grassy and open and provides easy, yet unprotected movement under the interstate. It is recommended that any riprap placed under the bridge be grubbed and seeded to maintain and wildlife travel corridors.

During a site visit on 12/18/2015 with Vermont Fish & Wildlife Biologist, Alyssa Bennet, six living and one dead big brown bats (*Eptesicus fuscus*) were found under the eastern abutments of both bridges, 17N and 17S. It is assumed that the living bats are young-of-the-year and are likely to move to a different location to overwinter. Subsequent site visits will be required to document the movement of these individuals.

Rare, Threatened and Endangered Species
The above mentioned big brown bat has been identified as a High Concern Regional Species of Greatest Conservation Need. Due to the observed presence, an exit survey and/or acoustic monitoring will likely be required during the bats' active season to determine if mitigation measures will be required prior to work being performed on the bridges.

Recently, the Northern Long Eared bat was listed by the US Fish & Wildlife Service as threatened and the Vermont Fish and Wildlife Department as endangered throughout the entire state of Vermont. The Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) have implemented a Range wide Programmatic Informal Consultation for Indiana Bat and Northern Long-eared Bat. The guidance indicates that all trees $\geq$ 3" in diameter, that exhibit: cracks, crevices, holes, and peeling bark are considered suitable habitat roost trees. If tree clearing will be required, a habitat assessment will be needed prior to cutting unless trees can be cleared from November 1st through April 15th.

No other threatened or endangered species were identified within the project area.

Agricultural Soils:
The project area includes the following mapped soils: Hitchcock silt loam, 8 to 15% slope (statewide significant); Hitchcock silt loam, 25 to 50% slope; Windsor loamy sand, 0 to 8% slope (statewide significant) and Hinckley sandy loam, 0 to 8% (statewide significant).

APPENDIX

8.8. Archaeological Memo

VERMONT

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

Agency of Transportation

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

To: Lee Goldstein, VTrans Environmental Specialist

From: Jeannine Russell, VTrans Archaeology Officer
via Jacquelyn Lehmann, VTrans Archaeology Tech

Date: December 11, 2015

Subject: Sharon IM 089-1 (64) – Archaeological Resource ID

The scope for this project has not yet been fully defined. We have identified archaeological resources within the vicinity of Bridges 17 N/S on US Interstate 89 over the White River in Sharon, Windsor County, Vermont.

The VTrans Archaeology Officer and Archaeology Tech visited the site on 12-10-15. Three areas of archaeological sensitivity were found within the project area. Level knolls within the northwest, northeast, and southwest quadrants have been identified as archaeologically sensitive, and are marked on the Arch Sensitive Lines map. VT-WN-34, a known pre-historic archaeological site, is about 871 meters away from the project area located at the confluence of Broad Brook and the White River. Trees present in the 1960s photos are still visible on-site and this indicates potentially intact soils.

Please see the attached map identifying the sensitive areas, as well as historic maps and photographs associated with the project area. Please feel free to contact me with any questions.

Thank you,
Jeannine Russell
VTrans Archaeology Officer

/Prepared by Jacquelyn Lehmann, Archaeology Technician

VTrans Working to Get You There
Vermont Agency of Transportation

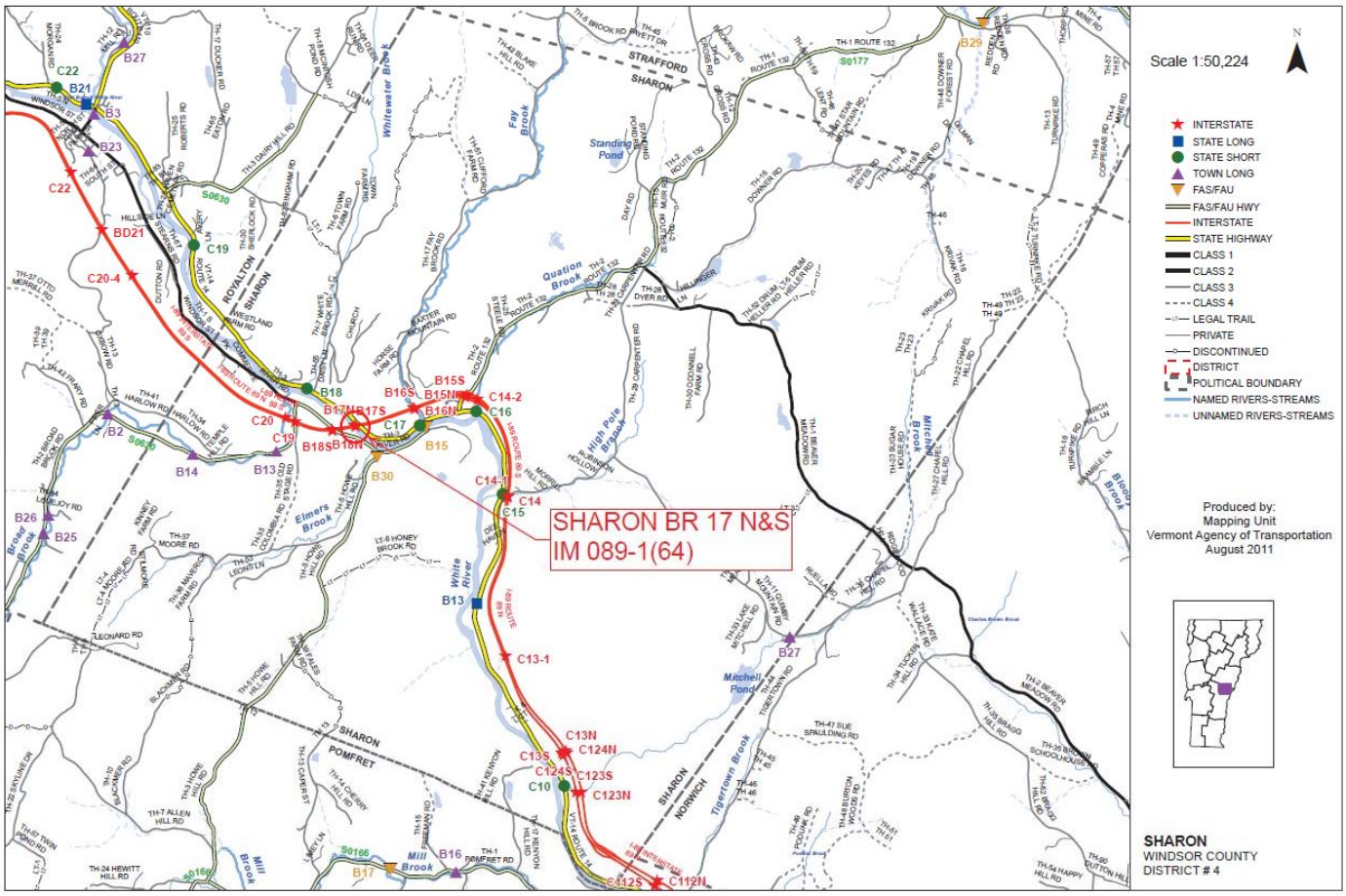


Figure 1: 2015 Project Location

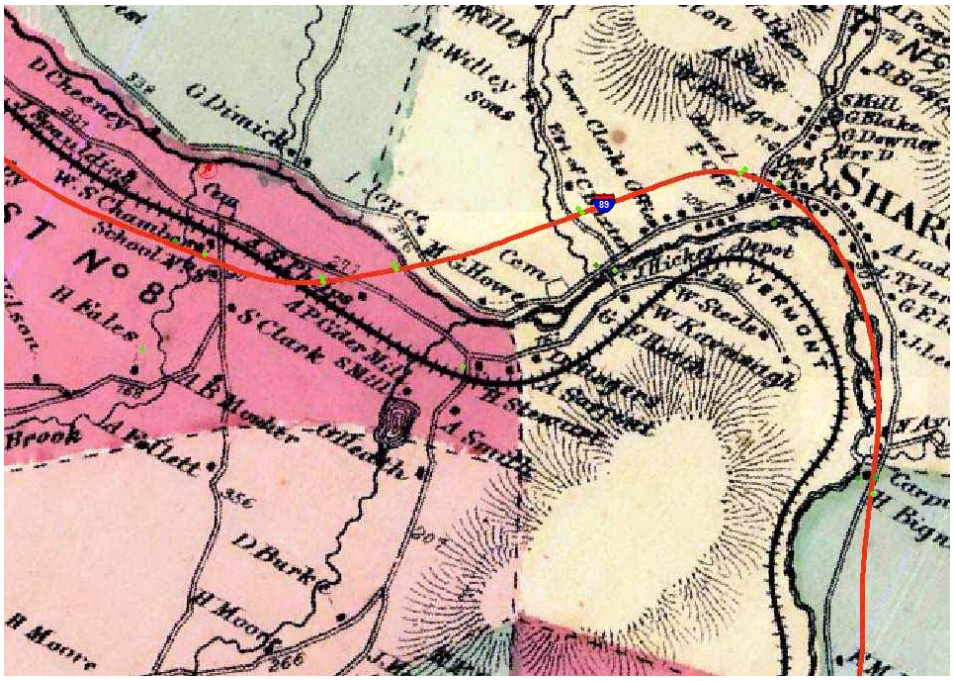
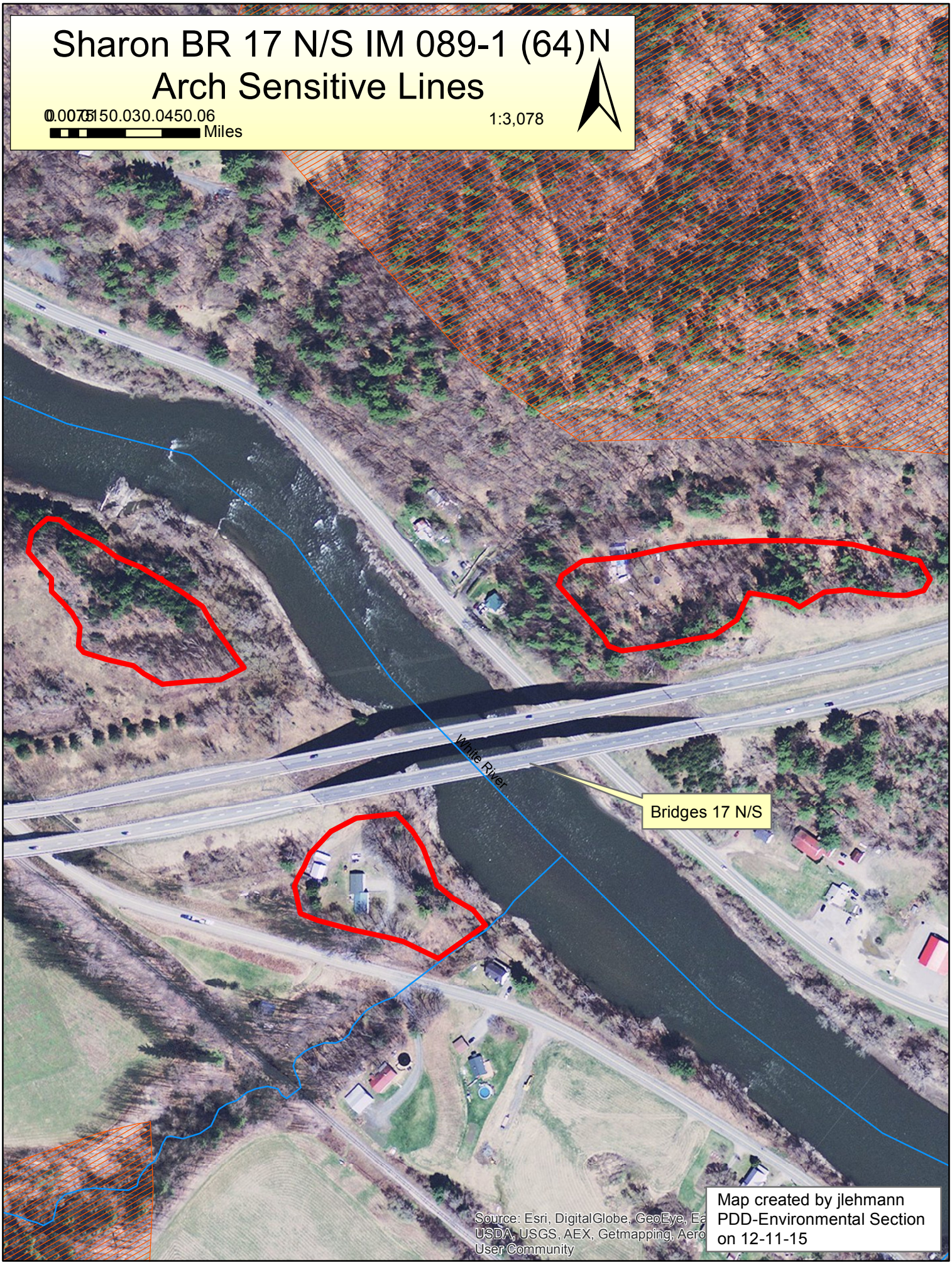


Figure 2: 1860s Map (at Center)

Figure 3: 1960's Photo

Figure 4: 1960's Photo

Figure 5: 1960's Photo


Sharon BR 17 N/S IM 089-1 (64)
Arch Sensitive Lines
N
0.0075
0.015
0.03
0.045
0.06
Miles
1:3,078
White River
Bridges 17 N/S
Source: Esri, DigitalGlobe, GeoEye, Ea
USDA, USGS, AEX, Getmapping, Aero
User Community
Map created by jlehmann
PDD-Environmental Section
on 12-11-15

APPENDIX

8.9. Historic Memo

Goldstein, Lee

From: Ehrlich, Judith
Sent: Tuesday, October 20, 2015 2:52 PM
To: Goldstein, Lee
Cc: Gauthier, Brennan; Obenauer, Kyle
Subject: RE: SHARON IM 089-1(64)-resource ID requested--Interstate bridge project

Hi Lee—
This project is considered EXEMPT for above-ground resources per the Section 106 Exemption Regarding Effects to the Interstate Highway System adopted by the Advisory Council on Historic Preservation on March 7, 2005. (See Federal Register Vol.70/No.46)
Thanks!
Judith

Judith Williams Ehrlich, VTrans Historic Preservation Officer
Vermont Agency of Transportation
(802) 828-1708
judith.ehrlich@vermont.gov

State email addresses have changed as of July 27, 2015. Please note my new address above.

From: Goldstein, Lee
Sent: Tuesday, October 20, 2015 1:13 PM
To: Armstrong, Jon; Brady, James; Gauthier, Brennan; Obenauer, Kyle; Ehrlich, Judith
Cc: Fitch, Jennifer
Subject: SHARON IM 089-1(64)-resource ID requested--Interstate bridge project

Hello resource team!
We have two interstate bridges requesting resource ID. This first one is on I-89 in Sharon—please see the town map linked below for location:
M:\Projects\13a250\Structures\Correspondence\2013\Sharon Town Map Interstate Br 17 NS.pdf
The existing conditions plans are linked below as well:
M:\Projects\13a250\Structures\Plots\1 - Submittals\1 - Conceptual Plans\Existing Conditions-June 2014\13a250_Existing Conditions_20140612.pdf
As is typical for resource ID, we don't have a SOW, or project limits.
Please place your ID docs in the project file here:
M:\Projects\13a250\Environmental\ResourceIDandClearances\ResourceID
Thanks everyone—the second one will follow…

Lee

From: EnterpriseSQL@state.vt.us [mailto:EnterpriseSQL@state.vt.us]
Sent: Tuesday, October 20, 2015 10:20 AM
To: Goldstein, Lee; Goldstein, Lee; Ramsey, Jeff; Slesar, Chris; Wright, Andrea
Cc: Spencer, Lisa
Subject: Environmental Request NOTIFICATION: SHARON IM 089-1(64)

Please do not reply to this email.

NOTIFICATION EMAIL

The following Environmental\Hydraulic Request has been successfully submitted:

Date Requested: Oct 20 2015 10:19AM

Project Request Type: Capital Program

Pin: 13A250

Project Name and Number: SHARON IM 089-1(64)

Request Activity: Arch\Hist\Bio Resource Identification

Other Request Activity Description: N/A

File(s): M:\Projects\13a250\Structures\Plots\1 - Submittals\1 - Conceptual Plans\Existing Conditions-June 2014\13a250_Existing Conditions_20140612.pdf

Work Outside of ROW: No

Work Outside of ROW Details: N/A

Public Meetings: No

Public Meeting Dates: N/A

Comments: Existing Conditions plan set attached. We have set a target due date of January 20th, 2016 in artemis. Let us know if there is anything else you need, or if you will be unable to meet this date.

Contact Information:

Name: FITCH, JENNIFER (Structures)

Phone Number: (802) 828-3042

Email: jennifer.fitch@vermont.gov

Additional Contact(s):

APPENDIX

8.10. Local Response and Input

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 bike races, festivals, parades, cultural events, farmers market, concerts, etc. that could be impacted? If yes, please provide date, location and event organizers' contact info.

   Since the project is an interstate highway bridge (no ped or bike traffic).
   Regional Events
   Tunbridge Fair – September 2016
   Quechee Balloon Festival – June 2016
   Dartmouth Graduation – May / June 2016
   Any bike races? 100 on 100 Relay Race – August 2016
   New World Music Festival in Randolph on Labor Day weekend
   Vermont Law School graduation / VTC graduation / Norwich University graduation
   Bluegrass Festival in Tunbridge end of June
   Good Sam Club – RV festival at Tunbridge Fairgrounds in the middle of summer
   Vermont History Expo at Tunbridge Fairgrounds – June 21/22
   Green Mountain Stage Race

2. Is there a "slow season" or period of time from May through October where traffic is less?

   April to June

3. Please describe the location of emergency responders (fire, police, ambulance) and emergency response routes.

   Please see attached map for Sharon, Hartford, Pomfret and Royalton.

4. Are there businesses (including agricultural operations) that would be adversely impacted either by a detour or due to work zone proximity?

   Truck traffic might have a problem, as getting off VT14 Exit 2 NB – can't get through to Royalton because of narrow rail underpass.

   Sharon Industrial Park

   GW Plastics

   Green Mountain Container (industrial Sharon park)

Are there important public buildings (town hall, community center, senior center, library) or community facilities (recreational fields, town green, etc.) close to the project?

No.

5. What other municipal operations could be adversely affected by a road/bridge closure or detour?

   Traffic control / increase in traffic on VT14 or River Road to get back onto I-89 in Royalton.

6. Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road?

   River Road

7. Is there a local business association, chamber of commerce or other downtown group that we should be working with?

   Joseph Smith Memorial
   Sharon Listserv
   So Royalton
   Sandy's restaurant

Schools

1. Where are the schools in your community and what are their schedules?

   Bus routes (Sharon Elementary and Sharon Academy)

2. Is this project on the specific routes that students use to walk to and from school?

   No.

3. Are there recreational fields associated with the schools (other than at the school)? No.

Pedestrians and Bicyclists

1. What is the current level of bicycle and pedestrian use on the bridge?

   None (interstate highway bridge)

2. Are the current lane and shoulder widths adequate for pedestrian and bicycle use?

   N/A

3. Does the community feel there is a need for a sidewalk on the bridge? No

4. Is pedestrian and bicycle traffic heavy enough that it should be accommodated during construction?

   N/A

5. Does the Town have plans to construct either pedestrian or bicycle facilities leading up to the bridge? Please provide a planning document demonstrating this (scoping study, master plan, corridor study, town plan). No

6. In the vicinity of the bridge, is there a land use pattern, existing generators of pedestrian and/or bicycle traffic, or zoning that will support development that is likely to lead to significant levels of walking and bicycling? N/A

Communications

1. Please identify any local communication channels that are available for us to use in communicating with the local population. Include weekly or daily newspapers, blogs, radio, public access TV, Front Porch Forum, etc. Also include any unconventional means such as local low-power FM.

   Joseph Smith Memorial
   Vermont Law School
   Surrounding town listservs (pomfret, vital communities, royalton, Strafford,)
   Sharon Town Listserv
   Valley News
   Vermont Standard
   Randolph Herald
   Front Porch Forum for surrounding towns using Exit 2 and Exit 3 of I-89.
   Regional – Killington area
   Any traffic impacts of I-91 going onto I-89 and vice versa?
   NHDOT

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? No.

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

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

5. Are there any known Hazardous Material Sites near the project site? No.

6. Are there any known historic, archeological and/or other environmental resource issues near the project site? No.

Request – water marks on the abutments to resume please.

7. Are there any other comments that are important for us to consider?

Land Use & Zoning (to be filled out by the municipality or RPC).

1. Please provide a copy of your existing and future land use map or zoning map, if applicable. Please see attached map.

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

3. Is there any planned expansion of public transit service in the project area? If not known please contact your Regional Public Transit Provider.

   Stagecoach I-89 Commuter Route will be impacted. Greyhound service from Boston to Montreal will be impacted.

APPENDIX

8.11. Traffic and Crash Data

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

POLICY, PLANNING AND INTERMODAL DEVELOPMENT DIVISION

TO: Christopher Williams, Structures Project Manager

FROM: Maureen Carr, Traffic Analysis Engineer MC
Colin Philbrook, Traffic Analysis Technician CCP

DATE: January 22, 2013

RE: Sharon IM 089-1(64)
I-89, BR #17 NB/SB, MM 14.459

As requested on December 11, 2013, please find in the table below the estimated 2017, 2037 and 2057 traffic data for the subject project.

~ ***Section #1-*** *BR #17 Northbound*
~ ***Section #2-*** *BR #17 Southbound*

Section	AADT		DHV		%T		%D		ADTT		ESALs	
	2017	2037	2017	2037	2017	2037	2017	2037	2017	2037	(2017 ~2037)	(2017 ~2057)
1	6100	7300	850	1000	13.7	19.1	100	100	1200	2100	9,507,000	22,813,000
2	6100	7300	890	1100	14.3	19.8	100	100	1200	2000	10,136,000	24,388,000

If you have any questions please call me at x3667.

CC: Chris Cole, Director of Policy, Planning and Intermodal Development
Data Analysis Files

Vermont Agency of Transportation

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

From 01/01/08 To 12/31/12 General Yearly Summaries Information

*	Reporting Agency/ Number	Town	Mile Marker	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
Route: I-89 Continued ...													
	VTVSP1100/09D30 2347	Sharon	12.65	07/08/2009	11:53	Rain	Driving too fast for conditions, Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Single Vehicle Crash	2	0	0		SH
	VTVSP1100/08D30 0211	Sharon	12.85	01/14/2008	00:38	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	S	SH
	VT0141100/10RY0 0007	Sharon	12.87	03/02/2010	14:10	Clear	Unknown, No improper driving	Rear End	0	0	0		SH
	VTVSP1100/08D30 4761	Sharon	13	11/30/2008	18:55	Snow	Driving too fast for conditions	Single Vehicle Crash	1	0	0	N	SH
	VTVSP1100/12D30 1453	Sharon	13	04/14/2012	21:26	Clear	Under the influence of medication/drugs/alcohol, Fatigued, asleep	Single Vehicle Crash	1	0	0	S	SH
	VTVSP1100/09D30 4393	Sharon	13.08	12/06/2009	10:49	Cloudy	Driving too fast for conditions, Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc, No improper driving	Other - Explain in Narrative	0	0	0	S	SH
	VTVSP1100/09D30 0250	Sharon	13.15	01/19/2009	08:53	Clear	Driving too fast for conditions, Failure to keep in proper lane, No improper driving	Rear End	0	0	0	S	SH
	VTVSP1100/11D30 0137	Sharon	13.23	01/09/2011	22:24	Cloudy	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	0	0	0	N	SH
	VTVSP1100/10D30 2278	Sharon	13.28	06/25/2010	22:03	Clear	Distracted	Single Vehicle Crash	1	0	0	S	SH
	VTVSP1100/08D30 1367	Sharon	13.4	03/25/2008	22:29	Clear	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Single Vehicle Crash	1	0	0	S	SH
	VTVSP1100/12D30 0165	Sharon	13.5	01/13/2012	08:28	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions, Operating defective equipment	Single Vehicle Crash	1	0	0	S	SH
	VTVSP1100/09D30 4386	Sharon	13.54	12/06/2009	00:09	Cloudy	Driving too fast for conditions	Single Vehicle Crash	1	0	0	N	SH
	VTVSP1100/12D30 4095	Sharon	13.63	09/14/2012	14:52	Clear	No improper driving, Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc, Failure to keep in proper lane	Rear End	2	0	0	N	SH
	VTVSP1100/08D30 0682	Sharon	13.67	02/08/2008	06:19	Snow	Driving too fast for conditions, Followed too closely, No improper driving	Rear End	0	0	0	S	SH
	VTVSP1100/08D30 4128	Sharon	13.7	10/15/2008	12:30	Clear	Operating defective equipment	Single Vehicle Crash	0	0	0	S	SH
	VTVSP1100/10D30 2359	Sharon	13.79	07/01/2010	15:51	Clear	Failure to keep in proper lane, Exceeded authorized speed limit, No improper driving	Left Turn and Thru, Broadside v<--	0	0	0		SH
	VTVSP1100/08D30 4580	Sharon	14	11/19/2008	18:11	Clear	Driving too fast for conditions	Single Vehicle Crash	0	0	0	S	SH
	VTVSP1100/12D30 1427	Sharon	14	04/13/2012	09:26	Clear	Failure to keep in proper lane, No improper driving	Same Direction Sideswipe	1	0	0	N	SH
	VTVSP1100/09D30 2699	Sharon	14.3	08/01/2009	14:35	Clear	Failure to keep in proper lane	Single Vehicle Crash	1	1	0		SH
	VTVSP1100/12D30 2131	Sharon	14.6	05/29/2012	16:22	Rain	Driving too fast for conditions	Single Vehicle Crash	0	0	0	N	SH
	VTDMV0004/12DM V0156	Sharon	14.85	06/25/2012	14:10	Clear	No improper driving	Head On	0	0	0	N	SH
	VTVSP1100/08D30 0462	Sharon	14.88	01/28/2008	19:58	Clear	Fatigued, asleep, Failure to keep in proper lane	Head On	0	0	0	S	SH
	VTVSP1100/09D30 3663	Sharon	15	10/12/2009	00:17	Clear	Under the influence of medication/drugs/alcohol, Inattention	Single Vehicle Crash	2	0	0	S	SH
	VTVSP1100/09D30 3974	Sharon	15	11/05/2009	06:59	Cloudy	Failure to keep in proper lane	Single Vehicle Crash	1	0	0	S	SH
	VTVSP1100/10D30 1066	Sharon	15.11	03/27/2010	16:50	Cloudy		Single Vehicle Crash	0	0	0	N	SH
	VTVSP1100/10D30 2912	Sharon	15.63	08/08/2010	12:59	Clear	Failure to keep in proper lane	Single Vehicle Crash	2	0	0		SH

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

APPENDIX

8.12. Preliminary Seismic Evaluation

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We performed a preliminary seismic analysis on NB Pier #3. We selected pier #3 as it is the tallest pier in the structure at approximately 104 feet. The piers are founded directly on ledge so we evaluated the site classification as Category B and peak ground acceleration as 0.08 from LRFD Figure 3.10.2.1-1. With the corresponding 0.2 second and 1.0 second rock accelerations from Figures 3.10.2.1-2 and 3.10.2.1-3 we constructed the Response Spectrum curve for this site. We found that the peak spectral acceleration is 0.17 G for short period, 0.2 second structures, decaying down to 0.05 G at 1.0 second.

For simplicity to assess potential seismic vulnerabilities in the pier, we analyzed it as an inverted pendulum in its weak direction with no restraint provided by any fixity from the superstructure. We applied the superstructure dead load reactions as part of the mass of the pendulum, estimated the stiffness based on the un-cracked section of the pier stem and found the period of the pier to be 1.14 seconds, thus conservatively the peak spectral acceleration for this pier is 0.045 G. Because of the height of the pier and the corresponding length of the period there is not much benefit to seismic isolation in the longitudinal direction as the spectral acceleration curve begins to flatten out and the law of diminishing returns comes into play.

We applied both loads at their respective elevations on the pier and calculated moments at the base of the footing for overturning. We checked the flexural reinforcement in the toe of the footing, at the base of the pier stem, and at the change in section at Elevation 454, and shear on the footing slab.

We found for this simplified analysis the pier is stable for overturning by a Factor of Safety of approximately 4, the reinforcement in the stem at the base of the pier is adequate with a C/D ratio of approximately 1.5, and the reinforcement in the stem at the change in section Elevation 454 is adequate with a C/D ratio of approximately 1.3. The footing slab shear resistance is adequate with a C/D ratio of approximately 1.4. The only component that appears to be inadequate is the reinforcement in the footing for flexure, with a capacity-to-demand (C/D) ratio of approximately 0.33.

Sharon I-89 N/S over the White River conveys an interstate highway and would be considered a critical essential bridge. Based upon our preliminary seismic analysis it is likely the structure would suffer moderate to significant damage in a design earthquake depending on the performance of the footing. It should be noted that this analysis is very simplified and hence very conservative but it is a good tool to provide a quick evaluation of critical structural components to determine if retrofitting the structure should be considered or if a structure may be deemed adequate from a detailed structural analysis alone. For this structure a detailed seismic analysis should be performed to provide more refined seismic loads but is likely that seismic retrofitting is warranted although in limited applications.

Because the structure is on a Seismic Zone 1 site a simplified seismic analysis could be performed assuming a seismic load equal to 25% of the dead load. However as has been demonstrated from the preliminary analysis, because of the very long structure period due to the height of the pier a refined seismic analysis would be preferred as it will produce significantly lower design forces. We

APPENDIX

believe a single mode analysis would be appropriate for the structure on this site. Thus a strategy to confirm adequacy and assess any potential deficiencies would include a single-mode analysis of the entire structure.

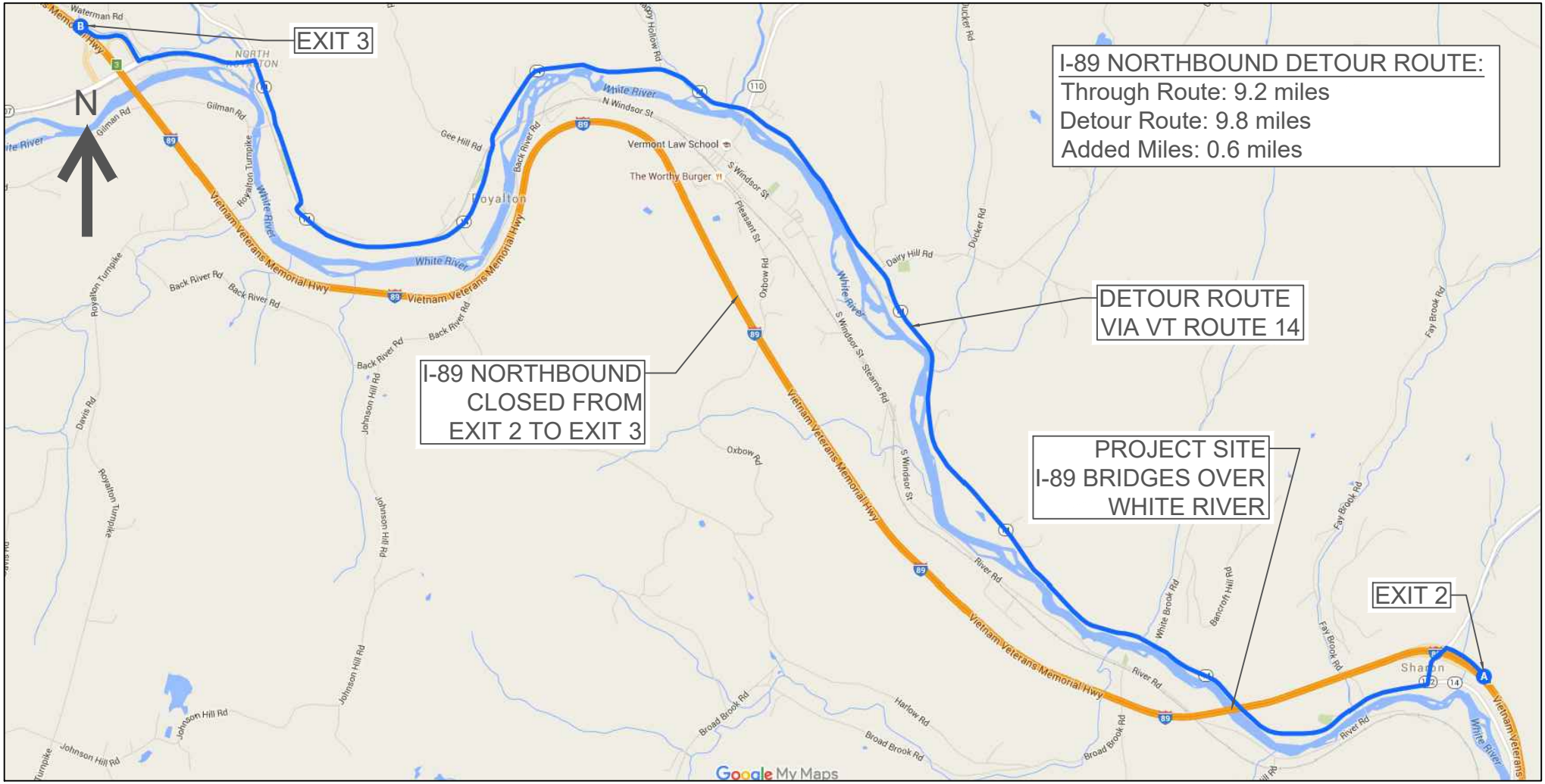
The existing high level rocker bearings have a demonstrated history of being vulnerable to toppling in a seismic event. Replacement of these bearings with elastomeric bearings would have a two-fold benefit both addressing the stability providing isolation which could be beneficial in the transverse direction. Thus the initial analysis would analyze the structure in its existing condition and then in the condition of the superstructure isolated from the substructure with reinforced elastomeric bearings designed as isolation bearings. We have performed a preliminary design on a set of reinforced elastomeric bearings as isolation bearings for the structure and find that they are feasible.

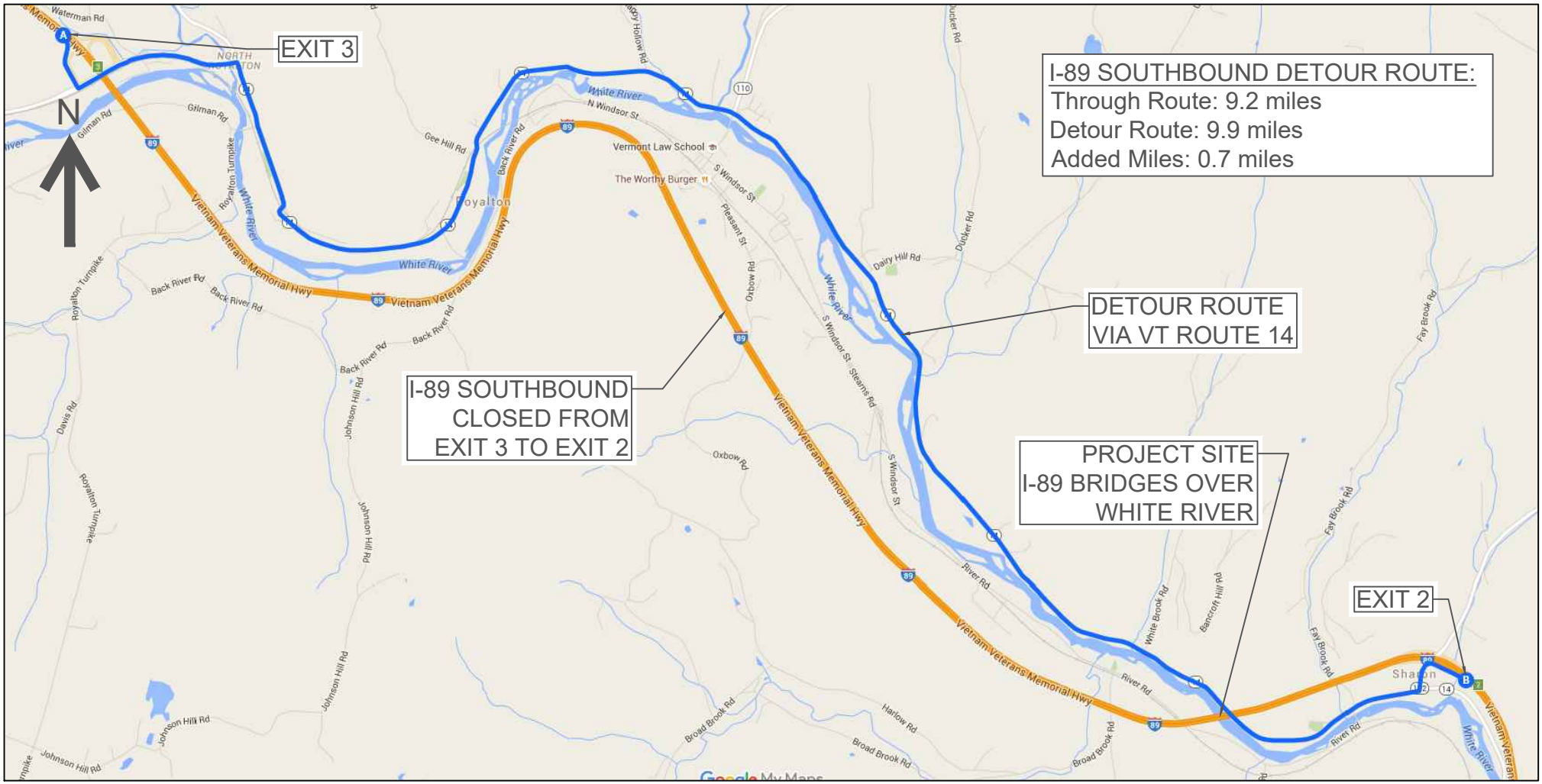
A common problem for older structures is a lack of development length of stem or column reinforcement into caps and footings and in this case potentially the horizontal construction joints in the stem. A detailed analysis can be performed to determine if the development is adequate for the demands. In the event that the development of reinforcement from the stem into the footing is found to be inadequate a potential solution would be to construct a reinforced concrete collar around the stem base at the top of the footing to strengthen the connection. This collar could serve an additional function that would reduce the moment arm on the footing and thus reduce the flexural demand on it as well. Additional measures would be to strengthen the pier stem if necessary by adding a reinforced concrete jacket around the stem to the height necessary for the required additional capacity in the longitudinal direction.

The abutments would be checked for impact from the superstructure on the backwalls in the longitudinal direction and shear blocks could be added to restrain the structure in the transverse direction. More damage could be accepted at the abutments as they are easier to repair after an earthquake and a loss of support failure is less likely, however the abutments could also be upgraded if necessary to fully resist seismic loads. Finally the need for a seismic slope stability analysis of the bridge fore slopes should be assessed as their failure in an earthquake could have a significant impact on the four piers that are founded within them. Conversely the fact that the piers are within the soil mass can also be beneficial if it is confirmed the slopes are stable or can be made stable by pinning or some other means.

APPENDIX

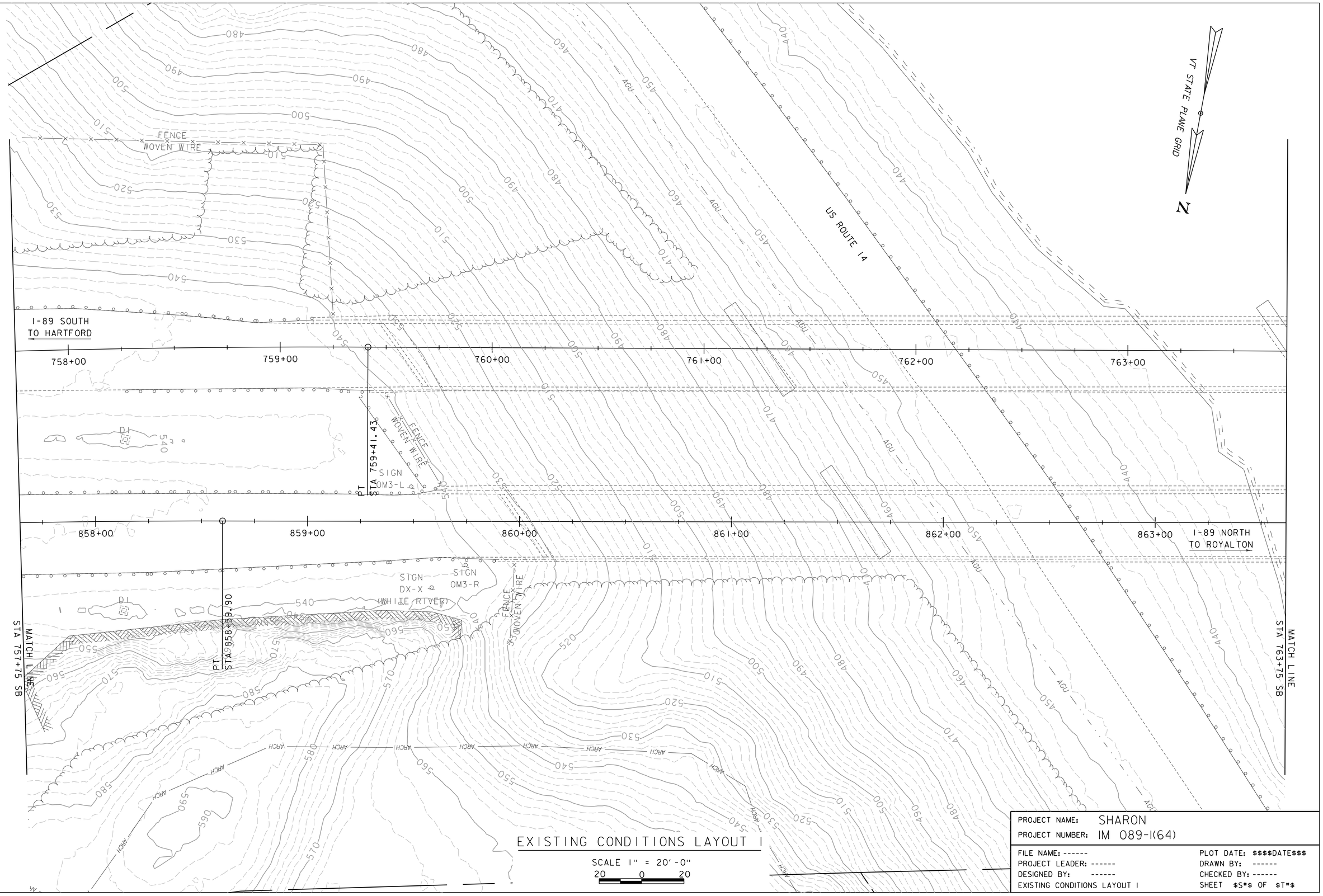
8.13. Detours


EXIT 3
N
I-89 NORTHBOUND DETOUR ROUTE:
Through Route: 9.2 miles
Detour Route: 9.8 miles
Added Miles: 0.6 miles
DETOUR ROUTE
VIA VT ROUTE 14
I-89 NORTHBOUND
CLOSED FROM
EXIT 2 TO EXIT 3
PROJECT SITE
I-89 BRIDGES OVER
WHITE RIVER
EXIT 2
Waterman Rd
Gilman Rd
Royalton Turnpike
Back River Rd
Gee Hill Rd
Vietnam Veterans Memorial Hwy
White River
Royalton
Vermont Law School
The Worthy Burger
N Windsor St
S Windsor St
Pleasant St
Oxbow Rd
Dairy Hill Rd
Ducker Rd
Steams Rd
Johnson Hill Rd
Davis Rd
Broad Brook Rd
Harlow Rd
River Rd
White Brook Rd
Bancroft Hill Rd
Fay Brook Rd
Sharon
Google My Maps


EXIT 3
I-89 SOUTHBOUND DETOUR ROUTE:
Through Route: 9.2 miles
Detour Route: 9.9 miles
Added Miles: 0.7 miles
DETOUR ROUTE
VIA VT ROUTE 14
I-89 SOUTHBOUND
CLOSED FROM
EXIT 3 TO EXIT 2
PROJECT SITE
I-89 BRIDGES OVER
WHITE RIVER
EXIT 2
N
Waterman Rd
Gilman Rd
Royalton Turnpike
Back River Rd
Gee Hill Rd
Vietnam Veterans Memorial Hwy
White River
Royalton
Vermont Law School
The Worthy Burger
N Windsor St
S Windsor St
Pleasant St
Oxbow Rd
Dairy Hill Rd
Ducker Rd
Stearns Rd
Johnson Hill Rd
Davis Rd
River Rd
White Brook Rd
Bancroft Hill Rd
Fay Brook Rd
Broad Brook Rd
Harlows Rd
Sharon

APPENDIX

8.14. Plans



EXISTING CONDITIONS LAYOUT 1

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: SHARON	
PROJECT NUMBER: IM 089-1(64)	
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 1	SHEET $S#$ OF $T#$

N/F
HOLMES, DOREEN J. (LIFE ESTATE)
HOLMES, SETH M. & TODD F

VT STATE PLANE GRID
N

WHITE RIVER
FLOW

53+00
52+00
51+00
50+00

I-89 SOUTH
TO HARTFORD

I-89 NORTH
TO ROYALTON

764+00
765+00
766+00
767+00
768+00
769+00
864+00
865+00
866+00
867+00
868+00
869+00

SIGN
DX-X
(WHITE RIVER)

SIGN
OM3-R

SIGN
OM3-L

FENCE
WOVEN WIRE

ARCH

AGU

STA 763+75 SB
MATCH LINE

STA 769+75 SB
MATCH LINE

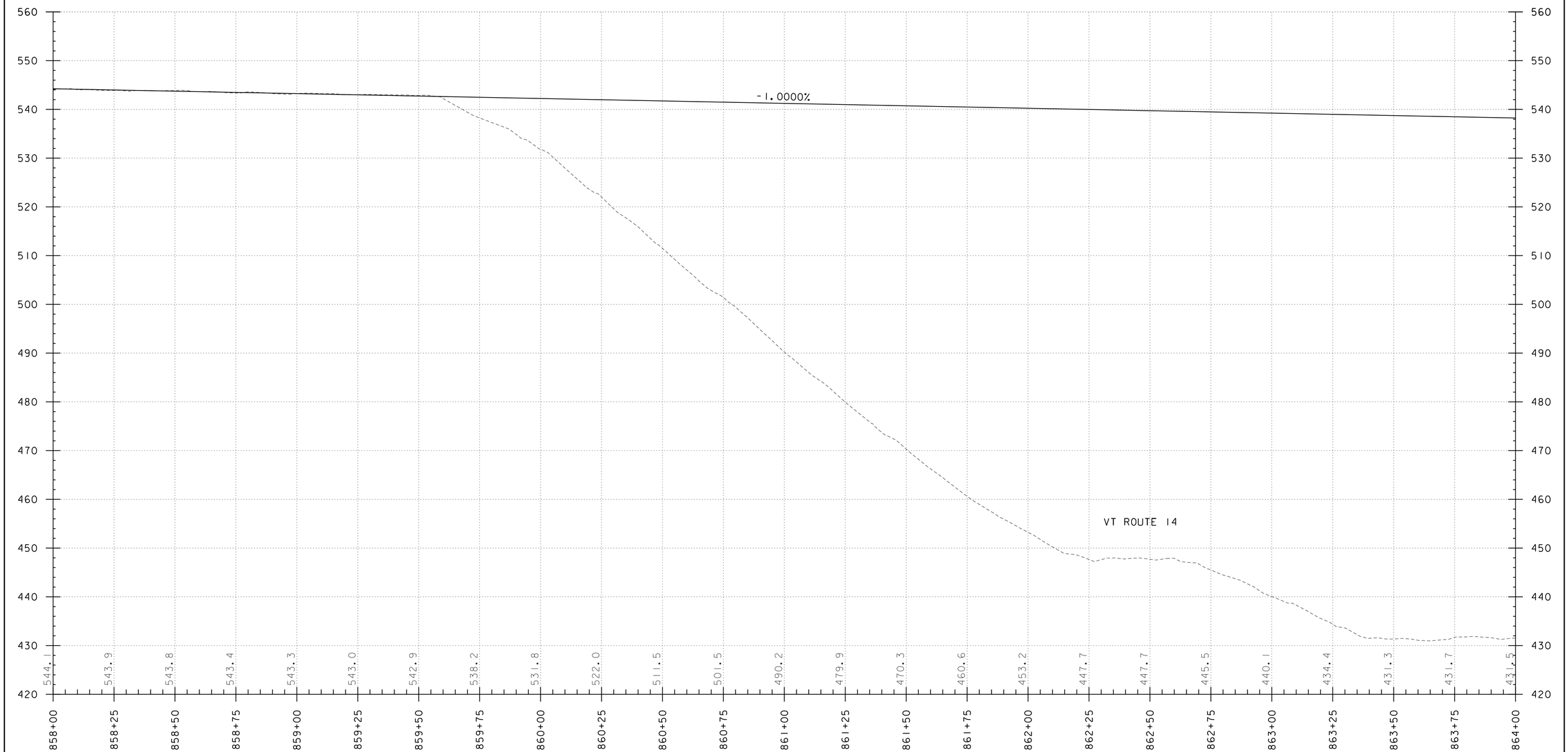
N/F
STATE OF VERMONT

N/F
E.P.E. CORPORATION

EXISTING CONDITIONS LAYOUT 2

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

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 2	SHEET $S#$ OF $T#$



NORTHBOUND EXISTING/PROPOSED PROFILE 1

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

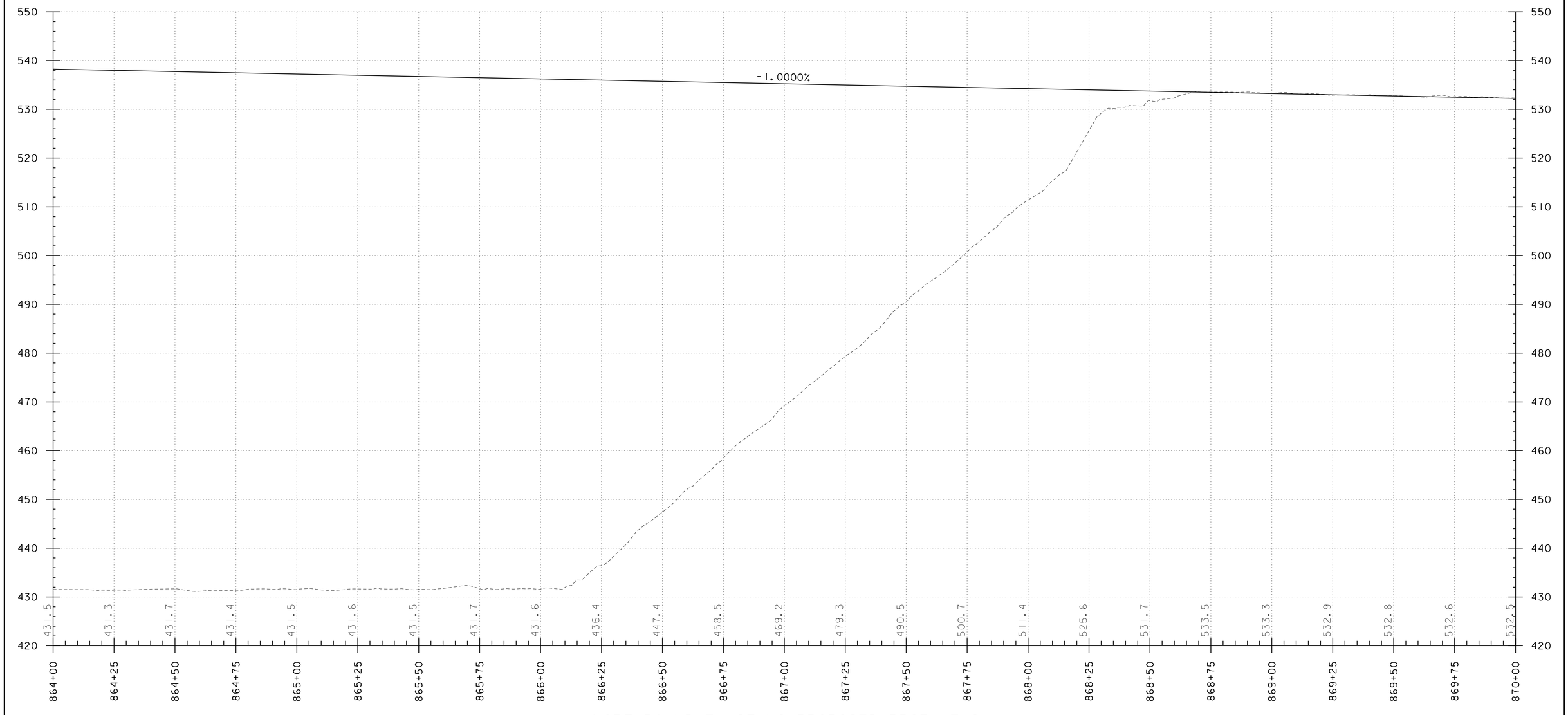
NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

NOTE: EXISTING GROUND IS FROM LIDAR DATA, TOP OF WATER IS SHOWN

PROJECT NAME: SHARON
PROJECT NUMBER: IM 089-1(64)

FILE NAME: 13a250/sl3a250profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
NB PROFILE SHEET 1

PLOT DATE: $$$$DATE$$$
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET $S#$ OF $T#$



NORTHBOUND EXISTING/PROPOSED PROFILE 2

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

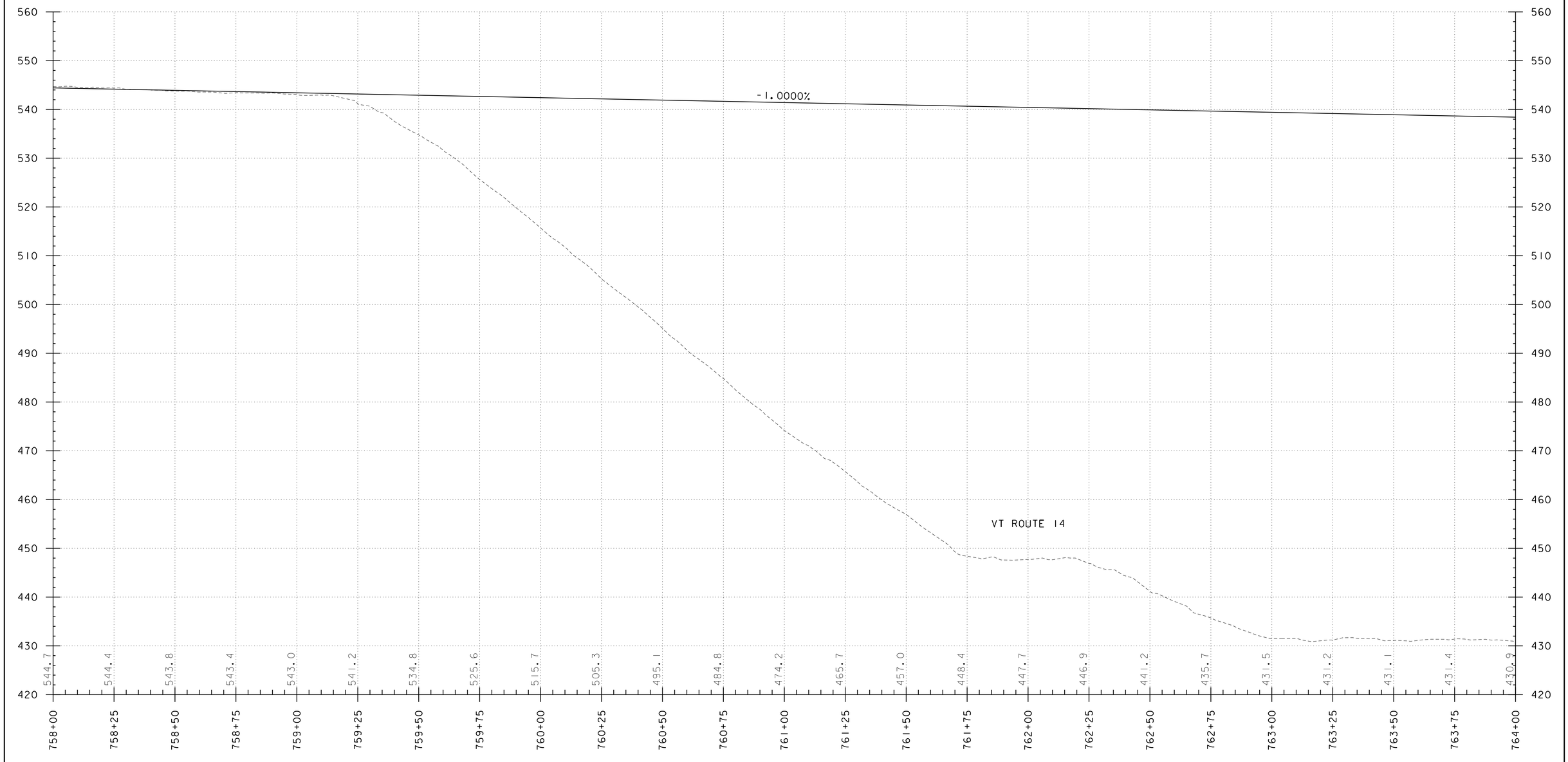
NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

NOTE: EXISTING GROUND IS FROM LIDAR DATA, TOP OF WATER IS SHOWN

PROJECT NAME: SHARON
PROJECT NUMBER: IM 089-1(64)

FILE NAME: 13a250/sl3a250profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
NB PROFILE SHEET 2

PLOT DATE: $$$$DATE$$$
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET $S#$ OF $T#$



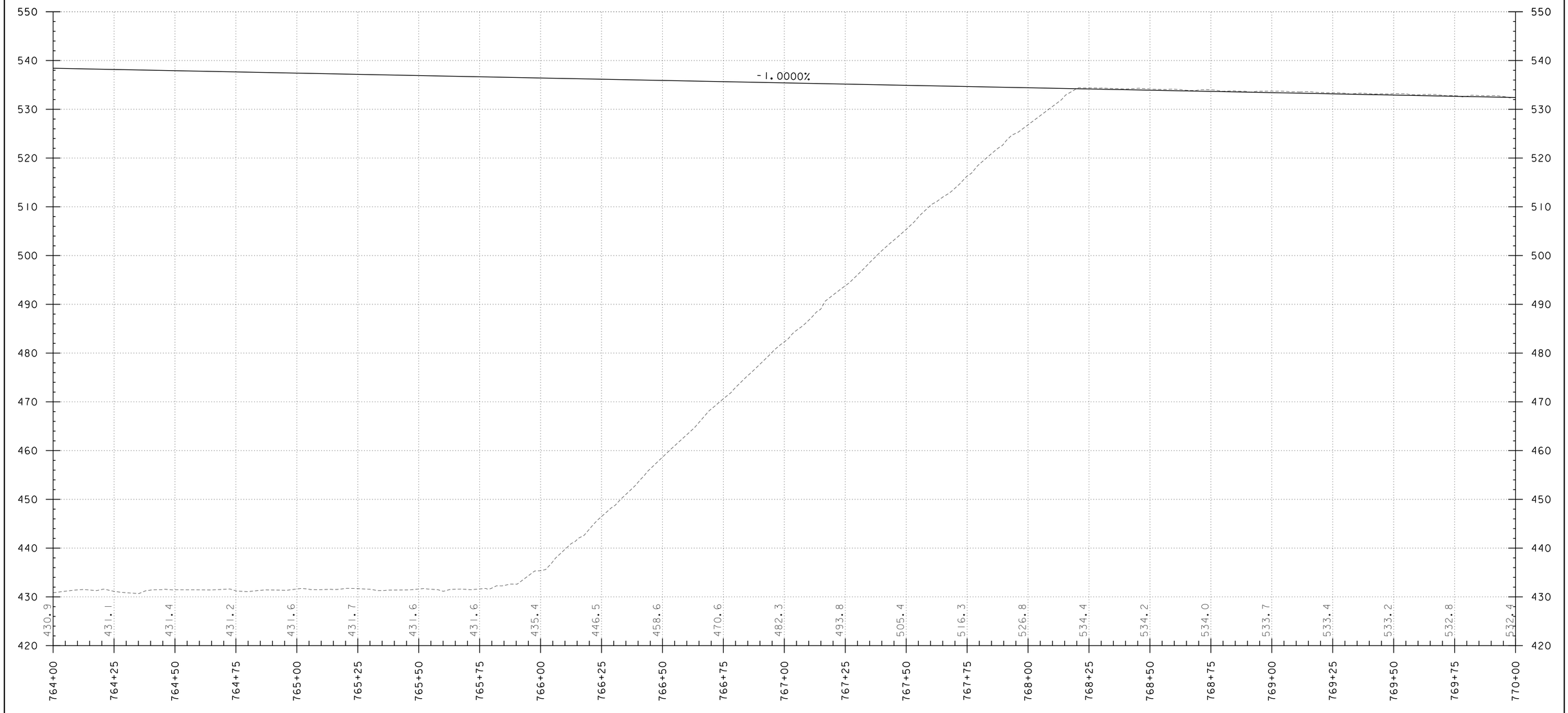
SOUTHBOUND EXISTING/PROPOSED PROFILE 1

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

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

NOTE: EXISTING GROUND IS FROM LIDAR DATA, TOP OF WATER IS SHOWN

PROJECT NAME: SHARON	
PROJECT NUMBER: IM 089-1(64)	
FILE NAME: 13a250/sl3a250profile.dgn	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB PROFILE SHEET 1	SHEET $S#$ OF $T#$



SOUTHBOUND EXISTING/PROPOSED PROFILE 2

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

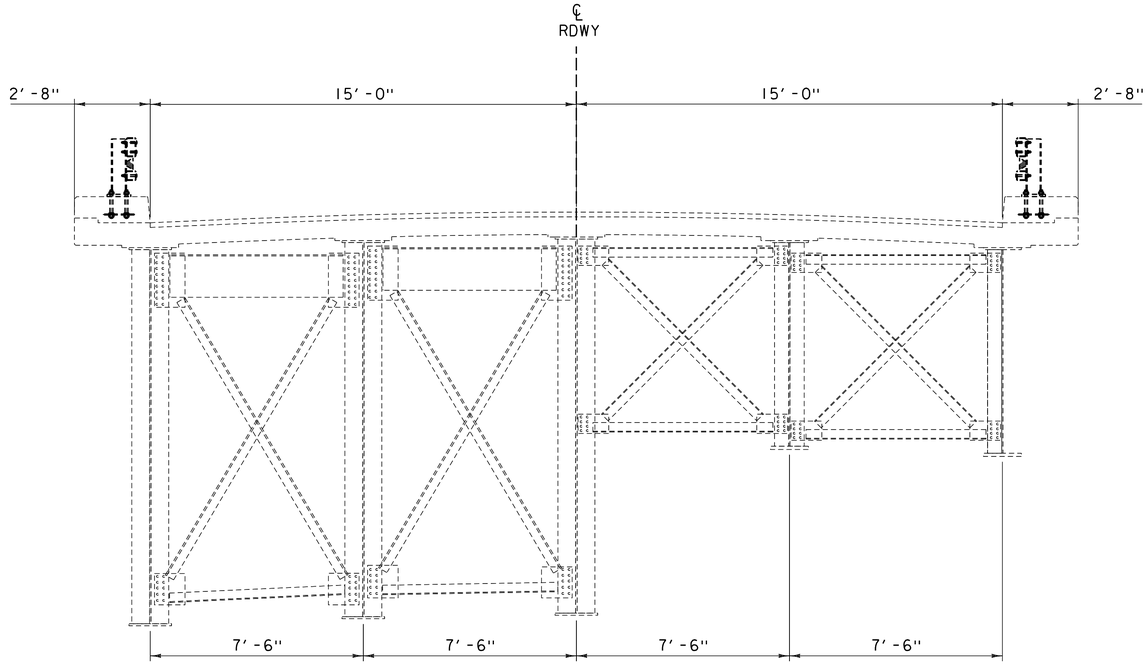
NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

NOTE: EXISTING GROUND IS FROM LIDAR DATA, TOP OF WATER IS SHOWN

PROJECT NAME: SHARON
PROJECT NUMBER: IM 089-1(64)

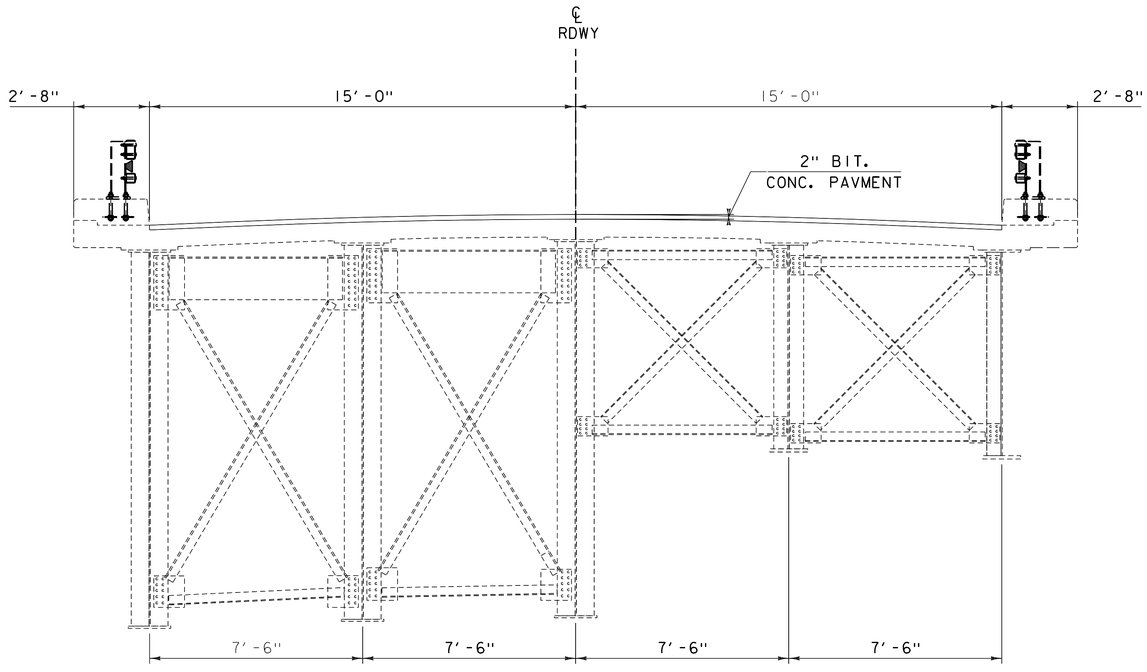
FILE NAME: 13a250/sl3a250profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
SB PROFILE SHEET 2

PLOT DATE: $$$$DATE$$$
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET $S#$ OF $T#$



TYPICAL EXISTING BRIDGE SECTION

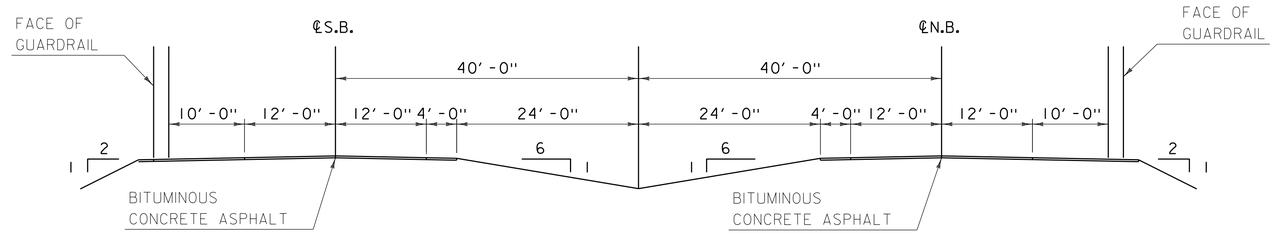
SCALE: 3/8" = 1'-0"



TYPICAL PROPOSED BRIDGE SECTION - DECK PATCHING (ALT. I)

SCALE: 3/8" = 1'-0"

PROJECT NAME:	VAOT PROJECT NAME
PROJECT NUMBER:	PROJECT NUMBER
FILE NAME: ppms*/Section/------.dgn	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
------ ------	SHEET $S*$ OF $T*$



PROPOSED I-89 TYPICAL SECTION

SCALE 1″ = 10′-0″

10 0 10

PROJECT NAME: SHARON	
PROJECT NUMBER: IM 089-1(64)	
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
TYPICAL SECTIONS	SHEET $S#$ OF $T#$

VT STATE PLANE GRID

N

FENCE
WOVEN WIRE

AGU

US ROUTE 14

BEGIN APPROACH
STA 758+50.00

℄ BEARING
ABUT #1
STA XXX+XX.XX

I-89 SOUTH
TO HARTFORD

758+00 759+00 760+00 761+00 762+00 763+00

PT
STA 759+41.43

FENCE
WOVEN WIRE

SIGN
OM3-L

DI

BEGIN APPROACH
STA 859+00.00

℄ BEARING
ABUT #1
STA XXX+XX.XX

858+00 859+00 860+00 861+00 862+00 863+00

I-89 NORTH
TO ROYALTON

SIGN
DX-X
(WHITE RIVER)

SIGN
OM3-R

FENCE
WOVEN WIRE

PT
STA 858+59.90

ARCH

PROPOSED LAYOUT 1

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
PROPOSED LAYOUT 1	SHEET $S#$ OF $T#$

N/F
HOLMES, DOREEN J. (LIFE ESTATE)
HOLMES, SETH M. & TODD F

VT STATE PLANE GRID
N

ARCH
FENCE WOVEN WIRE

WHITE RIVER
FLOW

53+00
52+00
51+00
50+00

I-89 SOUTH
TO HARTFORD

I-89 NORTH
TO ROYALTON

℄ BEARING
ABUT #2
STA XXX+XX.XX

END APPROACH
STA 769+00.00

℄ BEARING
ABUT #2
STA XXX+XX.XX

END APPROACH
STA 869+50.00

SIGN
DX-X
(WHITE RIVER)

SIGN
OM3-R

SIGN
OM3-L

764+00
765+00
766+00
767+00
768+00
769+00

864+00
865+00
866+00
867+00
868+00
869+00

AGU

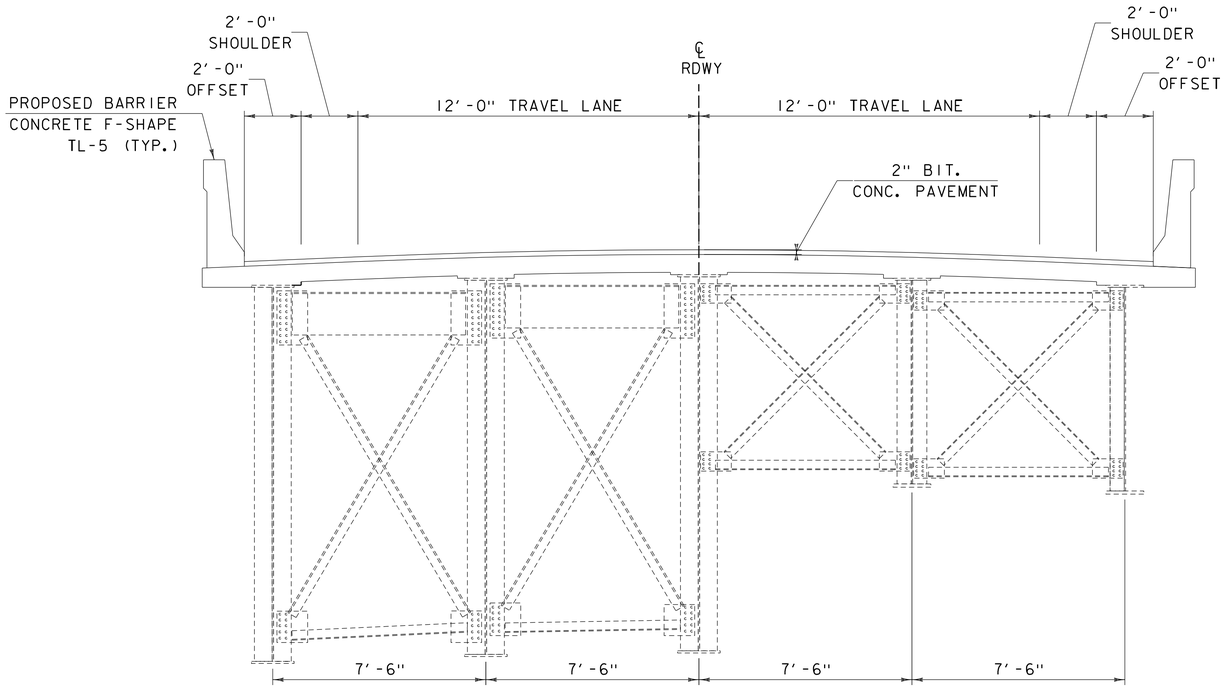
N/F
STATE OF VERMONT

N/F
E.P.E. CORPORATION

PROPOSED LAYOUT 2

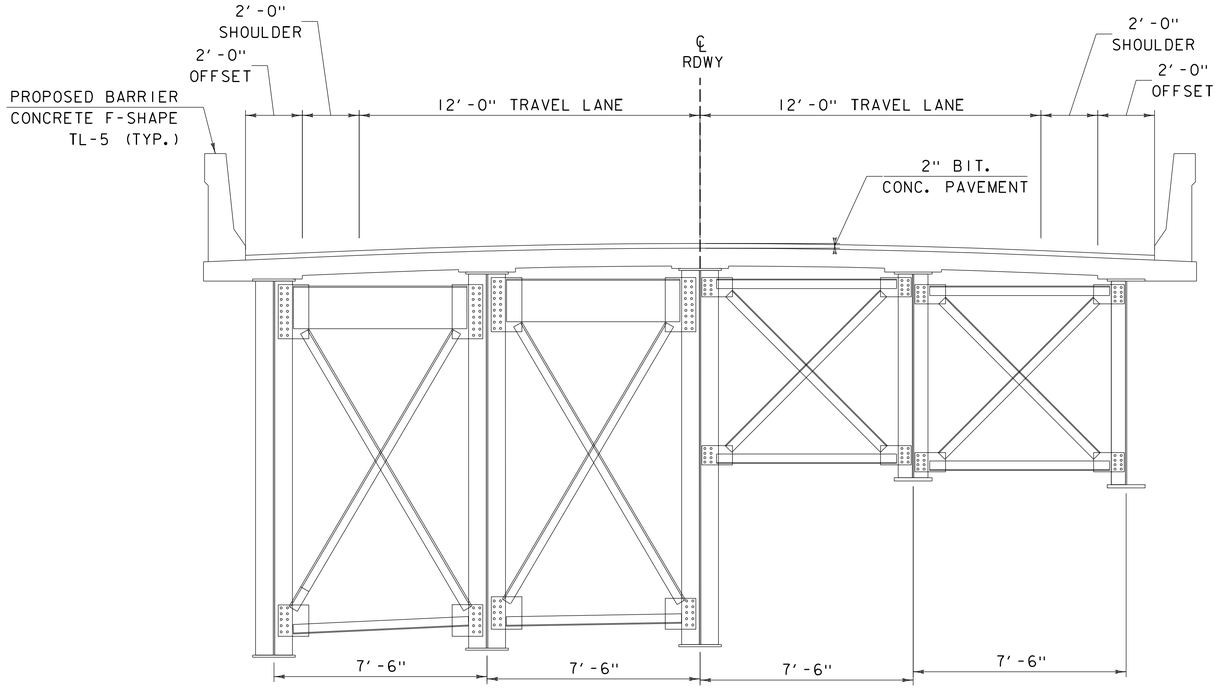
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
PROPOSED LAYOUT 2	SHEET $S#$ OF $T#$



TYPICAL PROPOSED BRIDGE SECTION - DECK REPLACEMENT (ALT. 2)

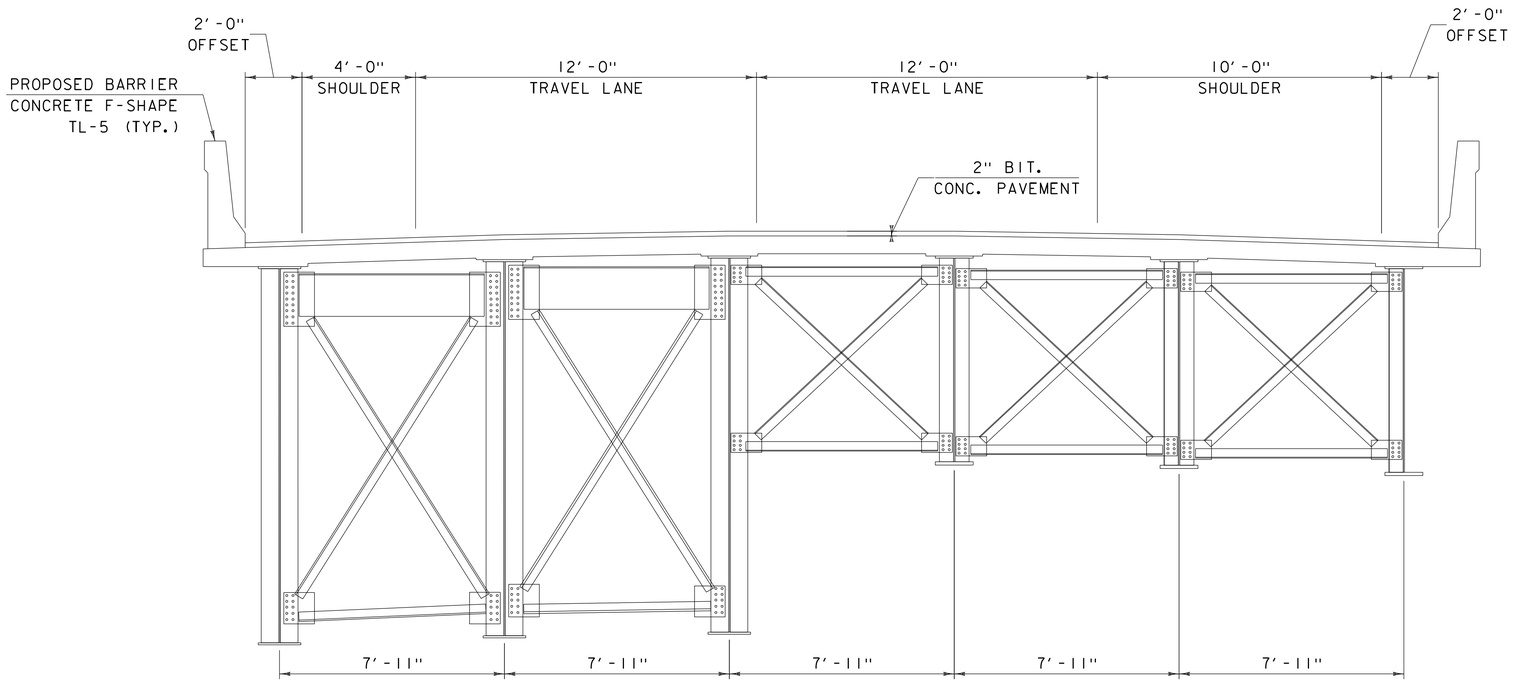
SCALE: 3/8" = 1'-0"



TYPICAL PROPOSED BRIDGE SECTION - SUPERSTRUCTURE REPLACEMENT (ALT. 3)

SCALE: 3/8" = 1'-0"

PROJECT NAME:	VAOT PROJECT NAME
PROJECT NUMBER:	PROJECT NUMBER
FILE NAME: ppms#/Section/------.dgn	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
------ ------	SHEET $S#$ OF $T#$



TYPICAL PROPOSED BRIDGE SECTION - BRIDGE REPLACEMENT (ALT. 4)

SCALE: 3/8" = 1'-0"

PROJECT NAME:	VAOT PROJECT NAME
PROJECT NUMBER:	PROJECT NUMBER
FILE NAME: ppms#/Section/------.dgn	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
------ ------	SHEET $S#$ OF $T#$

VT STATE PLANE GRID

N

FENCE
WOVEN WIRE

I-89 SOUTH
TO HARTFORD

758+00 759+00 760+00 761+00 762+00 763+00

US ROUTE 14

AGU

DI

PT
STA 759+41.43

SIGN
OM3-L

FENCE
WOVEN WIRE

858+00 859+00 860+00 861+00 862+00 863+00

I-89 NORTH
TO ROYALTON

PT
STA 858+59.90

SIGN
DX-X
(WHITE RIVER)

SIGN
OM3-R

FENCE
WOVEN WIRE

ARCH

PHASED CONSTRUCTION

PHASE I LAYOUT I

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------•	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 2 LAYOUT 1	SHEET $S#$ OF $T#$

N/F
HOLMES, DOREEN J. (LIFE ESTATE)
HOLMES, SETH M. & TODD F

VT STATE PLANE GRID

N

ARCH

FENCE WOVEN WIRE

SIGN DX-X (WHITE RIVER)

SIGN OM3-R

SIGN OM3-L

WHITE RIVER FLOW

53+00

52+00

51+00

50+00

I-89 SOUTH TO HARTFORD

764+00 765+00 766+00 767+00 768+00 769+00

864+00 865+00 866+00 867+00 868+00 869+00

I-89 NORTH TO ROYALTON

AGU

N/F
STATE OF VERMONT

N/F
E.P.E. CORPORATION

PHASED CONSTRUCTION

PHASE I LAYOUT 2

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: SHARON

PROJECT NUMBER: IM 089-1(64)

FILE NAME: l3a250/sl3a250border.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------

PLOT DATE: $$$$DATE$$$
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET $S#$ OF $T#$

VT STATE PLANE GRID

N

FENCE
WOVEN WIRE

I-89 SOUTH
TO HARTFORD

758+00 759+00 760+00 761+00 762+00 763+00

PT
STA 759+41.43

SIGN
OM3-L

FENCE
WOVEN WIRE

US ROUTE 14

AGU

DI

858+00 859+00 860+00 861+00 862+00 863+00

I-89 NORTH
TO ROYALTON

PT
STA 858+59.90

SIGN
DX-X
(WHITE RIVER)

SIGN
OM3-R

FENCE
WOVEN WIRE

ARCH

PHASED CONSTRUCTION
PHASE 2 LAYOUT 1

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------•	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 2 LAYOUT 1	SHEET $S#$ OF $T#$

N/F
HOLMES, DOREEN J. (LIFE ESTATE)
HOLMES, SETH M. & TODD F

VT STATE PLANE GRID
N

ARCH
FENCE WOVEN WIRE

WHITE RIVER
FLOW

SIGN DX-X (WHITE RIVER)
SIGN OM3-R
SIGN OM3-L

I-89 SOUTH
TO HARTFORD

53+00
52+00
51+00
50+00

764+00
765+00
766+00
767+00
768+00
769+00

864+00
865+00
866+00
867+00
868+00
869+00

I-89 NORTH
TO ROYALTON

AGU

N/F
STATE OF VERMONT

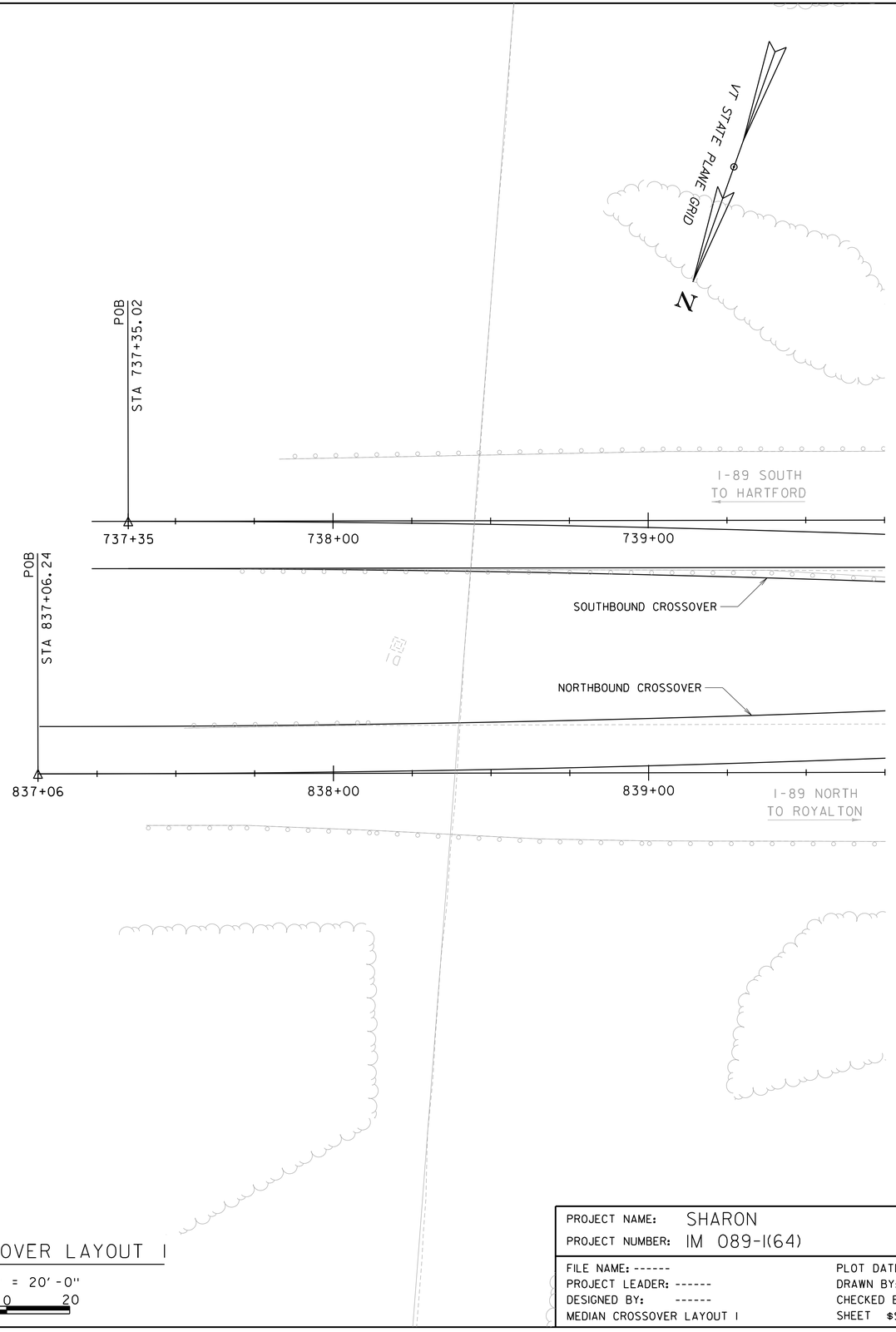
N/F
E.P.E. CORPORATION

PHASED CONSTRUCTION
PHASE 2 LAYOUT 2
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: SHARON
PROJECT NUMBER: IM 089-1(64)

FILE NAME: l3a250/sl3a250border.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------

PLOT DATE: $$$$DATE$$$
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET $S#$ OF $T#$



MEDIAN CROSSOVER LAYOUT 1

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: SHARON	
PROJECT NUMBER: IM 089-1(64)	
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 1	SHEET $S#$ OF $T#$

VT STATE PLANE GRID

N

SIGN
D9-18B
(D9-11
D9-8
D9-1)

D1

SIGN
W8-13

I-89 SOUTH
TO HARTFORD

740+00 741+00 742+00 743+00 744+00 745+00

D1

D1

NORTHBOUND CROSSOVER

SOUTHBOUND CROSSOVER

840+00 841+00 842+00 843+00 844+00 845+00

NORTH
YALTON

I-89 NORTH
TO ROYALTON

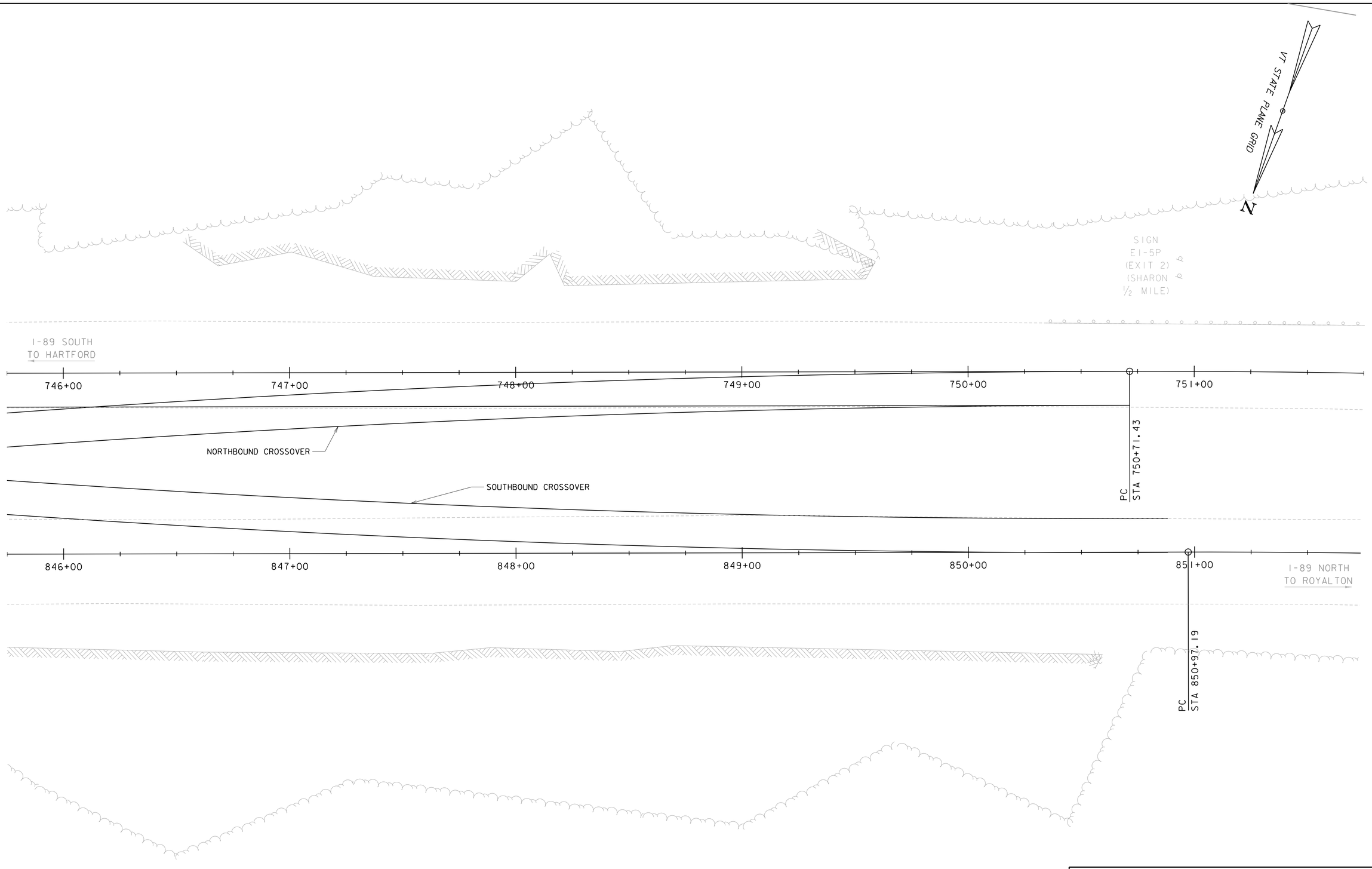
SIGN
W8-10
VP-396

SIGN
W8-13

MEDIAN CROSSOVER LAYOUT 2

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

PROJECT NAME: SHARON	
PROJECT NUMBER: IM 089-1(64)	
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 2	SHEET $S#$ OF $T#$

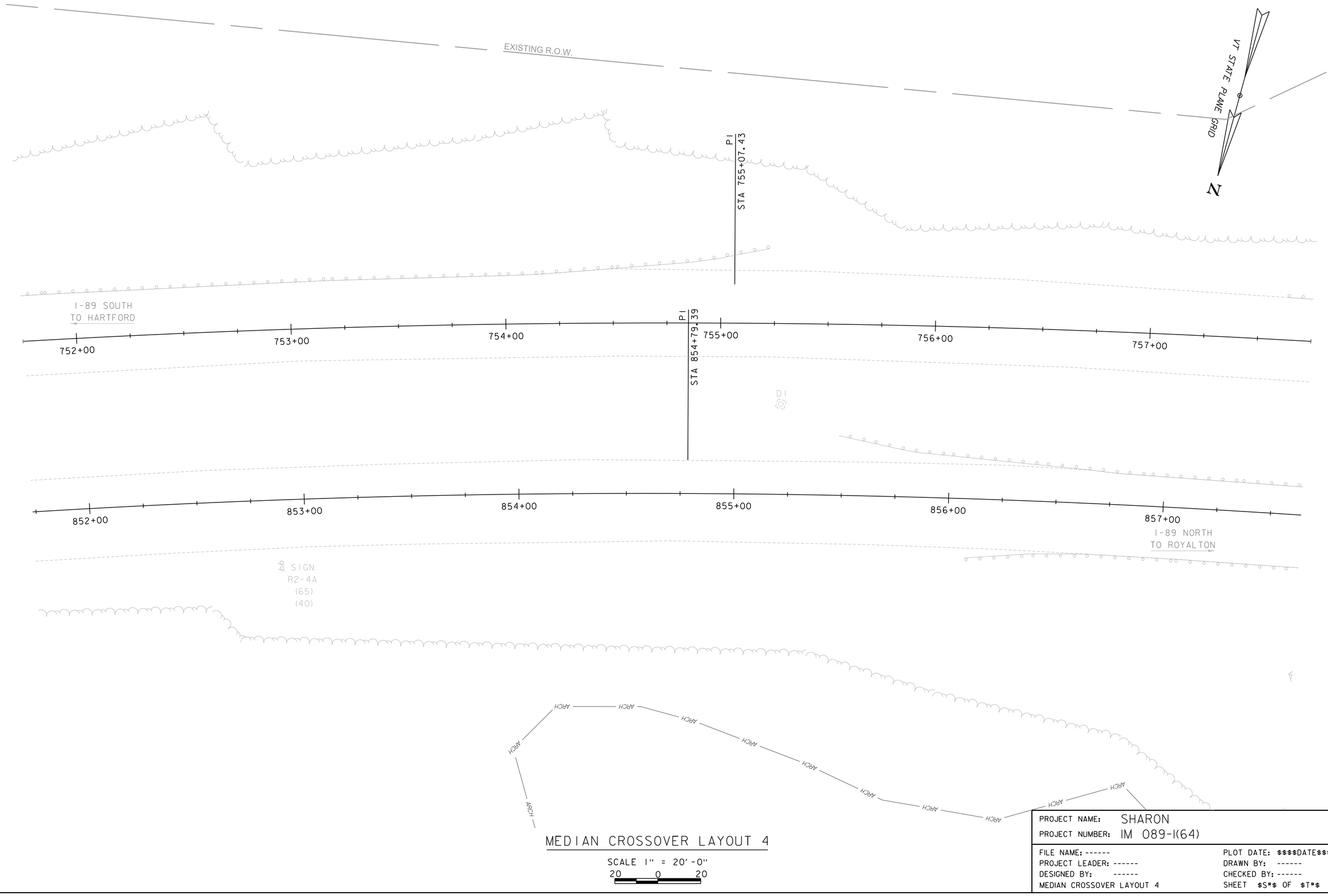


MEDIAN CROSSOVER LAYOUT 3

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 3	SHEET $S#$ OF $T#$



MEDIAN CROSSOVER LAYOUT 4

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 4	SHEET $S#$ OF $T#$

VT STATE PLANE GRID

N

FENCE
WOVEN WIRE

AGU

US ROUTE 14

I-89 SOUTH
TO HARTFORD

758+00 759+00 760+00 761+00 762+00 763+00

PT
STA 759+41.43

FENCE
WOVEN WIRE

SIGN
OM3-L

DI

858+00 859+00 860+00 861+00 862+00 863+00

I-89 NORTH
TO ROYALTON

PT
STA 858+59.90

SIGN
DX-X
(WHITE RIVER)

SIGN
OM3-R

FENCE
WOVEN WIRE

ARCH

MEDIAN CROSSOVER LAYOUT 5

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 5	SHEET $S#$ OF $T#$

N/F
HOLMES, DOREEN J. (LIFE ESTATE)
HOLMES, SETH M. & TODD F

VT STATE PLANE GRID
N

ARCH
FENCE WOVEN WIRE

SIGN DX-X (WHITE RIVER)
SIGN OM3-R
SIGN OM3-L

WHITE RIVER FLOW

I-89 SOUTH TO HARTFORD

53+00
52+00
51+00
50+00

764+00
765+00
766+00
767+00
768+00
769+00
864+00
865+00
866+00
867+00
868+00
869+00

I-89 NORTH TO ROYALTON

AGU

N/F
STATE OF VERMONT

N/F
E.P.E. CORPORATION

MEDIAN CROSSOVER LAYOUT 6

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

PROJECT NAME: SHARON
PROJECT NUMBER: IM 089-1(64)

FILE NAME: ------
PROJECT LEADER: ------
DESIGNED BY: ------
MEDIAN CROSSOVER LAYOUT 6•

PLOT DATE: $$$$DATE$$$
DRAWN BY: ------
CHECKED BY: ------
SHEET $S#$ OF $T#$

N/F
HOLMES, DOREEN J. (LIFE ESTATE)
HOLMES, SETH M. & TODD F

EXISTING R.O.W.

FENCE
WOVEN WIRE

N/F
CV PROPERTIES INC., LESSOR
NEW ENGLAND CENTRAL RAILROAD, INC., LESSEE

N/F
RIKERT, JAMES K. & GERRIE L.

VT STATE PLANE GRID

N

I-89 SOUTH
TO HARTFORD

770+00
771+00
772+00
773+00
774+00
775+00

SIGN
OM3-R

SIGN
OM3-L

FENCE
WOVEN WIRE

TH 3
(RIVER ROAD)

NEW ENGLAND
CENTRAL RAILROAD

D1

PC
STA 772+51.51

I-89 NORTH
TO ROYALTON

870+00
871+00
872+00
873+00
874+00
875+00

SIGN
OM3-R

D1

PC
STA 872+15.29

FENCE
WOVEN WIRE

AGU EXISTING R.O.W. AGU AGU AGU

N/F
E.P.E. CORPORATION

MEDIAN CROSSOVER LAYOUT 7

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

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 7	SHEET $S#$ OF $T#$

N/F
RIKERT, JAMES K. & GERRIE L.

EXISTING R.O.W.

FENCE
WOVEN WIRE

SIGN
SUPPLIMENTAL GUIDE
(JUSTIN MORRILL
HISTORICAL SITE
NEXT RIGHT)

I-89 SOUTH
TO HARTFORD

776+00 777+00 778+00 779+00 780+00 781+00

PI
STA 880+29.48

DI

VT STATE PLANE GRID

N

DI DI

SIGN
R3-4

SIGN
R3-4

I-89 NORTH
TO ROYALTON

876+00 877+00 878+00 879+00 880+00 881+00

SIGN
D2-3
(BETHEL 11)
(BARRE 37)
(MONTPELIER 39)

DI

FENCE
WOVEN WIRE

EXISTING R.O.W.

N/F
CV PROPERTIES INC., LES
NEW ENGLAND CENTRAL RAILROA

F
K. & GERRIE L.

MEDIAN CROSSOVER LAYOUT 8

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

PROJECT NAME: SHARON	
PROJECT NUMBER: IM 089-1(64)	
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 8	SHEET $S#$ OF $T#$

EXISTING R.O.W.

VT. STATE PLANE GRID

N

DI

SIGN
W8-13

DI

I-89 SOUTH
TO HARTFORD

782+00 783+00 784+00 785+00 786+00 787+00

I-89 NORTH
TO ROYALTON

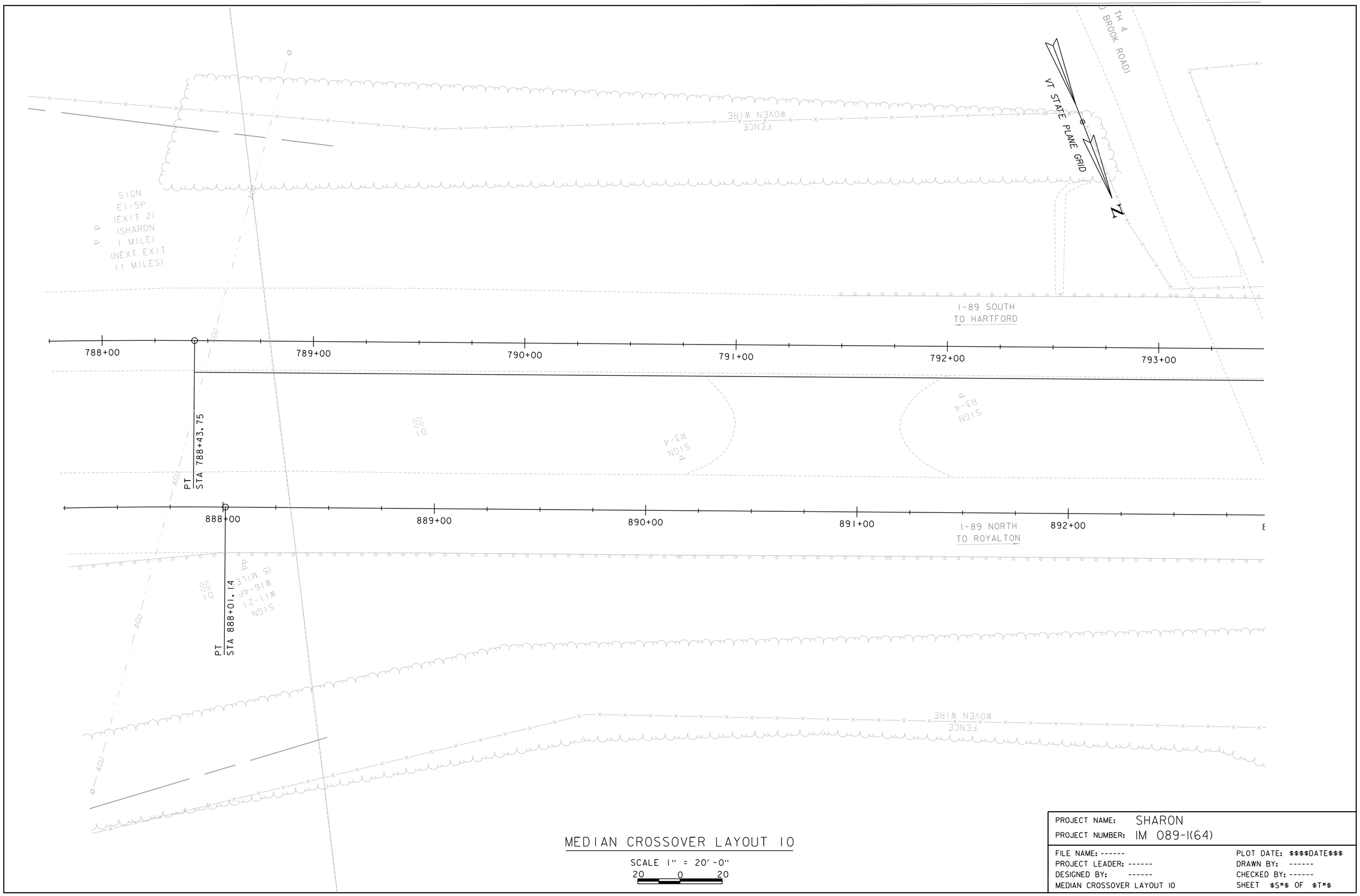
882+00 883+00 884+00 885+00 886+00 887+00

MEDIAN CROSSOVER LAYOUT 9

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 9	SHEET $S#$ OF $T#$



MEDIAN CROSSOVER LAYOUT 10

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 10	SHEET $S#$ OF $T#$

VT STATE PLANE GRID

N

I-89 SOUTH
TO HARTFORD

793+00
794+00
795+00
796+00
797+00
798+00
799+00

NORTHBOUND CROSSOVER

SOUTHBOUND CROSSOVER

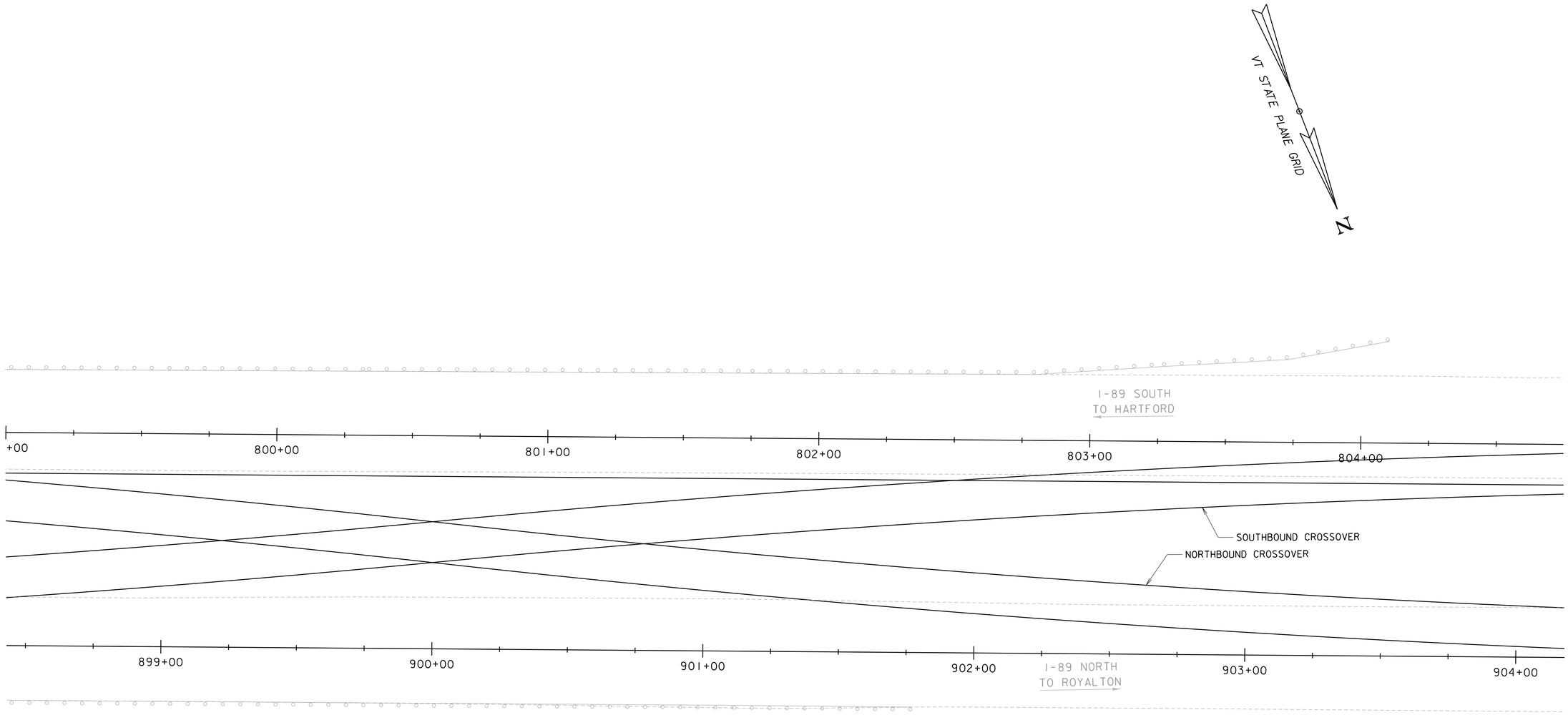
893+00
894+00
895+00
896+00
897+00
898+00

I-89 NORTH
TO ROYALTON

MEDIAN CROSSOVER LAYOUT II

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

PROJECT NAME: SHARON	
PROJECT NUMBER: IM 089-1(64)	
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT II	SHEET $S#$ OF $T#$

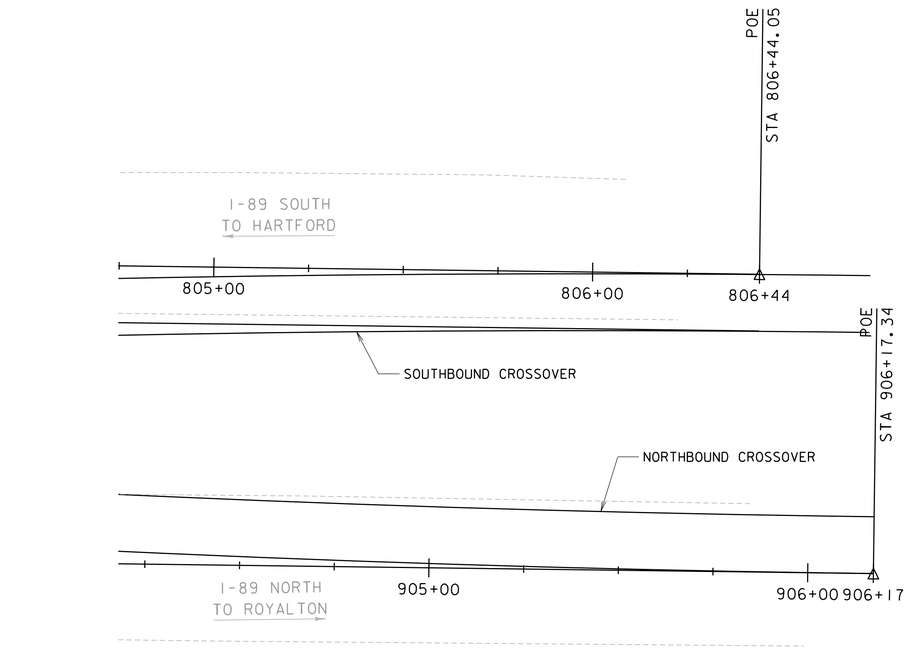


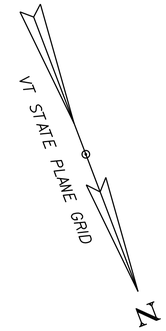
MEDIAN CROSSOVER LAYOUT 12

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SHARON
PROJECT NUMBER:	IM 089-1(64)
FILE NAME: ------	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 12	SHEET $S#$ OF $T#$





MEDIAN CROSSOVER LAYOUT 13

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

PROJECT NAME: SHARON	
PROJECT NUMBER: IM 089-1(64)	
FILE NAME: ------	PLOT DATE: 1-Jan-01
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
MEDIAN CROSSOVER LAYOUT 13	SHEET $S#$ OF $T#$