STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Springfield BF 0134(49)

TH-1 (Chester Road), BRIDGE 61 over UNNAMED BROOK

October 13, 2017

I. Contents

I. Site Information

Bridge 61 is a Town-Owned 14'1" wide by 8'9" high corrugated metal pipe arch located in the Springfield Urban Compact, in an urban area along TH-1 (Chester Road) approximately 245' north of TH- 338 (Old Chester Road), and approximately 100 feet south of the intersection with TH-336 (Fairgrounds Road). TH-1 is a Class 1 Town Road, which is an extension of VT Route 11 through the Springfield Urban Compact. The culvert is located on a curved and banked segment of TH-1 at approximately mile marker 3.742. The depth of cover on top of the culvert is approximately 3'-5'. The existing conditions were gathered from a combination of the Inspection Report, the Route Log and the existing Survey. See correspondence in the Appendix for more detailed information.

Roadway Classification	Urban Major Collector – Class 1 Town Highway
Culvert Type	Corrugated Galvanized Multi-Plate Pipe Arch
Culvert Span	14 feet
Culvert Clear Height	8'-9"
Culvert Length	164 ft.
Skew	30 degrees
Year Built	1960
Ownership	Town of Springfield
County	Windsor
VTrans Maintenance District	2 White River

Need

The following is a list of the deficiencies of Bridge 61.

1. This culvert has a rating of 3 "Serious" and is suffering significant invert deterioration and perforations throughout.

2. The existing culvert meets the Hydraulic Standard, but does not meet Bank Full Width.

3. Roadway banking is substandard in the project area.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2018 and 2038.

TRAFFIC DATA	2018	2038
AADT	7900	8900
DHV	1100	1200
ADTT	440	700
%T	5.5	7.7
%D	51	51

Design Criteria

The design standards for this bridge project include:

1. AASHTO. *A Policy on Geometric Design of Highways and Streets.* Association of State Highway and Transportation Officials, Washington, DC, 2011. ("The Green Book").

2. AASHTO. *Roadside Design Guide.* Association of State Highway and Transportation Officials, Washington, DC, 2011.

3. Vermont State Standards, dated October 22, 1997. Minimum standards are based on an ADT > 8900 and a design speed of 25 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 5.3	12'/2' (28') plus 5' sidewalk on each side	11'/3' (28')	
Bridge Lane and Shoulder Widths	VSS Table 5.3	12'/2' (28') plus 5' sidewalk on each side	11'/3' (28')	
Clear Zone Distance	VSS Table 5.5	Shielded	14' fill / 12' cut (1:3), 12' cut (1:4)	
Banking	VSS Section 5.13	Varies from approx. 2% to 6.7% max. in project area	6.2% for R=314'	Substandard
Speed	VSS Section 5.3	25 mph (Posted)	25 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R= 314'	R=2370' required for 2% bank	
Vertical Grade	VSS Table 5.6	Roadway centerline slopes at 1.94%.	7% (max) for level terrain	
K Values for Vertical Curves	VSS Table 5.1	Bridge not located on vertical curve.	20 crest / 30 sag	
Vertical Clearance Issues	VSS Section 5.8	None noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 5.1	Approx. 325 ft. minimum	150'	
Bicycle/Pedestrian Criteria	VSS Table 5.9	2' Shoulder	2' Shoulder[1]	
Bridge Railing	Structures Manual Section 13	Steel Beam Guardrail	Steel Beam Guardrail	N.A.
Hydraulics	VTrans Hydraulics Section	Meets VTrans Hydraulic Standard, but not Bank Full Width	Pass Q_{50} storm event without exceeding 1.2X diameter, and Q_{100} without exceeding 1.5X diameter. No roadway overtopping below Q_{100}. No increase in WSE elev. Allowed on Flood Plain	Does not meet Bank Full Width
Structural Capacity	SM, Ch. 3.4.1	Unknown	Design Live Load: HL-93	Structurally Inadequate

[1] Table 5.9 of the Vermont State Standards requires a 2' shoulder for shared use conditions. This is assumed to apply even where there is a sidewalk.

Inspection Report Summary

Culvert Rating	3 Serious
Channel Rating	7 Good

From the most recent Inspector's Report:

*"11/08/2016 - ** Culvert has severe corrosion of invert, along with piping occurring. Pipe has potential for significant distortion/sink hole formation and needs replacement. ~ MJ/AC"*

*"4/22/2016 – Special inspection to monitor distress. Invert poor and ~ 6" drop at 2/3rds from the inlet at ~ 140', where large invert holes have formed and plate ribs are torn away. **Culvert needs extensive invert repair or replacement in the near future. ~ MJ/SP"*

"12/3/2015 Culvert is in poor condition due to the invert at mid-span. Should consider a concrete invert or a replacement in the near future. ~ FRE/TJB"

"09/23/2014 – No significant changes since the last inspection. The arch pipe is poor due to extensive corrosion and sequential distortion along the invert. The pipe needs replacement soon or possible reinforced invert repair now, to stop its progressive failure. – MJ/JS"

*"12/05/2013 - **Arch pipe is poor due to extensive corrosion and sequential distortion. The pipe needs replacement soon or possible reinforced invert repair now to stop its progressive failure. ~MJ/JS"*

Hydraulics

A Preliminary Hydraulics Report was done for this site and can be seen in the Appendix. The existing pipe arch culvert configuration does meet the hydraulic standard. Bank Full Width (BFW) is not discussed in detail, but subsequent to the development of the Preliminary Hydraulics Report, the Vermont Agency of Natural Resources River Management Engineer agreed that considering the natural and artificial constraints on the stream upstream and downstream, a 15' BFW would be acceptable. "The existing structure likely passes fish during low to moderate flow events."

<u>Recommendations</u>

Any rehabilitation effort that decreases the waterway area, even if slight, and theoretically causes an increase in water surface elevations upstream of the culvert will likely be resisted by regulators. The project area is within a mapped flood plain and there is a residence very close to the inlet that may be sensitive to an increase in flood elevations. Therefore, the typical rehabilitation techniques are not recommended by the Hydraulics staff as long term solutions to this project. A rehabilitation alternative assuming a 3" thick liner was modeled with a resulting increase of 0.1 ft. in the upstream water surface elevation. If a liner or other repair option is considered, consult the Structures Hydraulics staff for a determination of projected water surface elevation increases.

A replacement solution was offered in the Preliminary Hydraulics report:

- A precast concrete box culvert with a waterway width of 15' and a height of 8'. The top of the bottom slab is recommended to be buried 2', so a 15' by 10' clear inside box would be needed. A slight reduction in clear height may be achieved if it doesn't adversely affect constructability of the simulated streambed within the box.

Other scenarios may be possible with input from the Hydraulics Section.

Utilities

Underground:

The Town of Springfield owns buried water and wastewater utilities at the site. Some of these utilities are close enough to require protection or relocation from any excavation that is done for a replacement project.

The sewer line is believed to be an 8" AC pipe buried underneath the existing culvert and is only 1'-2' below the culvert bottom. This pipe will have to be relocated for any alternative requiring excavation along the culvert.

The waterline is believed to be a 16" DI pipe which passes around the end of the outlet end of the culvert and then runs to VT 11 ROW in each direction. This pipe is buried approximately 3'-4' deep. A replacement project could probably be done without disturbing this line if caution is used in protecting it. A service water line runs across VT 11 north of the culvert, which would likely require protection if a deep excavation project is undertaken.

There is also a buried fiber optic cable that runs along the north side of VT 11. Any excavation around the inlet end of the culvert will require measures to protect this line.

Aerial:

There are overhead utility lines passing around and over the culvert. These include high tension lines from the electrical substation next to the project location, 3-phase power, single phase power, communications, and cable facilities. These facilities will have to be relocated for any alternative that includes replacement of the culvert.

All known utilities are shown on sketches and plans in the Appendix.

Right of Way (ROW)

The existing Right-of-Way (approximate location) is shown on the Layout sheet. At the project site, the Right-of-Way width varies, being quite wide on the east side, but fairly narrow on the west side. Additional Right-of-Way will almost certainly be needed for any work done on the west side in the vicinity of the culvert inlet.

Resources

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

Biological:

- "The project carries VT Route 11 over an unnamed brook via Bridge 61. There are no wetlands present within the project area."
- There is low value habitat adjacent to this project. Providing a natural, or simulated natural bottom to the stream under VT Route 11 would provide access to multiple aquatic organisms. Currently, this structure is assumed to pass some aquatic organisms and could possibly be retrofitted to provide better passage.
- There are no mapped rare, threatened, or endangered species within the project area. That said, the entire State of Vermont is potential habitat for the federally threatened northern long-eared bat. This project is not likely to impact habitat for the northern long-eared bat, but this may change if a large amount of trees need to be cut. The structure itself is not considered habitat."

Rare, Threatened and Endangered Species

There are no mapped rare, threatened or endangered species within the project area, except potentially for the Northern Long Eared Bat.

Agricultural

There are no mapped prime agricultural soils within the project area.

Archaeological:

It has been determined by VTrans Archaeological staff that the project area has a high potential for pre-contact sensitivity. It appears that any work other than rehabilitation will require further exploration of these sensitive areas.

Historic:

Input from VTrans Historic staff indicates that the culvert itself is not eligible for consideration for the National Register of Historic Places (NRHP), and is not a contributing resource to a current or potential historic district. The two and one-half story house in the NW quadrant, despite probably being constructed within the period of significance for which the neighboring industrial and commercial district NRHP is listed, has been determined to be outside of the district boundaries and lacks the integrity needed for inclusion in the NRHP. It is unlikely that a culvert project will disturb this house, although the retaining wall along the north edge of the waterway may be disturbed by the project, depending on the alternative selected.

Hazardous Materials:

According to the Vermont Agency of Natural Resources (VANR) Vermont Hazardous Sites List, there is a known hazardous site in the project area. VANR has closed its active investigation of the adjacent site that documented leaking underground gasoline storage with the stipulation that when disturbances are made in the project area the Agency of Natural Resources Hazardous Waste Division is required to be present to direct the handling of any excavated materials that may contain hazardous substances. This will include excavation of the existing culvert and/or existing buried utilities in the vicinity, and includes the drilling of soil material to collect samples for geotechnical

investigations. The report from the Hazardous Waste Division of ANR is quite voluminous. It is available from them or from us upon request. For VTrans personnel, it is located at:

M:/Projects/16b068/Structures/Scoping/Supporting Information/Hazmat site

Stormwater:
There are no known stormwater concerns for this project.

II. Safety

The project area is in a high crash location (section) of VT 11. The section includes MM 3.640 through MM 3.940, with the culvert location at approximately 3.742.

III. Alternatives Discussion

The existing roadway at the culvert location meets standards in terms of roadway geometry and safety features, with the exception of banking. The project site is in a high crash location. However, this project, even in its most impactful form, will affect only a few feet of roadway. Therefore, given that the roadway geometry and sight distance appear to be generally adequate, the alternatives presented here are based on improvement of the condition of the culvert and channel.

The original Preliminary Hydraulics Report recommends only replacement alternatives because it concluded, under the previous VTrans Hydraulics Manual, that the existing culvert does not meet the hydraulic standard. However, it is recognized that under the new Hydraulics Manual the existing culvert does meet the standard, but does not meet field determined BFW. The area is within a mapped flood zone, in which increases in the Q_{100} flood elevation are not allowed.

It is believed that some level of fish passage is currently possible under existing conditions, but the extent is not clear. It is recognized that some projects will not get funded for full replacements that meet all standards and resource requirements. Therefore, rehabilitation alternatives will be discussed in this report as a measure to extend the life of this culvert to the point where funding could allow a replacement to be completed.

There are two basic approaches to this project; replacement and rehabilitation.

- A replacement project could be designed to resolve all of the deficiencies that exist today at the project site. They include structural deterioration, BFW, AOP, and maintenance of flood elevations.
- A rehabilitation project would restore some degree of structural integrity to the culvert, but some alternatives could leave several desirable features unresolved including BFW and full AOP, and would only extend the service life of the structure approximately 30 years. Hydraulic and flood capacity could even be reduced.

No Action

This alternative would involve leaving the culvert in its current condition. There are two ways used to evaluate whether a "No Action" alternative is appropriate - one is to determine whether the existing structure can stay in place without substantial work being performed on it during the next 10 years. The other is the ratings of all of the elements of a bridge or culvert, with the goal that all elements rated 4 or less are to be removed or rehabilitated. In this case, the culvert is already rated "3", and it will likely require substantial work within the next 10 years. There are also signs of soil erosion taking place under the roadway. Therefore, the No Action alternative is not recommended.

Structure Replacement with an Integral Abutment Bridge

A full replacement with an integral abutment bridge was discussed in the Preliminary Hydraulics Report. This concept was not developed for this project because it is generally more economical to replace a buried structure in kind for short spans where there is adequate cover for the structure. A buried structure in this location will also be more protected from de-icing salts and will require less maintenance. An integral bridge would undoubtedly require a difficult and costly short radius curved bridge, which, because it would be much longer than the existing culvert width, would interfere with residential drives and Town roadways in the project area. An integral abutment bridge is not considered further in this report.

Structure Replacement Using Trenchless Methods

Trenchless methods, as discussed in this scoping report, include jack and bore, pipe ramming, and similar methods of installing a new pipe without open excavation. A replacement of the existing culvert adjacent to the current location was considered. Although done more frequently in other states, it is unlikely that there is the expertise or equipment available to make these methods of pipe replacement cost competitive for this project, which would require one 12' diameter pipe or two 8' diameter pipes be installed. BFW would likely not be satisfied with this method. Also, there are numerous utilities in the vicinity of the pipe. As this method does not seem economical for pipes that have this amount of cover, these methods will not be considered further in this report.

Alternative 1: Rehabilitation

Rehabilitation is usually considered for any culvert project. Normally on a project with the hydraulic characteristics seen here (constricts the stream and would raise Q_{100} flood elevations if lined), rehabilitation would be discounted, and a replacement project would be recommended. However, two conditions suggest including a discussion of rehabilitation in this report. The first is that economic considerations are becoming a higher priority on many projects, and second, it may be possible for short term improvements to be made in a manner that prevents raising the flood elevations.

Rehabilitation options considered:

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

All rehabilitation options would employ the use of hydro-blasting or hydro-demolition to appropriately clean the existing pipe interior prior to rehabilitation. In addition to cleaning, some grouting would be needed to plug holes in the pipe and fill all voids on the outside of the pipe. Additional injection of flowable fill would be recommended to stabilize the roadbed above the culvert. Curing in dry conditions would be required in most cases, necessitating a re-routing of the stream flow during the work and for a prescribed curing period (usually 24 hours). A headwall with beveled inlets would be recommended for all rehabilitation alternatives.

a. Invert Repair

The condition of the galvanized metal above the ordinary water line in the culvert is fairly good. There is some corrosion evident along bolt lines and seams, but it does not appear that the pipe is settling significantly. There are different types of invert repair that can be utilized on corrugated steel pipe. The following were considered:

- Bituminous concrete paving is not recommended for this situation because it is ineffective where structural capacity needs to be replaced.
- Reinforced concrete can also be used to form the new invert. This does restore some of the structural integrity of the culvert and extends the life of the culvert, but it also reduces the waterway area, likely causing higher velocities and water surface elevations during flood conditions.
- VTrans' Construction and Maintenance Bureau (Technical Section) is experimenting with a project which uses phased plate replacement to accomplish the invert repair. Since this project is likely to be bundled with up to 3 other projects on VT 11, this project is probably not a good choice for a pilot project. Plate replacement will not be considered further in this report.
- To provide the maximum possible waterway area, a configuration of the new invert using reinforced concrete that is lower than the existing pipe bottom could be considered. Provision of AOP and avoidance of higher flood elevations should be considerations. It is expected that the service life could be extended approximately 30 years with this solution.

b. Pipe Liner

Adding a pipe liner, also called sliplining, consists of pulling a complete new pipe into the existing culvert, then grouting the space between the two. Sliplining can be done using several different types of pipe material including corrugated steel, aluminum, reinforced concrete, and polyethylene, and can restore the structural integrity of the culvert. There are drawbacks to sliplining: one is that the waterway area is always reduced when sliplining is done; and two, it can be difficult to get the new liner installed, especially if there is distortion of the original host pipe. Another drawback is that it does not enhance AOP. Lastly, actions that raise the water surface elevations in Flood Insurance Zones is prohibited without additional modelling of the

waterway to show no detrimental effects. Crucial to the success of this method would be surveying the interior of the existing CMP to ensure that a rigid liner can be installed in the pipes. In the case of a pipe arch, it may be possible to procure a slightly smaller pipe arch to use as a liner, but it will be costly to produce the matching arch shape and will reduce further the waterway area. Temporary Right-of-Way would likely be needed to provide a staging area at each end to accomplish this alternative. Pipe lining will not be considered further in this report. Approximately 50 years is assumed to be the service life for a culvert rehabilitated in this manner.

c. CIPP (Cured In Place Pipe)

CIPP is another way of providing a new lining to the interior of an existing pipe. A resin-saturated felt or fiber tube is inserted into the pipe in a folded configuration, and is then expanded to be in contact with the entire interior surface of the existing culvert. Curing takes place by heating the resin using hot water, steam, or UV light. This method of culvert repair is not considered further in this report because a literature search on the subject yields no data on CIPP over the size of 8' diameter. Therefore, although it is expected that this method of culvert repair will be used in the future in Vermont, it is not considered to be a feasible solution for this project. It is expected that another 30 years of life could be achieved with this method.

d. Spray-On Liners

Spray-On liners provide a new rigid interior surface for the pipe and use either cementitious materials (polymer-enhanced cement mortar) or polyurea. These liners are spray applied either by hand or machine, although some users have had better quality control with hand-applied methods. Cementitious liners installed by these methods can provide full structural support, depending on thickness applied. Proper curing is essential to using spray-on liners to avoid bond failures. There could be water quality impacts associated with the application of these liners, their degree of impact related to selection of materials and adherence to curing requirements. If a spray-on liner is selected, the polymer-enhanced cement mortar is recommended for environmental and safety reasons. Approximately 30 years of service life is assumed for this method of rehabilitation.

It is important to note that this method of lining also has thickness, which has the result of raising the water elevations and adversely affecting AOP.

Advantages: A repair alternative using methods a, b, c, and d would address the structural deficiencies of the existing culvert pipes with minimum upfront costs. Alternative a. would extend the life of the culvert for a few years. A repair would have minimal impacts on resources and on traffic flow.

Disadvantages: Several of the rehabilitation methods described above have detrimental impacts on flood elevations, AOP, and normal flow characteristics. Rehabilitation offers the shortest service life projection (approximately 30 years would be gained, depending on the alternative chosen). It is assumed that for any rehabilitation alternative, temporary right-of-way will be necessary for the contractor's access. If the invert repair option is used, more information on subsurface rock conditions is needed, and a more precise location of the existing sewer is needed.

Alternative 2: Structure Replacement with a Buried Structure

Culvert replacement using an open cut was considered. The preliminary hydraulics report suggests consideration of a precast concrete box. Since bedrock is expected to be shallow at this site, a precast arch or frame could also be placed using the bedrock as the founding material.

The new minimum waterway area would be a 15' wide (perpendicular to channel) by 6.5' high. A clear height of 8' would be suggested to make it easier to place the natural streambed material by machine. A box or frame should be founded either on bedrock, or on suitable soils: a minimum of 6' below the channel bottom if a frame, or to fit the stream bottom if a box. A frame construction would be appropriate if bedrock is found to be high enough to interfere with a box, but a box would allow for less excavation volume if hazardous materials are found in or below the stream. Consideration should be given to constructing this configuration with a natural stream bottom. Additional Right-of-Way would be required with this alternative. Roadway geometry would not be revised with this method of replacement. Traffic could be maintained with an offsite detour, using phased construction, or a temporary bridge.

There are a number of conditions at this project site that will need to be addressed if a replacement alternative is chosen:

- It is believed that shallow bedrock exists at the site, as indicated in test cores done by an environmental consultant near the culvert outlet.
- There are documented hazardous wastes present east of VT 11 due to a now removed leaking underground fuel storage tank. Removal and disposal of these materials will be required for any excavation that takes place, including subsurface geotechnical exploration.
- There is an electrical substation just east of the project site. Overhead high tension utilities will likely conflict with project activities.
- A 16" municipal water main is present near the culvert outlet. If the project were to be done in phases, the new culvert would need to be longer than the existing so the various temporary roadway locations could be built.
- A municipal sewer line and two manholes are present near the culvert. The sewer is very close to and parallel to the culvert and possibly even below the culvert. It would be impacted by a replacement project.
- There is a high probability of archaeological sensitivity in the project area. A phase 1 study is likely to be needed if excavation takes place.

Advantages: A new buried structure would resolve all structural deficiencies at this site and offer a 100-year service life if precast concrete, 75 years if closed bottom (box). It would provide the full waterway area required to meet the hydraulic standard and BFW, as well as AOP.

Disadvantages: This alternative would have the largest initial cost of the alternatives considered and would have the largest impact in terms of resources and traffic disruption. Many conflicts need to be resolved to make this alternative constructible.

IV. Maintenance of Traffic

In keeping with a nation-wide trend toward accelerated construction aided and supported by the Federal Highway Administration, the Vermont Agency of Transportation has created an

Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right of Way, as well as faster construction of projects in the field. One practice that will help in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects early. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of 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. The following options have been considered:

Option 1: Off-Site Detour

This option would close the bridge and reroute traffic onto an official, signed State detour, which detours traffic from the intersection of VT 11 and VT 106 in Springfield north on VT 106 to the intersection of VT 106 and VT 10 in North Springfield. Then the detour heads west on VT 10 to VT 103, south on VT 103 to Chester, and then back onto VT 11.

Thru distance:	7.1 miles	9 minutes
Detour distance:	13 miles	19 minutes
Added distance for Thru Traffic:	5.9 miles	10 minutes
End to end distance:	20.1 miles	28 minutes

The times listed assume no delays due to traffic congestion.

An alternate detour exists routing traffic to the south of the project:

Starting at the intersection of VT 106 and VT 11 in Springfield, travel southeast on VT 11 to I-91, then south on I-91 to Exit 6 in Rockingham. From Exit 6, travel northwest on VT 103 to Chester, then back to VT 11.

Thru distance:	7.1 miles	9 minutes
Detour distance:	20 miles	23 minutes
Added distance for Thru Traffic:	12.9 miles	14 minutes
End to end distance:	27.1 miles	22 minutes

Again, no delays for congestion are included in the travel times above.

There are some opportunities for local bypasses, but they are few and not ideal. Park St. (TH-340) travels from Chester Rd. (TH-1) just south of the project site eastward to rejoin TH-1 on the east side of the Black River. This is a steep, narrow Class 3 Town road through a largely residential area that is paved, but would not easily endure an increase of possibly over 7000 cars per day. There is a bridge over the Black River that is a concrete arch rated 5. This route would not be appropriate for through trucks. In a closure, this route would nonetheless become a bypass of choice for many.

Another possible bypass starting on the west side of the project site follows TH-336 (Fairground Road) to TH-337 (Fairground Heights Road) to TH-27 which is still Fairground Heights Road but in the Town of Springfield, which takes the traveler back to VT 11. These are all Class 3 Town Roads that are very narrow, with poor sight distance in some segments and intersections, and with some fairly densely populated residential areas that are very close to the road. These roads are not appropriate for through trucks or for possibly over 7000 additional vehicles a day.

A bypass could be used by emergency responders, but would add to response times.

Other bypass routes may be available. Access to driveways and town highways would be maintained. A map of the primary detour route can be found in the appendix.

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

Disadvantages: Traffic flow would not be maintained through the project corridor during construction. The town roads likely to be used as bypasses are less than ideal for the potential volumes expected.

Option 2: Phased Construction

Phased construction is the maintenance of one lane of alternating traffic on the existing bridge while building one lane at a time of the proposed structure. Once the first half of the project is completed, traffic is shifted to the new lane, and work proceeds on the second lane. This allows keeping the road open during construction, while having minimal impacts to resources and adjacent property owners.

Existing conditions at this project site; traffic volumes, length of project, and existing roadway width, make it very difficult to consider alternating one-way traffic through the work zone. If an on-site detour is considered, it should be a two-way configuration to minimize delays. For this to work, temporary extensions to the culvert and widening of the roadway lanes and shoulders would be required. After reviewing the ROW available at the site, it seems likely that there would be enough room on the downstream side to consider this as an option, but this is in the area where known hazardous waste materials exist. Delays will still occur as speed will be reduced through the work zone.

If bedrock is not shallow, the excavation to install a 3-sided frame or arch would be approximately 23’-25’ deep to reach the recommended footing scour depth. Phasing would require a fairly deep braced excavation immediately adjacent to a live traffic lane while the work is performed. However, bedrock is expected to be shallow, making it necessary to use a modified method of bracing for the excavation.

Advantages: Traffic would be maintained through the work zone.

Disadvantages: Delays would be experienced due to reductions in speed through the work area. Additional ROW would be required and utility relocation would be required.

Option 3: Temporary Bridge

It would be very difficult to fit in a temporary bridge to maintain traffic through the corridor on this project. There is a house on the northwest quadrant of the project site, which would be impacted by traffic passing by very close to the house. On the other side of TH-1, there is more room, but there is an electrical substation and a hazardous waste site nearby. It would seem that a temporary extension of the existing culvert and a temporary on-site detour would have fewer impacts and serve the same purpose. A temporary bridge will not be considered further in this report.

V. Alternatives Summary

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

Alternative 1a:	Culvert Rehabilitation using Invert Repair, with traffic maintained with periodic short term delays.
Alternative 1b:	Culvert Rehabilitation using Spray-on Liner with traffic maintained with periodic short term delays.
Alternative 2a:	New Buried Structure with traffic maintained on an Off-Site Detour.
Alternative 2b:	New Buried Structure with two-way traffic maintained on an On-Site Detour via a widened shoulder.

VI. Cost Matrix[1]

Springfield BF 0134(49)		Alt 1a	Alt 1c	Alt 2a	Alt 2b
		Invert Repair	Spray-on Liner	New Buried Structure	New Buried Structure
		Minor Traffic Impacts	Minor Traffic Impacts	Off-Site Detour	Phased Construction
	Bridge Cost	$396,000	$246,000	$705,000	$776,000
	Removal of Structure	$0	$0	$5,000	$5,000
	Roadway	$152,000	$152,000	$579,000	$705,000
	Maintenance of Traffic	$25,000	$25,000	$43,000	$97,000
	Construction Costs	$573,000	$423,000	$1,332,000	$1,583,000
	Construction Engineering + Contingencies	$195,000	$123,000	$386,000	$459,000
	Total Construction Costs w CEC	$768,000	$546,000	$1,718,000	$2,042,000
	Preliminary Engineering[2]	$172,000	$107,000	$333,000	$396,000
	Right of Way	$17,000	$17,000	$90,000	$90,000
	Total Project Costs	**$957,000**	**$670,000**	**$2,141,000**	**$2,528,000**
	Town Share	**$48,000 (5%)**	**$33,500 (5%)**	**$107,000 (5%)**	**$253,000 (10%)**
	Project Development Duration[3]	2 years	2 years	4-5 Years	4-5 Years
	Construction Duration	2 months	2 months	6 months	16 months
	Closure Duration (If Applicable)	NA	NA	28 days (7 days for a box)	NA
	Typical Section - Roadway (feet)	40’	40’	40’	40’
	Typical Section - Bridge (feet)	8-12-12-8	8-12-12-8	8-12-12-8	8-12-12-8
	Geometric Design Criteria	No Change	No Change	No Change	No Change
	Traffic Safety	Improved	Improved	Improved	Improved
	Alignment Change	No	No	No	No
	Bicycle Access	No Change	No Change	No Change	No Change
	Hydraulic Performance	Meets Standard	Substandard	Meets Standard	Meets Standard
	Pedestrian Access	No Change	No Change	No Change	No Change
	Utility	No Change	No Change	Relocation	Relocation
	ROW Acquisition	Yes	Yes	Yes	Yes
	Road Closure	No	No	Yes	No
	Design Life	30 years	30 years	100 years (75 if box)	100 years (75 if box)

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

VII. Conclusion

Alternative 2b is recommended; replace the culvert in phases with a new buried structure, while maintaining two-way traffic on VT 11 with periodic minor delays.

A replacement project was chosen after consideration of the impacts of this project. The existing municipal sanitary sewer is adjacent to the culvert for part of its length, and underneath the culvert for part of its length. The sewer is only 1'-2' below the culvert. Whatever alternative is chosen, this sewer must be relocated before the culvert can be addressed. The sewer relocation will cause impacts of its own, since it will have to be constructed in a completely new location, requiring ROW. Design will be challenging, since the sewer is not currently in compliance with sewer construction rules and it may be difficult to construct a new line that is compliant with minimum slope rules. Also, regardless of the alternative chosen, other obstacles such as bedrock conditions and contaminated soils will need to be addressed. Given the efforts required to get this far, it seems unreasonable to provide a rehabilitation effort that will require additional work in 15-20 years. Therefore, the replacement alternative is recommended, which will provide BFW, enhancing resilience, and full AOP, allowing access for aquatic organisms to the entire stream.

A full replacement project at this site will not be an accelerated project.

Maintenance of Traffic:

The recommended method of traffic control is to maintain traffic through the work zone during the construction by temporarily widening the shoulders so that two lanes are provided for traffic at all times. Speed reductions are expected and occasional short, minor delays may be experienced as construction vehicles enter and leave the project site.

There are three other culvert projects on VT Route 11 in Springfield and Chester that are being scoped. They are all rated 3 or less. Bundling all four together into one contract may be difficult due to the emergency status of Bridge 57, for which an effort is being made to replace in 2018. Also, due to the need for preliminary work to relocate the sewer on this project, it may not be possible to include Bridge 61 in a bundled package.

Maintenance of Traffic methods were considered as a group, but it was felt that traffic volumes are too high to close VT Route 11 and impacts on emergency responders was judged to be unacceptable in some locations.

Small impacts to adjacent properties are expected and temporary Right-of-Way will be needed for work space.

VIII. Appendices

Appendix A: Site Pictures

VT 11 looking east

VT 11 looking west

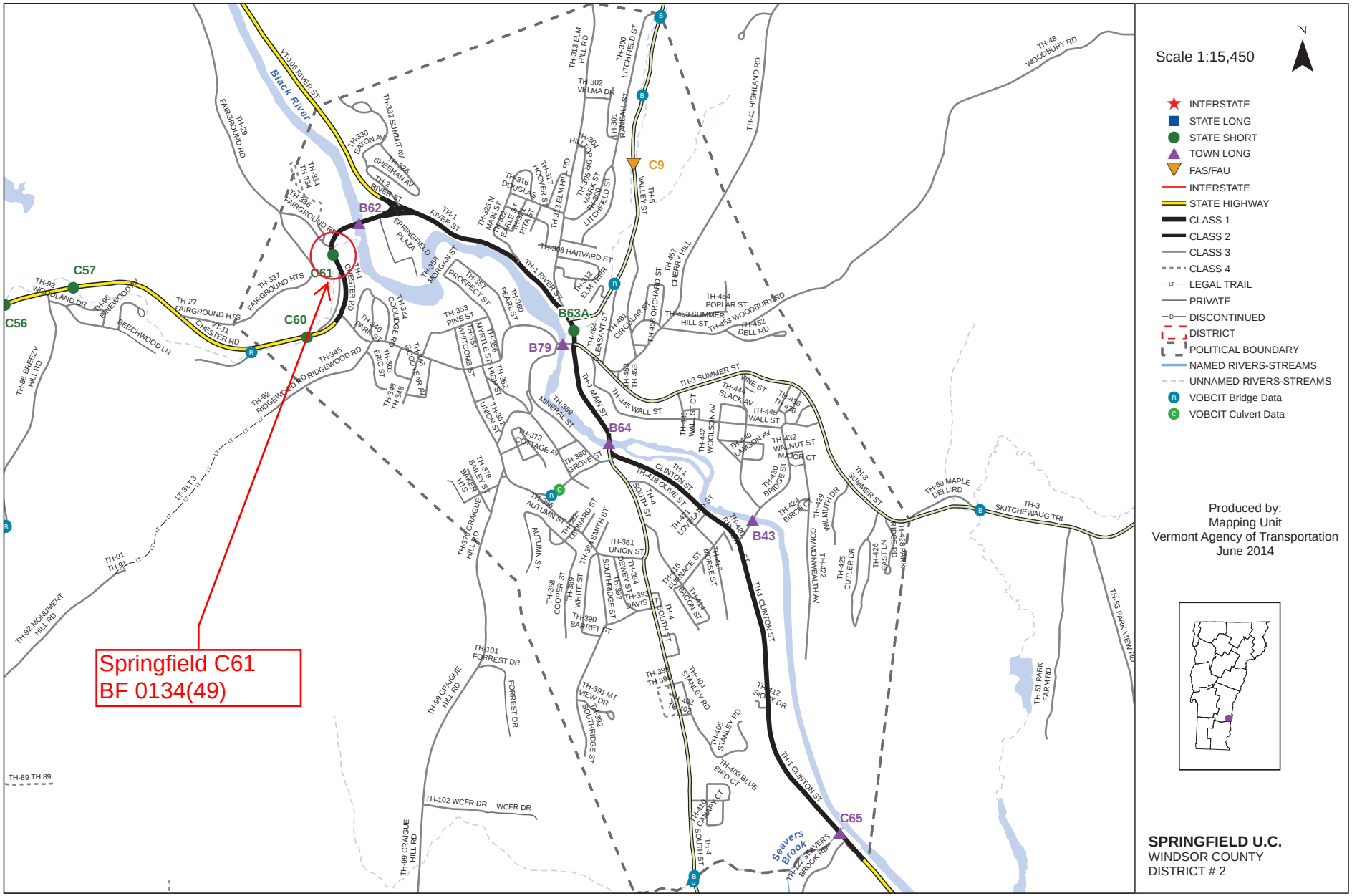
Culvert Outfall

Culvert Inlet

Culvert Interior

Upstream of Culvert

Appendix B: Town Map


Springfield C61
BF 0134(49)
Scale 1:15,450
N
INTERSTATE
STATE LONG
STATE SHORT
TOWN LONG
FAS/FAU
INTERSTATE
STATE HIGHWAY
CLASS 1
CLASS 2
CLASS 3
CLASS 4
LEGAL TRAIL
PRIVATE
DISCONTINUED
DISTRICT
POLITICAL BOUNDARY
NAMED RIVERS-STREAMS
UNNAMED RIVERS-STREAMS
VOBCIT Bridge Data
VOBCIT Culvert Data
Produced by:
Mapping Unit
Vermont Agency of Transportation
June 2014
SPRINGFIELD U.C.
WINDSOR COUNTY
DISTRICT # 2
Black River
Seavers Brook
B62
B63A
B64
B79
B43
C9
C57
C56
C61
C60
C65

Appendix C: Bridge Inspection Report

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for SPRINGFIELD **bridge no.:** 0061 **District:** 2

Located on: VT11 **over** BROOK **approximately** 0.3 MI W JCT VT 106 **Maintained By:** STATE

CONDITION

Deck Rating: N NOT APPLICABLE

Superstructure Rating: N NOT APPLICABLE

Substructure Rating: N NOT APPLICABLE

Channel Rating: 7 GOOD

Culvert Rating: 3 SERIOUS

Federal Str. Number: 302500006114181

AGE and SERVICE

Year Built: 1960 **Year Reconstructed:** ____

Type of Service On: 1 HIGHWAY

Type of Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 4

ADT: 8400 **Year of ADT:** 1996

GEOMETRIC DATA

Length of Maximum Span (ft): 14

Structure Length (ft): 14

Lt Curb/Sidewalk Width (ft): 0

Rt Curb/Sidewalk Width (ft): 0

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

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

Appr. Roadway Width (ft): 48

Skew: 30

Bridge Median: 0 NO MEDIAN

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 08 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: CGMPPA

Number of Main Spans: 1

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: N NOT APPLICABLE

Type of Wearing Surface: N NOT APPLICABLE

Type of Membrane: N NOT APPLICABLE

Deck Protection: N NOT APPLICABLE

CULVERT GEOMETRIC DATA and INDICATORS

Culvert Barrel Length (ft): 164

Average Cover Over Culvert (ft): 04

Waterway Area Through Culvert (sq.ft.): 101

Wingwall/Headwall Rating: 7 GOOD CONDITION

APPRAISAL

Appr. Rdwy. Alignment: 8 EQUAL TO DESIRABLE CRITERIA

INSPECTION

Inspection Date: 112016 **Inspection Frequency (months):** 12

INSPECTION SUMMARY and NEEDS

*11/08/2016 - ** Culvert has severe corrosion of invert, along with piping occurring. Pipe has potential for significant distortion/sink hole formation and needs replacement. ~ MJ/AC*

*04/22/2016 - Special inspection to monitor distress. Invert poor and ~ 6" drop at 2/3rds from the inlet at ~ 140', where large invert holes have formed and plate ribs are torn away. ** Culvert needs extensive invert repair or full pipe replacement soon. ~ MJ/SP*

12/3/2015 Culvert is in poor condition due to the invert at midspan. Should consider a concrete invert or replacement in the near future. ~FRE/TJB

09/23/2014 - No significant changes since the last inspection. The arch pipe is poor due to extensive corrosion and sequential distortion along the invert. The pipe needs replacement soon or possible reinforced invert repair now, to stop it's progressive failure. ~ MJ/JS

*12/05/2013 - ** Arch pipe is poor due to extensive corrosion and sequential distortion. The pipe needs replacement soon or possible reinforced invert repair now to stop it's progressive failure. ~ MJ/JS*

9/28/2012 Culvert should be evaluated for a possible concrete invert. FRE/JAS

Appendix D: Preliminary Hydraulics Report

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Jennifer Fitch, P.E., Structures Project Manager

FROM: Nick Wark, P.E., Hydraulics Engineer

DATE: September 6, 2016

SUBJECT: Springfield BF 0134(49) VT11 Br61 over Chester Brook
Preliminary Hydraulics

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

Existing Bridge Information

The field measurements of the existing corrugated metal plate pipe arch varied slightly, but it was modeled as a standard size, 14'-1" by 8'-9", providing 97 sq. ft. of waterway area. This structure nearly spans the channel, which was field measured as approximately 15' (naturally and artificially confined). This structure meets the hydraulic standard at the 2% AEP design storm. The water surface elevation is 446.8' (HW/D = 0.69). The existing structure likely passes fish during low to moderate flow events.

Recommendations

This site is in a mapped floodplain which likely requires no increase in water surface elevations at the 1% AEP. There is also a house that is very close to the inlet that could be very sensitive to changes in water surface elevations. We modeled a liner as small as 3" thick, with a beveled inlet to improve capacity. This liner increases water surface elevations by 0.1' and does not provide AOP. We do not think this will be acceptable to regulators. If you wish to pursue a liner of this type, please let us know the thickness so we can more accurately model impacts and we can help coordinate with ANR to see if this is an allowable alternative.

For a replacement structure, we recommend something similarly sized as the existing, that provides AOP. One option would be a 15' by 10' box, buried 2', resulting in a waterway opening of 15' by 8'. This matches the channel and retaining walls slightly better than the existing structure and the buried inlet will allow for AOP. This structure results in a headwater depth of 445.8' (HW/D = 0.64). This actually exceeds the hydraulic standards, but we feel the 8' waterway opening would help constructability (placing natural bed material) and be a cheap way to increase the resiliency of the site by maintaining a similar clear height as the existing structure. You could reduce the waterway height to 6.5' and still meet hydraulics standard. This would reduce the height compared to the existing structure, but provide the same waterway area.

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

NJW

cc: Hydraulics Project File

Appendix E: Preliminary Geotechnical Report

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Jennifer Fitch, P.E., Structures Project Manager

ZMH

From: Zachary Haffenreffer, Technician Apprentice IV, via Callie Ewald, P.E., Geotechnical Engineering Manager

CEE

Date: June 24th, 2016

Subject: Springfield BF 0134(49) Preliminary Geotechnical Information

1.0 INTRODUCTION

We have completed our preliminary geotechnical investigation for the replacement of Bridge No. 61 on Vermont Route 11 in the town of Springfield, VT. Bridge No. 61 is located approximately 0.3 miles West of the junction of VT Route 11 and VT Route 106. The subject project consists of replacing or repairing the existing corrugated galvanized metal plate pipe (CGMPP) culvert. This review included the examination of as-built record plans, historical in-house bridge boring files, water well logs and hazardous site information on-file at the Agency of Natural Resources, USDA Natural Resources Conservation soil survey records, published surficial and bedrock geologic maps, and photos taken during a site visit.

2.0 SUBSURFACE INFORMATION

2.1 Previous Projects

Record plans were available for this project from the construction in 1959. The plans included details of the existing culvert elevation, the plate pipe arch, and typical sections of the above roadway. Details of the plans did not include any subsurface information and there is no reference to shallow bedrock in the existing plan set. The culvert appears to be bearing on at least one foot of granular material according to the plan details.

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 within a 3-mile radius.

2.2 Water Well Logs

The Agency of Natural Resources (ANR) documents and publishes all water wells that are drilled for residential or commercial purposes. Published online, these logs can be used to determine general characteristics of the 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. Figure 1 contains the subject project as well as surrounding well locations found using the ANR Natural Resources Atlas. Three water wells within an approximate 1,100-foot radius of the project were used to get an estimate of the depth to bedrock likely to be encountered for Bridge No. 61 and are highlighted below with red boxes.

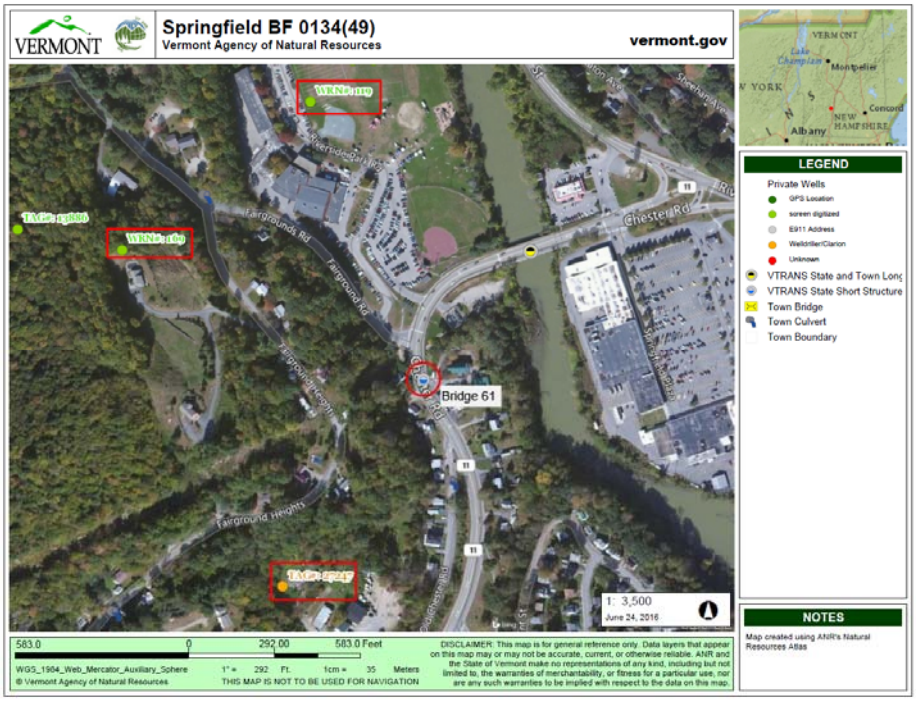


Figure 1. Highlighted Well Locations near Subject Project

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 overburden material encountered.

Table 1. Depths to Bedrock of Surrounding Wells

Well ID	Approx. Distance From Project (feet)	Approx. Depth To Bedrock (feet)	Overburden Material
119	1010	70	Hardpan, Sand, Gravel
169	1120	45	Gravel and Boulders
27247	850	65	Gravel

2.3 Hazardous Materials and Underground Storage Tanks

The ANR Natural Resource Atlas also maps the location and information of known hazardous waste sites and underground storage tanks. The location of this project is adjacent to a known hazardous site. The property adjacent to this site is on the Hazardous Site List as site number 20114140. No underground storage tanks are located within a 1-mile radius and no impact from other hazardous waste sites is anticipated.

2.4 USDA Soil Survey

The United States Department of Agriculture Natural Resources Conservation Service maintains an online surficial geology map of the United States. According to the Web Soil Survey, the stratum directly underlying the project site consists of Windsor and Agawam soils with a depth to groundwater of approximately 80 inches.

2.5 Geologic Maps of Vermont

According to the 2011 Bedrock Map of Vermont, published by the USGS and State of Vermont, the project site is underlain with Phyllite and Felsic rock.

3.0 BRIDGE INSPECTION

An inspection of the culvert was done in December of 2015 by the Bridge Inspection unit. This inspection stated the current culvert is in poor condition due to the invert at midspan. It recommended that an evaluation be done for a possible concrete invert or replacement in the near future.

4.0 RECOMMENDATIONS FOR SUBSURFACE INVESTIGATION

We recommend a minimum of two borings be taken from the roadway surface on opposite sides of the roadway, near the inlet and the outlet. Depending on the proposed alignment and structure chosen here, additional borings may be necessary due to the length of the culvert. There is a stone laid up wingwall at the inlet of the culvert, both an inspection and possibly a boring is recommended to determine the stability of the wall during construction activities and in the future. The borings will be performed to more fully assess the subsurface conditions at the site including, but not limited to, the soil properties, groundwater conditions, and depth to bedrock (if applicable).

If shallow bedrock is encountered during drilling operations, additional borings will likely be required to profile the bedrock elevation across the footprint of the proposed structure. Additionally, if soft or loose soils are encountered, an effort to access closer to the inlet and outlet for headwall and wingwall design may be necessary.

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

- Rehabilitation of the existing culvert with an alternative such as concrete invert
- Precast or steel arch bridge with spread footings founded on rock or soil
- Reinforced concrete box culvert with new headwalls and wingwalls

6.0 CONCLUSION

When an alternative as well as preliminary alignment has been chosen, the Geotechnical Engineering Section can assist in determining a subsurface investigation that efficiently gathers adequate information for the alternative chosen.

If you have any questions or would like to discuss this report, please contact us by phone at (802) 828-2561, or via email at zachary.haffenreffer@vermont.gov.

Appendix F: Natural Resources ID Memo

State of Vermont
Program Development Division
One National Life Drive
Montpelier, VT 05633-5001
vtrans.vermont.gov

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

Agency of Transportation

To: Lee Goldstein, VTrans Environmental Specialist

From: James Brady, VTrans Environmental Biologist

Date: July 15, 2016
Subject: Springfield BF 0134(49) - 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. A site visit was conducted on June 15, 2016.

Wetlands/Watercourses
The project carries VT Route 11 over an unnamed brook via Bridge 61. There are no wetlands present within the project area.

Wildlife Habitat
There is low value habitat adjacent to this project.

Providing a natural, or simulated natural bottom to the stream under VT Route 11 would provide access to multiple aquatic organisms. Currently, this structure is assumed to pass some aquatic organisms and could possibly be retrofitted to provided better passage.

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

That said, the entire state of Vermont is potential habitat for the federally threatened northern long-eared bat. This project is not likely to impact habitat for the northern long-eared bat, but this may change if a large amount of trees need to be cut. The structure itself is not considered habitat.

Agricultural Soils:
There are no mapped agricultural soils within the project area.

Appendix G: Archaeological Memo

VERMONT

To: JulieAnn Held, VTrans Environmental Specialist
From: Brennan Gauthier, VTrans Archaeologist
Date: June 27th, 2016
Subject: Springfield BF 0134(49) – Resource ID

Julie Ann,

We have completed our background research and field review of the proposed work at culvert C61 on VT Route 11 in Springfield, Windsor County (fig. 1). Although the project APE is currently unknown, a generalized project boundary has been assumed.

The potential for pre-contact archaeological sensitivity at this location is quite high. The (unnamed) stream that passes through the culvert in question feeds into the Black River less than 300ft further downstream, and the project's location on the floodplain of a major waterway, near a stream confluence, is reflected in the VDHP Predictive Model heat map (fig. 2) – even if this potential must be weighed against the likelihood of erosion by channel migration and disturbance stemming from the development of Springfield village. Although there are no known archaeological sites within a mile of the project area, there is abundant evidence of pre-contact populations in the vicinity. One pre-contact find site is known from downtown Springfield (VT-WN-42), and eight more sites (including the large Woodland Period site of Skitchewaug) have been recorded around the I-91 interchange and the confluence of the Black and Connecticut Rivers, approximately four miles away. The density and longevity of pre-contact settlement in the area is thus an important consideration in determining archaeological sensitivity at the project location.

The potential for remains of historic period structures is also high, given the proximity of the work site to Springfield's town center. Examination of both Walling (1858) and Beers (1869) maps revealed a different road configuration than exists today, wherein what is now Rte 11/Chester Rd did not cross the Black River to join River St on the opposite bank, but turned northwards and continued along the west side of the channel (where it is now called Fairground Rd). Both historic maps show the small tributary stream that runs through the culvert scheduled for work, and two structures in the immediate vicinity of that crossing: a blacksmith's shop on the west side of the road and north bank of the stream; and a residence to the east of the road and south of the stream (fig. 3).

Archaeologically sensitive areas have been added to the geodatabase for inclusion in project DGN files. Please feel free ask for additional background information or clarification if needed.

Sincerely,

Brennan

Brennan

Brennan Gauthier
VTrans Archaeologist
Vermont Agency of Transportation
Project Delivery Bureau
Environmental Section
1 National Life Drive
Montpelier, VT 05633
tel. 802-279-1460
Brennan.Gauthier@vermont.gov

VERMONT

/Prepared by Tico Wolff, VTrans Archaeology Technical Apprentice

Fig. 1. Detail of project location on VT Rte 11/Chester Rd in Spirngfield, VT.

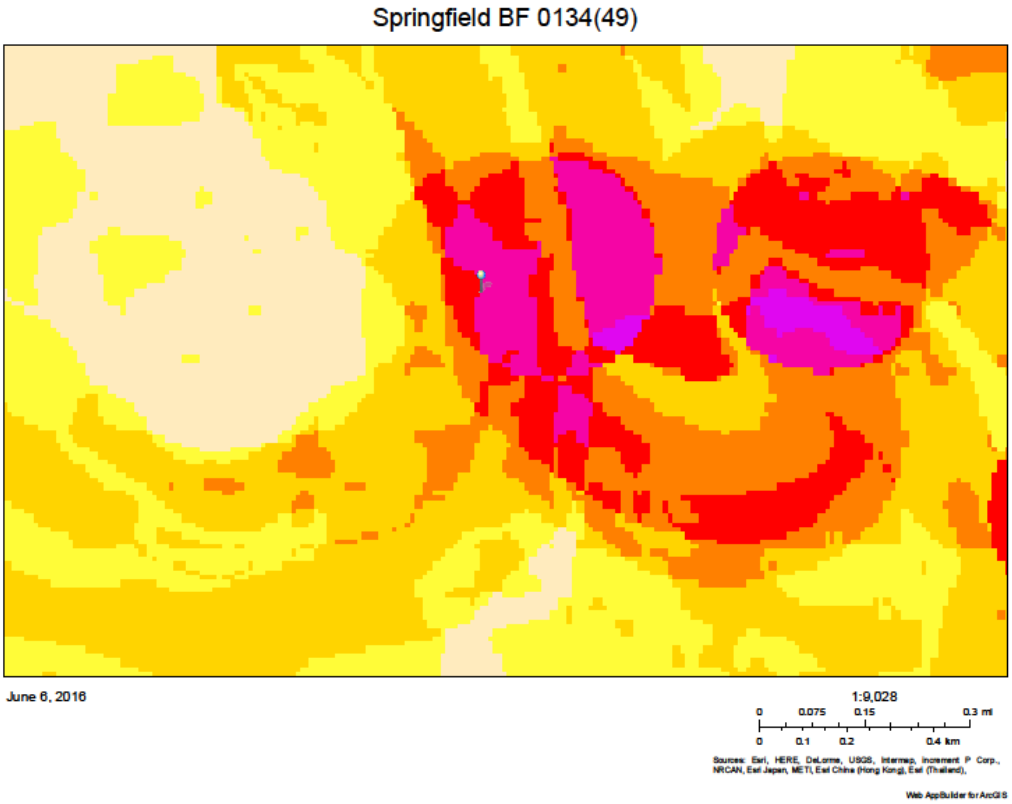


Fig. 2. VDHP Predictive Model heat map, showing high sensitivity for pre-contact archaeology at the project location (indicated by the pin)

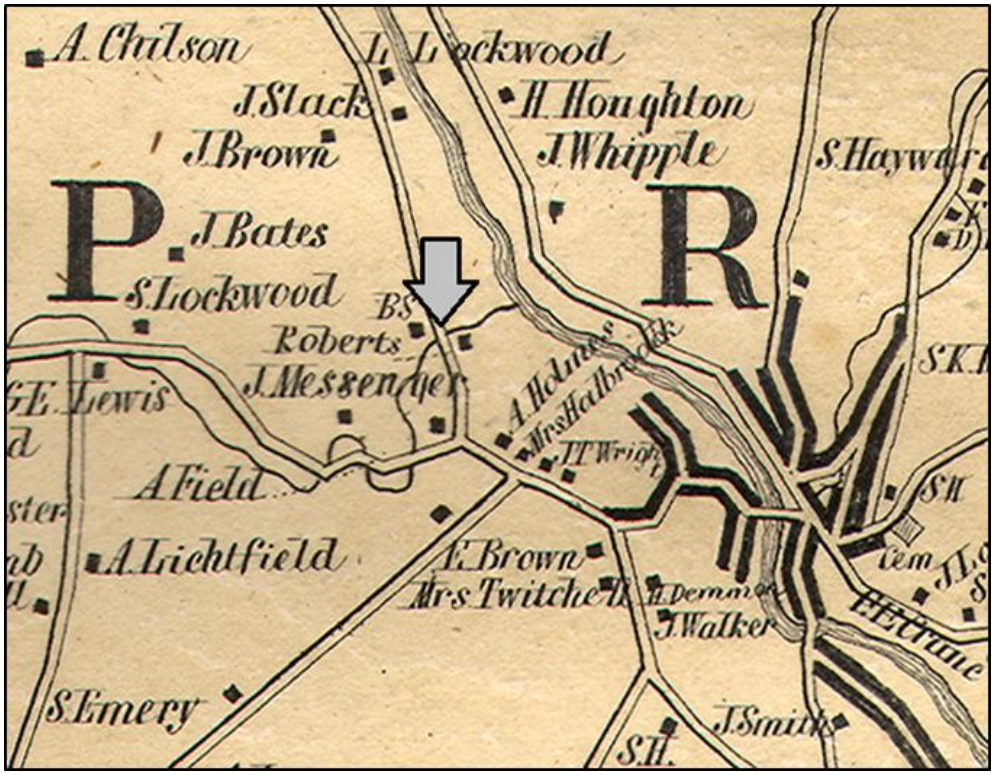


Fig. 3. Detail of Walling's (1858) map of Springfield. Arrow indicates the intersection of road and tributary stream where the proposed culvert work will take place. Note the blacksmith's shop (BS) and Roberts residence immediately adjacent to this crossing.

Appendix H: Historic Memo

Kyle Obenauer
Historic Preservation Specialist

Vermont Agency of Transportation

kyle.obenauer@vermont.gov
802.279.7040
www.vtrans.vermont.gov

Project Delivery Bureau - Environmental Section
One National Life Drive
Montpelier, VT 05633-5001

Historic Preservation Resource Identification Memo

To: Julie Ann Held, Environmental Specialist
Via: Judith Ehrlich, VTrans Historic Preservation Officer
Cc: Jen Russell, VTrans Archaeology Officer
Karen Spooner, Administrative Assistant
Date: June 20, 2016

Subject: Springfield BF 0134(49)

I have completed a Resource Identification (ID) for Springfield BF 0134(49). This project may include replacement of Bridge 61 on VT Route 11 in Springfield, Windsor County, Vermont (Figure 1). All work will be contained within the existing right of way.

Constructed around 1960, 0.3 miles east of the Route 106-Route 11 junction, Bridge 61 runs beneath VT Route 11 and is a large, corrugated metal culvert with rip-rap wing walls at its inlet and coursed, dry-laid stone wing walls at its outlet (Figure 2). VTrans has determined that Bridge 61 does not appear eligible for inclusion in the National Register of Historic Places (NRHP) individually, or as a contributing resource to a current or potential historic district. Although more than 50 years of age, this culvert is unremarkable architecturally and historically. The dry-laid stone walls at the outlet of Bridge 61 appear to have been constructed using traditional masonry traditions; however, they are associated with the construction of the culvert itself and not the adjacent house to the southwest (Figure 3). A similar stone wall at the same location on the Black River may have preceded culvert construction.

Finally, a tall, two and one-half story Greek Revival-style house stands directly northeast of Bridge 61. Overlooking the Black River below, this vernacular building has been significantly altered, including a large, shed roof dormer and modified fenestration at its eastern elevation, as well as an enclosed, contemporary, single-story, entry way with a shallow-pitched hip roof and one-bay of asymmetrical 1/1 wood sash windows at the main facade (Figure 3). VTrans has determined that this building lacks the necessary integrity and significance for individual inclusion in the NRHP. Despite the likelihood of being constructed within the period of significance (1830-1956) for the industrial and commercial context in which the neighboring NRHP-listed Springfield Downtown Historic District (District) is significant for, VTrans has also determined that this building is beyond the District's current boundary and lacks sufficient integrity for inclusion in the NRHP as a contributing resource.

Please, contact me with any questions. Additional background information and documentation can be provided upon request.

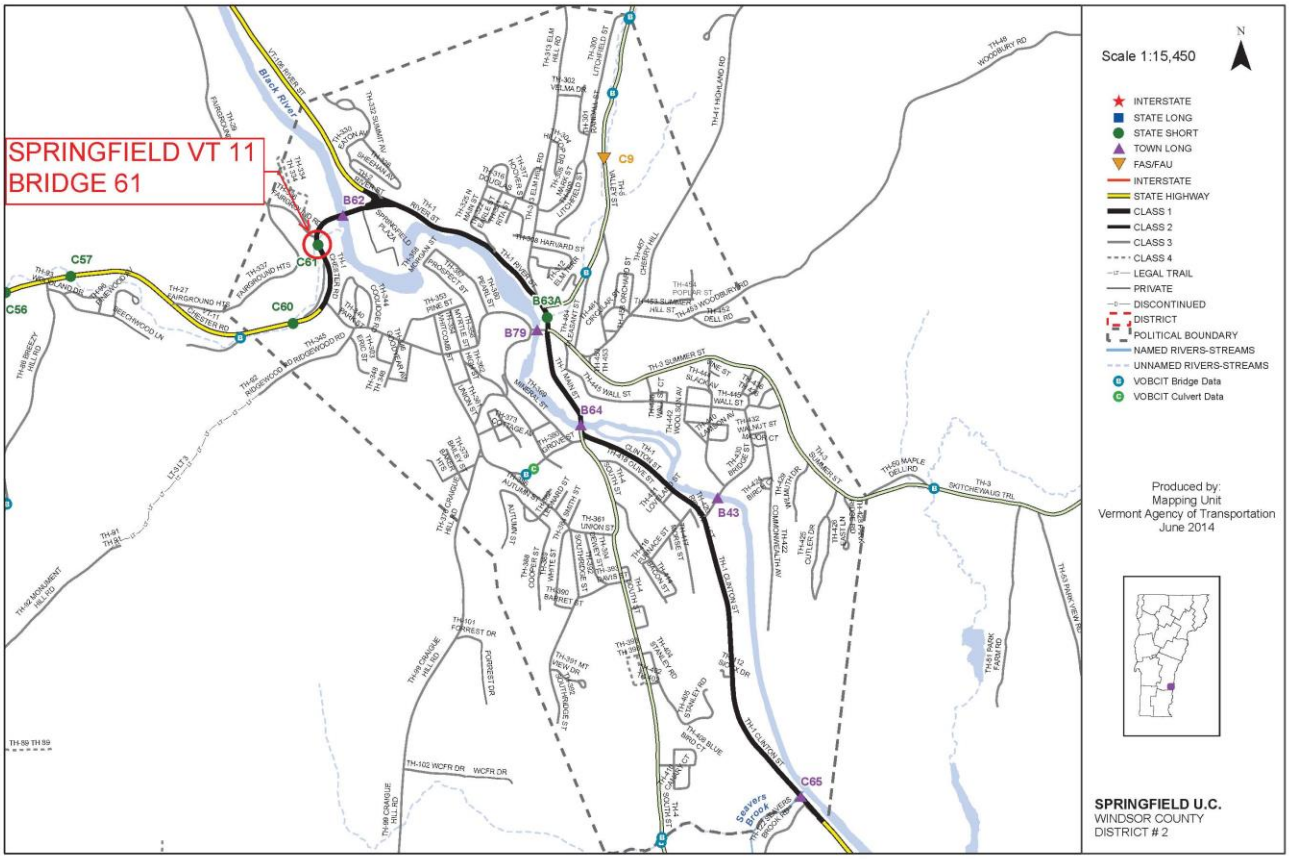


Figure 1. Potential project location.

Figure 2. Bridge 61 inlet, looking north.

Figure 3. Tall, two and one-half story vernacular Greek Revival-style house northeast of Bridge 61.

Appendix I: Local Input

Local & Regional Input Questionnaire

Project Name: Springfield Culverts 57 and 60 on VT-11
Project Number: Springfield BF 0134(43) and Springfield BF 0134(45)

Please note that answers apply to both C57 and C60, unless otherwise noted.

Attachments to give context to answers uploaded at https://drive.google.com/folderview?id=0B2jtfm2nTjt4LUxBR2FYeWU2TUU&usp=sharing :

- Land Use Map
- Context Map (includes sidewalks and some land use)
- Future Land Use Map
- Current Land Use Map
- Base Features Map (includes water and sewer lines)
- Public Transit Route Map
- Regional Transportation Map

Community Considerations

1. Are there any scheduled public events in the community that will generate increased traffic (e.g. vehicular, bicycles and/or pedestrians), or may be difficult to stage if the bridge is closed during construction? Examples include: a bike race, festivals, cultural events, farmers market, concerts, etc. that could be impacted? If yes, please provide date, location and event organizers' contact info.
   High School Alumni Day Parade (2nd or 3rd weekend in June)

2. Is there a "slow season" or period of time from May through October where traffic is less?
   No particular slow season. Very high traffic all year round.

3. Please describe the location of emergency responders (fire, police, ambulance) and emergency response routes.
   Springfield Police. 201 Clinton Street, Springfield, VT. Phone: (802)885-2113. Chief Douglas Thompson douglas.johnston@state.vt.us

   Springfield Fire and Ambulance. 77 Hartness Avenue, Springfield, VT. Phone 802-885-4546. Fire Chief Russ Thompson

4. Where are the schools in your community and what are their schedules?
   Elm Hill Primary School (K-2) – 10 Hoover Street, Springfield, Vermont 05156
   Union Street Elementary School (3-5) – 43 Union Street, Springfield, Vermont 05156
   Riverside Middle School – 13 Fairground Road, Springfield, Vermont 05156
   Springfield High School – 303 South St, Springfield, Vermont 05156

   School District summer dates approx 4th week in June through 3rd week of August

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

Residential and commercial land use. Near to Middle School, Hospital and several residential areas. This is a major through road carrying significant truck traffic. Sidewalks already exist (see map).

6. Are there any businesses (including agricultural operations) that would be adversely impacted either by a detour or due to work zone proximity?
   Many local businesses that have truck traffic travelling through the Town would be affected. See map for locations of businesses in town.

7. Are there any important public buildings (town hall or community center) or community facilities (recreational fields or library) in close proximity to the proposed project?
   Riverside Middle School, Springfield Hospital (main campus), Springfield Hospital (Rehabilitation Center).

8. Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road?
   Several town roads would be affected. No local roads could accommodate volume of traffic diverted.

9. Are there any other municipal operations that could be adversely impacted if the bridge is closed during construction? If yes, please explain.
   All operations in town would be adversely affected if bridge closed – due to large volume of traffic.

10. Please identify any local communication channels that are available—e.g. weekly or daily newspapers, blogs, radio, public access TV, Front Porch Forum, etc. Also include any unconventional means such as local low-power FM.
    Newspaper of record – Springfield Reporter

    Springfield Reporter – Weekly newspaper
    Eagle Times – Daily newspaper

    News updates emailed from Town Website - http://www.springfieldvt.govoffice2.com/

    Facebook (Town) - https://www.facebook.com/townofspringfieldvermont?fref=ts
    Facebook (Police Dept) - https://www.facebook.com/pages/Springfield-Police-Department-Springfield-VT/133631763326692?fref=ts
    Facebook (Springfield Regional Chamber of Commerce) - https://www.facebook.com/pages/Springfield-Regional-Chamber-of-Commerce/320106738039513?fref=ts
    Facebook (Springfield On The Move) - https://www.facebook.com/pages/Springfield-On-The-Move/168814006467688?ref=stream

11. Is there a local business association, chamber of commerce or other downtown group that we should be working with?
    Springfield Regional Chamber of Commerce – Jen Johnson spfldcoc@vermontel.net

Springfield Regional Development Corporation (SRDC) – Bob Flint
bobf@springfielddevelopment.org

Springfield On The Move (Downtown Organization) – Carol Lighthall som@vermontel.net

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 particular concerns

2. Are there any concerns with the width of the existing bridge?
   No particular concerns

3. What is the current level of bicycle and pedestrian use on the bridge?
   Some pedestrians on the sidewalk

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

5. Does the Town have plans to construct either bicycle or pedestrian facilities leading up to the bridge? Please provide a copy of the planning document that demonstrates this (e.g. scoping study, master plan, corridor study) Please explain and provide documentation.
   Existing sidewalk shown on map attached. Currently no plans for bike lane.

6. Does the bridge provide an important link in the town or statewide bicycle or pedestrian network such that you feel that bicycle and pedestrian traffic should be accommodated during construction?
   Important connection in sidewalk network from Downtown to residential neighborhoods in southeast part of town.

7. Are there any special aesthetic considerations we should be aware of?
   Not aware of any

8. Are there any traffic, pedestrian or bicycle safety concerns associated with the current bridge? If yes, please explain.
   No particular safety concerns known.

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

10. Are you aware of any nearby Hazardous Material Sites?
    None known

11. Are you aware of any historic, archeological and/or other environmental resource issues?
    None known

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

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

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

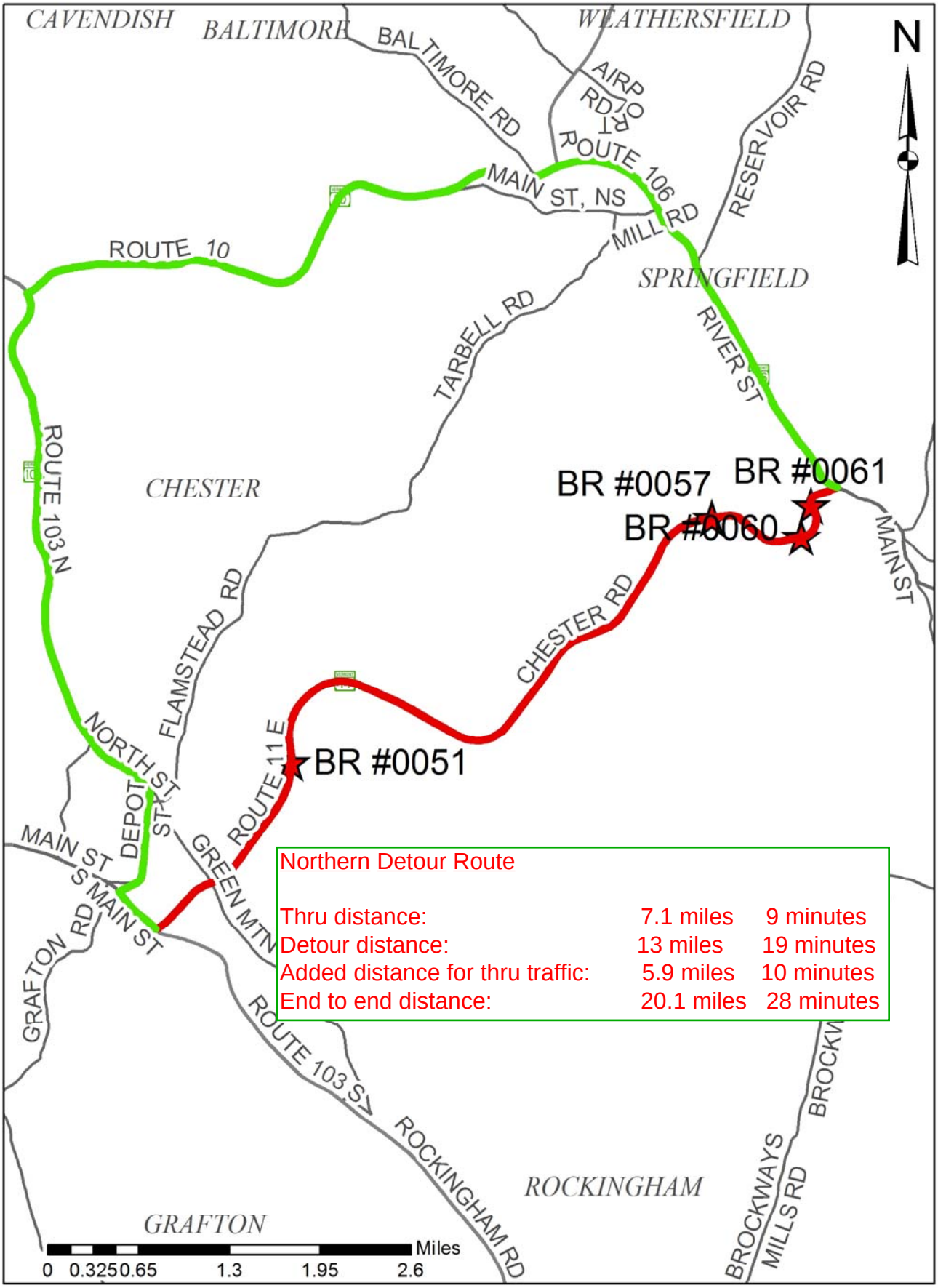
2. Please provide a copy of your existing and future land use map, if applicable.
   Attached

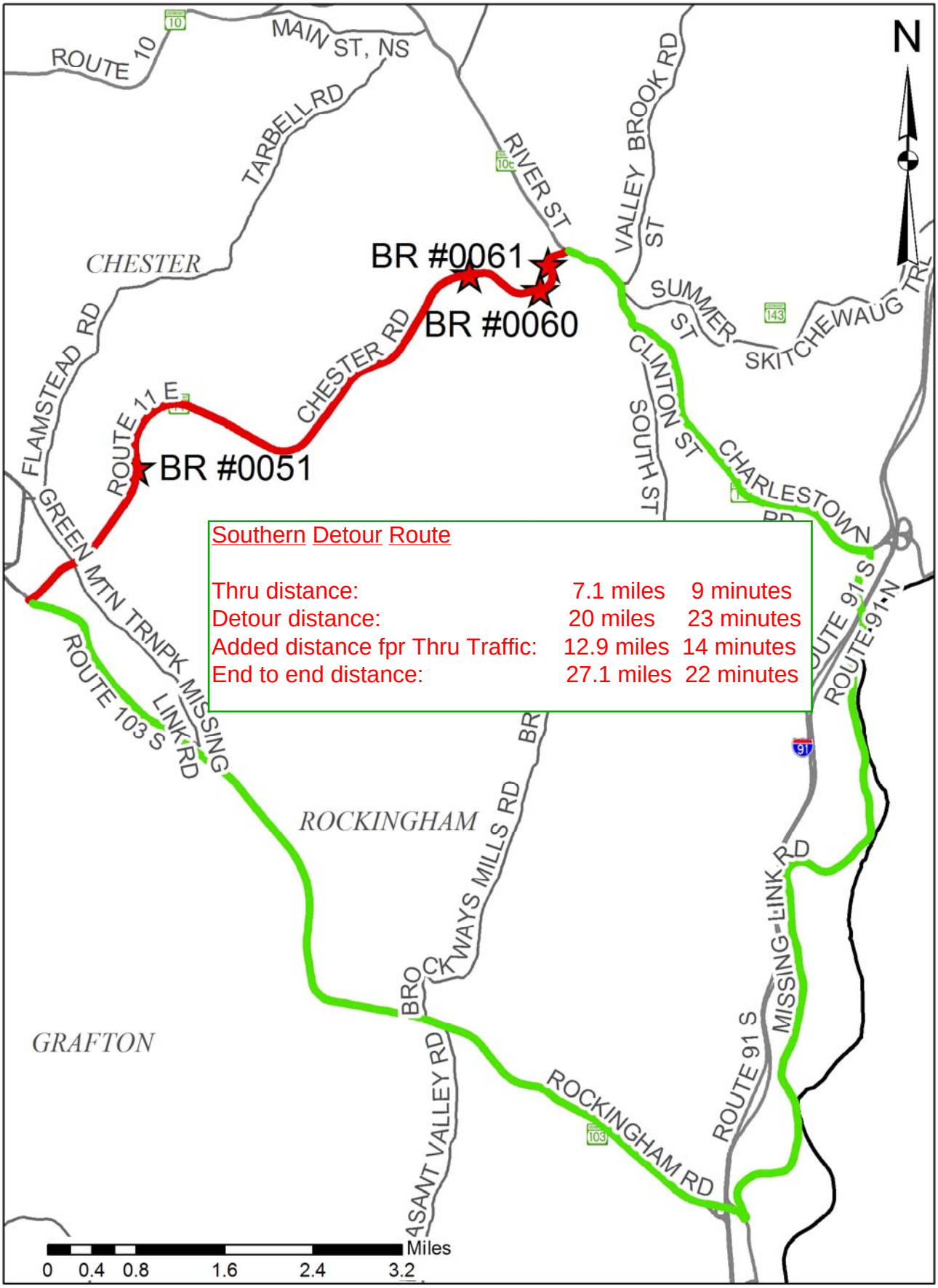
3. Are there any existing, pending or planned development proposal that would impact future transportation patterns near the bridge? If so please explain.
   None. But traffic will increase over time. VT-11 is a route over the Green Mountains which carries significant truck traffic.

4. Is there any planned expansion of public transit service in the project area? If not known please contact your Regional Public Transit Provider.
   None known expansion of public transit route known. Does not affect Fixed Route Transit Service (see map attached) but would affect Dial-A-Ride service – which covers the entire town of Springfield.

   For more information contact Rebecca Gagnon at Connecticut River Transit (The Current) who provides all transit services – rgagnon@crtransit.org

Appendix J: Detour

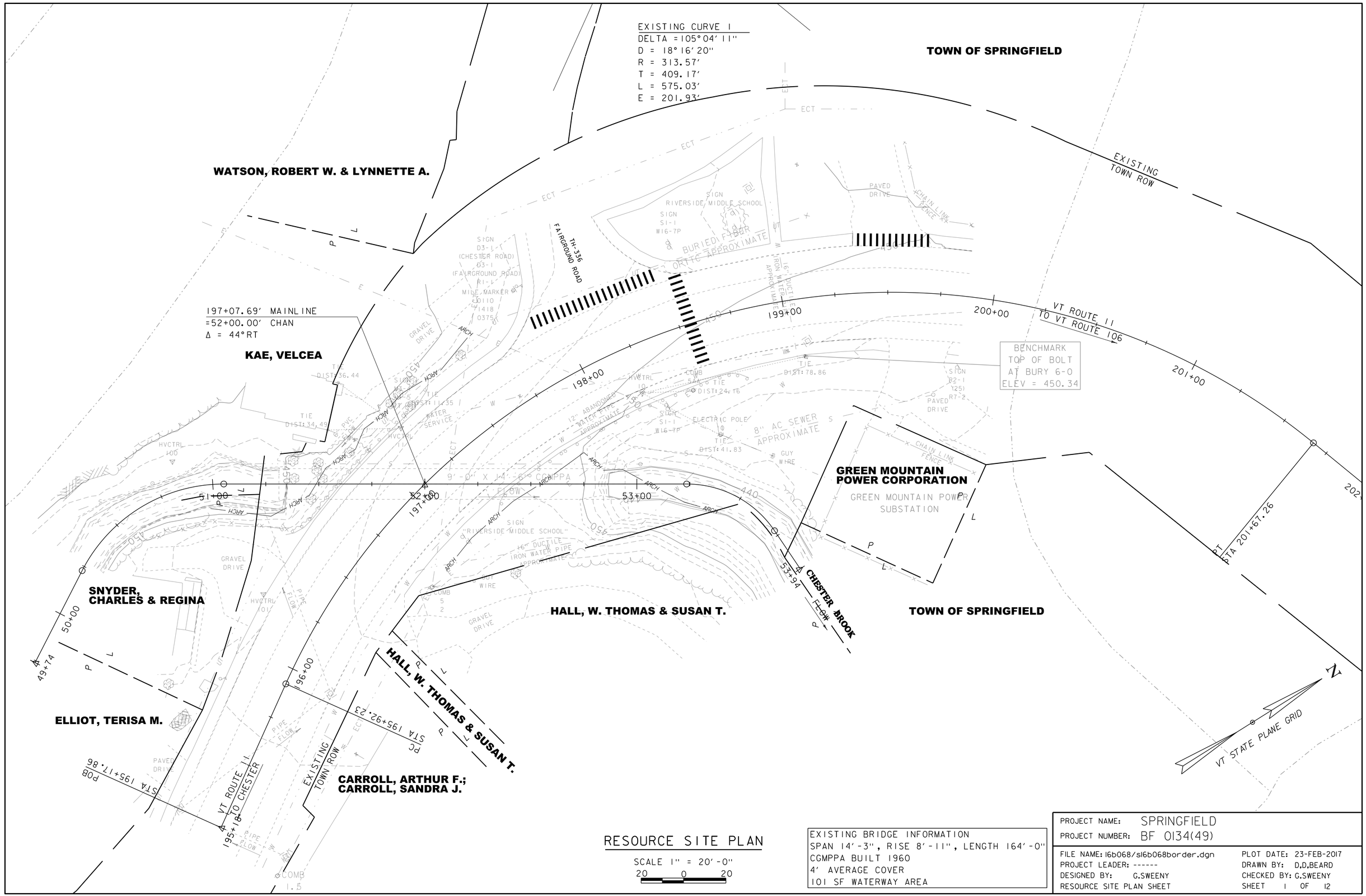

CAVENDISH
BALTIMORE
BAL TIMORE RD
WEATHERSFIELD
AIRPORT RD
ROUTE 106
MAIN ST, NS
RESERVOIR RD
MILL RD
ROUTE 10
SPRINGFIELD
TARBELL RD
RIVER ST
ROUTE 103 N
CHESTER
BR #0057
BR #0061
BR #0060
MAIN ST
CHESTER RD
FLAMSTEAD RD
NORTH ST
DEPOT ST
ROUTE 11 E
BR #0051
MAIN ST
S MAIN ST
GREEN MTN
GRAFTON RD
ROUTE 103 S
ROCKINGHAM RD
ROCKINGHAM
BROCKWAYS
MILLS RD
GRAFTON
Miles
0 0.325 0.65 1.3 1.95 2.6
N
Northern Detour Route
Thru distance: 7.1 miles 9 minutes
Detour distance: 13 miles 19 minutes
Added distance for thru traffic: 5.9 miles 10 minutes
End to end distance: 20.1 miles 28 minutes



Southern Detour Route

Thru distance:	7.1 miles	9 minutes
Detour distance:	20 miles	23 minutes
Added distance fpr Thru Traffic:	12.9 miles	14 minutes
End to end distance:	27.1 miles	22 minutes

Appendix K: Plans



RESOURCE SITE PLAN

SCALE 1" = 20'-0"

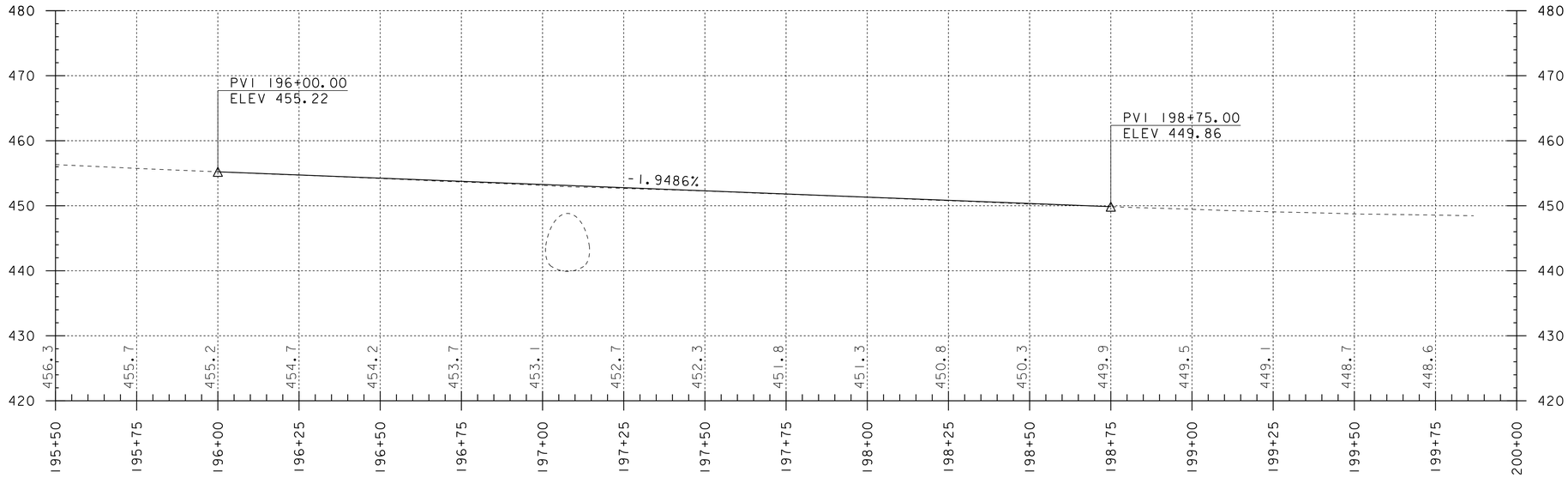
20 0 20

EXISTING BRIDGE INFORMATION
SPAN 14'-3", RISE 8'-11", LENGTH 164'-0"
CGMPPA BUILT 1960
4' AVERAGE COVER
101 SF WATERWAY AREA

PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: BF 0134(49)

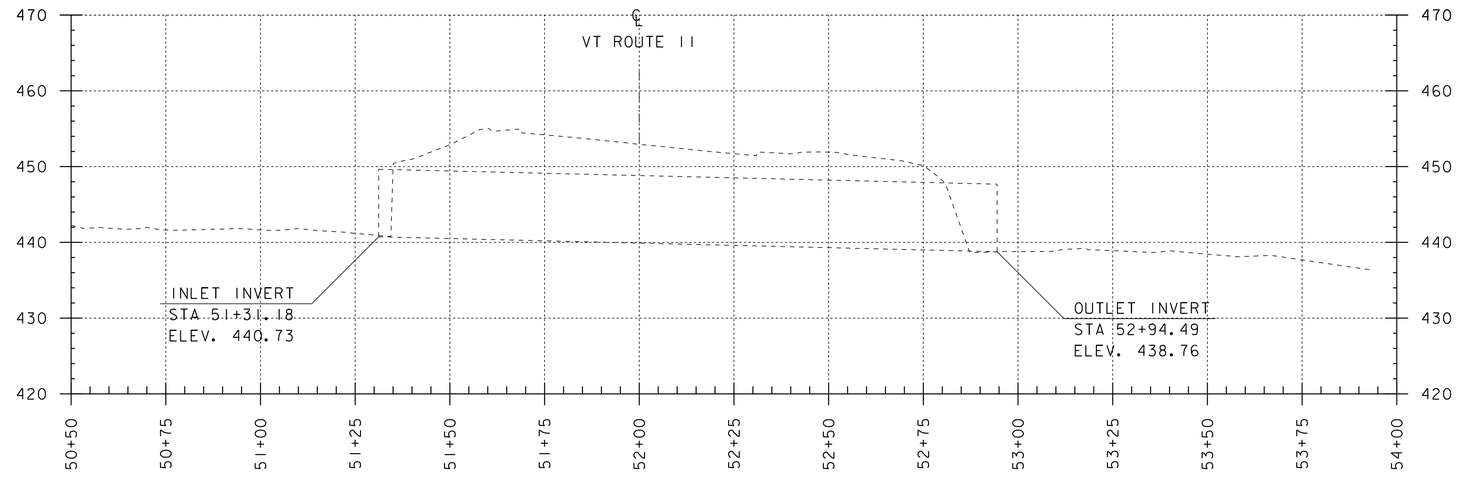
FILE NAME: l6b068/sl6b068border.dgn
PROJECT LEADER: ------
DESIGNED BY: G.SWEENY
RESOURCE SITE PLAN SHEET

PLOT DATE: 23-FEB-2017
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 1 OF 12



VT ROUTE 11 EXISTING PROFILE

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

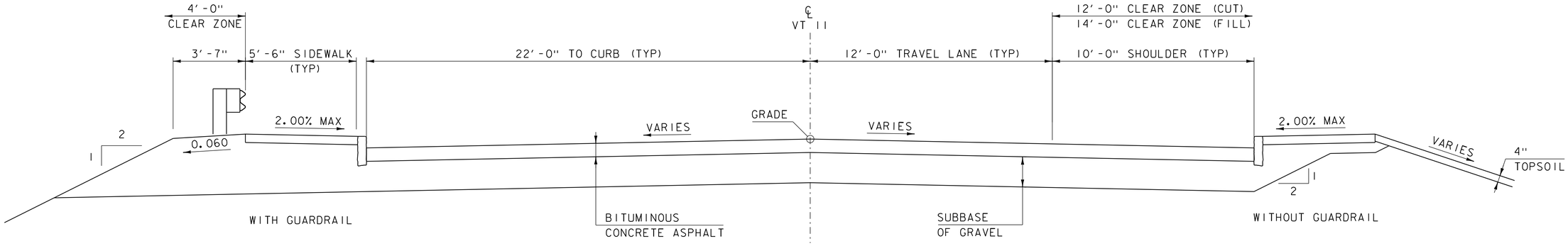


CULVERT 61 EXISTING CHANNEL PROFILE

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

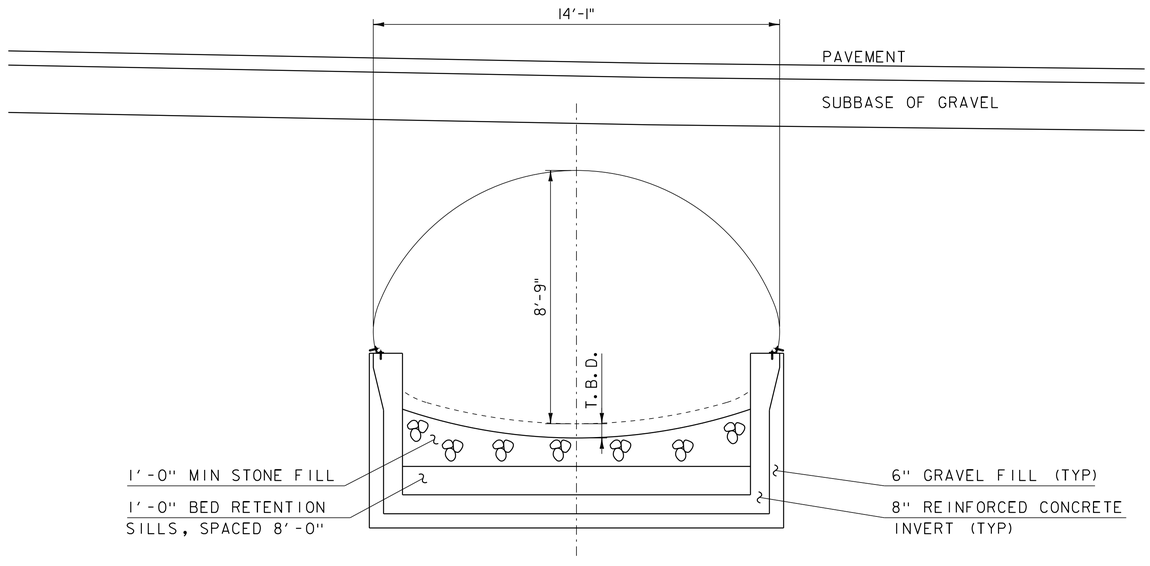
NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	BF 0134(49)
FILE NAME: 16b068/sl6b068profile.dgn	PLOT DATE: 23-FEB-2017
PROJECT LEADER: ------	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
PROFILE SHEET	SHEET 2 OF 12



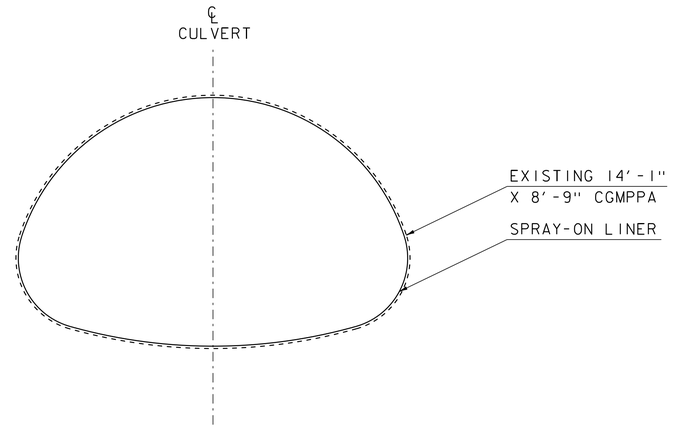
PROPOSED VT 11 ALTERNATIVE 1 TYPICAL SECTION

SCALE 3/8" = 1'-0"



ALTERNATIVE 1A TYPICAL SECTION

N.T.S.



ALTERNATIVE 1B TYPICAL SECTION

N.T.S.

NOTES:

1) CONCRETE INVERT, RETENTION SILLS, AND OTHER MATERIALS NOT YET DESIGNED.
2) THE INTENT IS TO RETAIN THE SAME OR SLIGHTLY LARGER WATERWAY AREA TO AVOID RISE IN THE 50 & 100 YEAR FLOODS
3) REINFORCED CONCRETE INVERT MAY BE CAST IN PLACE OR PRECAST
4) CONTRACTOR TO DETERMINE THE LENGTH OF CULVERT TO BE REMOVED AT ANY ONE TIME.

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: BF 0134(49)	
FILE NAME: 16b068\sl6b068typical.dgn	PLOT DATE: 23-FEB-2017
PROJECT LEADER: ------	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
ALTERNATIVE 1 TYPICAL SECTIONS	SHEET 3 OF 12

EXISTING CURVE 1
DELTA = 105°04'11"
D = 18°16'20"
R = 313.57'
T = 409.17'
L = 575.03'
E = 201.93'

197+07.69' MAINLINE
=52+00.00' CHAN
Δ = 44°RT

EXISTING TOWN ROW

VT ROUTE 11
TO VT ROUTE 106

TH-336
FAIRGROUND ROAD

BENCHMARK
TOP OF BOLT
AT BURY 6-0
ELEV = 450.34

9'-0" X 14'-6" CGMPPA
FLOW

CHESTER BROOK
FLOW

GREEN MOUNTAIN POWER
SUBSTATION

PAVED DRIVE

GRAVEL DRIVE

CHAIN LINK FENCE

PIPE FLOW

COMB 5 2

COMB 1.5

49+74
50+00
51+00
52+00
53+00
53+94
196+00
197+00
198+00
199+00
200+00
201+00
PC STA 195+92.23
POB STA 195+17.86
PT STA 201+67.26

VT STATE PLANE GRID

ALTERNATIVE 1 LAYOUT

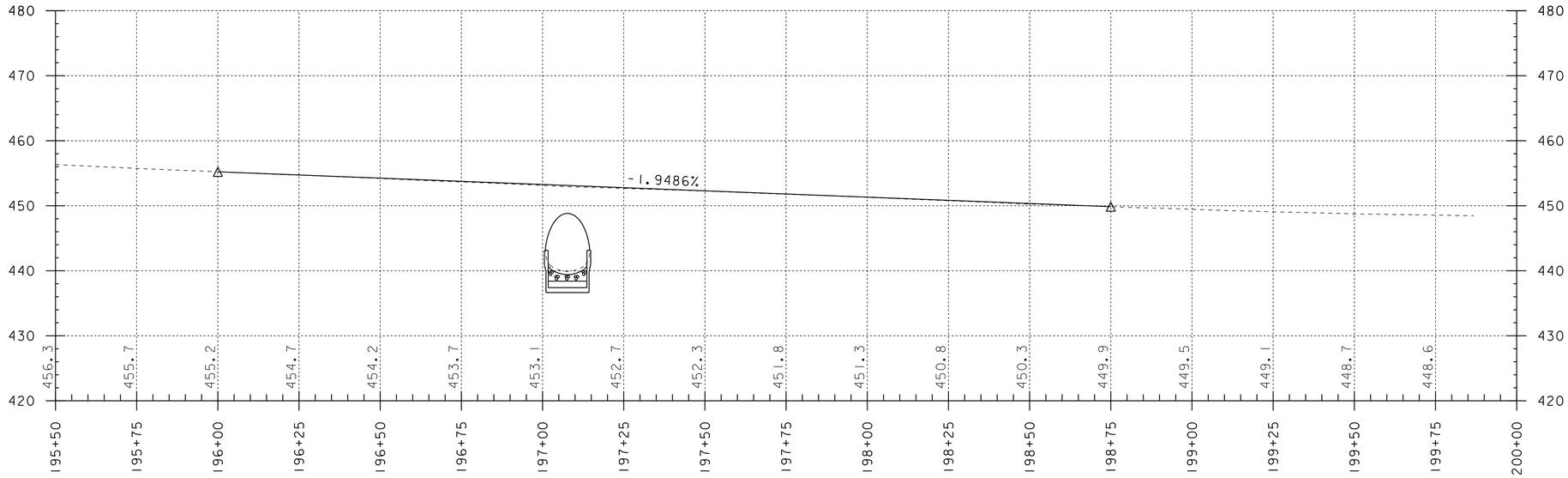
SCALE 1" = 20'-0"
20 0 20

EXISTING BRIDGE INFORMATION
SPAN 14'-3", RISE 8'-11", LENGTH 164'-0"
CGMPPA BUILT 1960
4' AVERAGE COVER
101 SF WATERWAY AREA

PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: BF 0134(49)

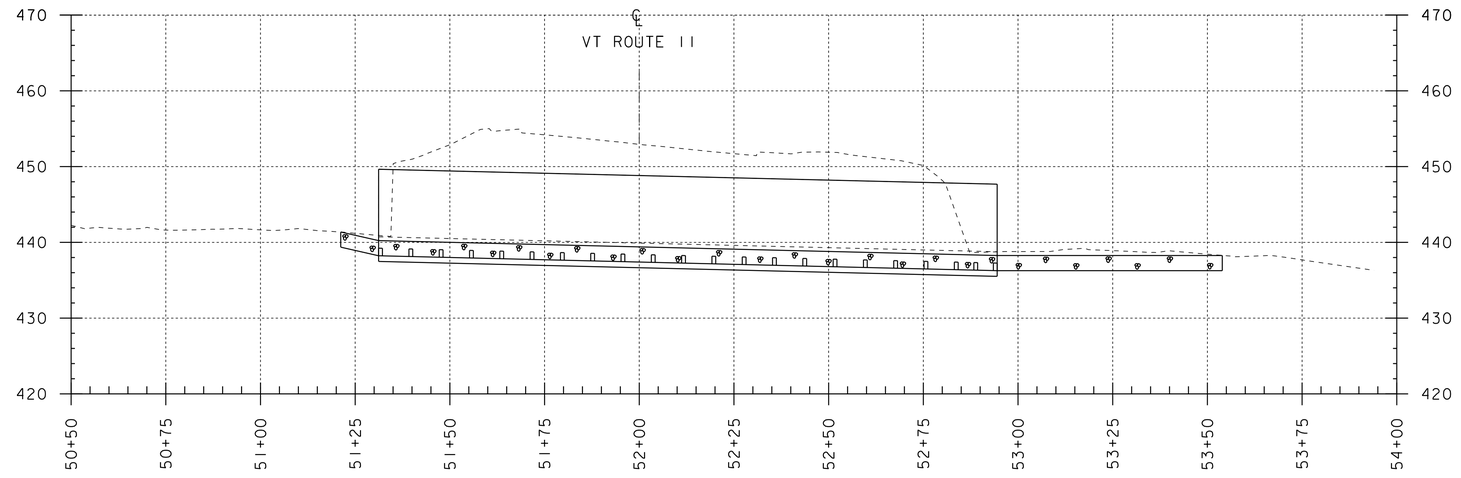
FILE NAME: l6b068/sl6b068border.dgn
PROJECT LEADER: ------
DESIGNED BY: G.SWEENY
ALTERNATIVE 1 LAYOUT SHEET

PLOT DATE: 23-FEB-2017
DRAWN BY: D,D,BEARD
CHECKED BY: G.SWEENY
SHEET 4 OF 12



VT ROUTE 11 ALTERNATIVE 1A PROFILE

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



CULVERT 61 ALTERNATIVE 1A CHANNEL PROFILE

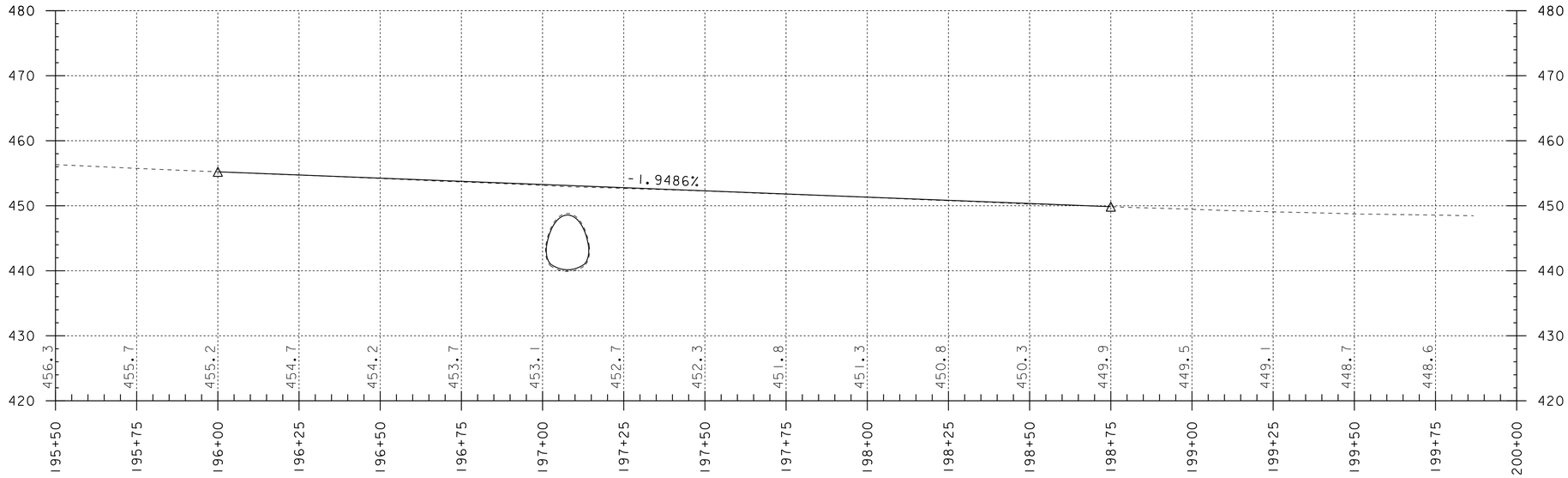
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: BF 0134(49)

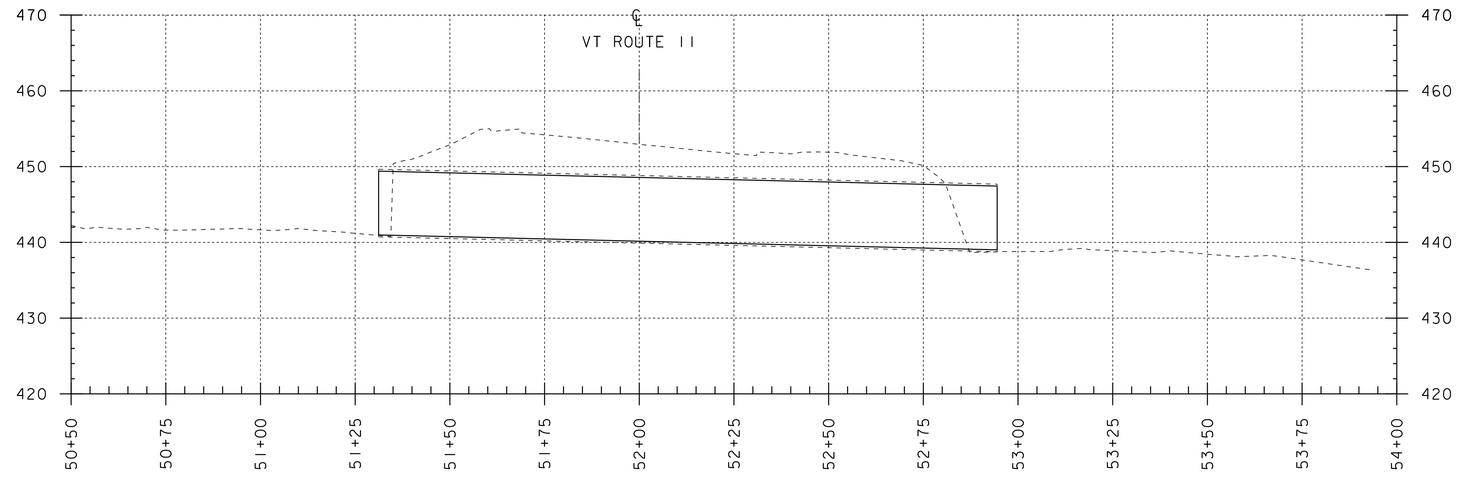
FILE NAME: 16b068/sl6b068profile.dgn
PROJECT LEADER: ------
DESIGNED BY: G.SWEENY
ALTERNATIVE 1A PROFILE SHEET

PLOT DATE: 23-FEB-2017
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 5 OF 12



VT ROUTE 11 ALTERNATIVE 1B PROFILE

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



CULVERT 61 ALTERNATIVE 1B CHANNEL PROFILE

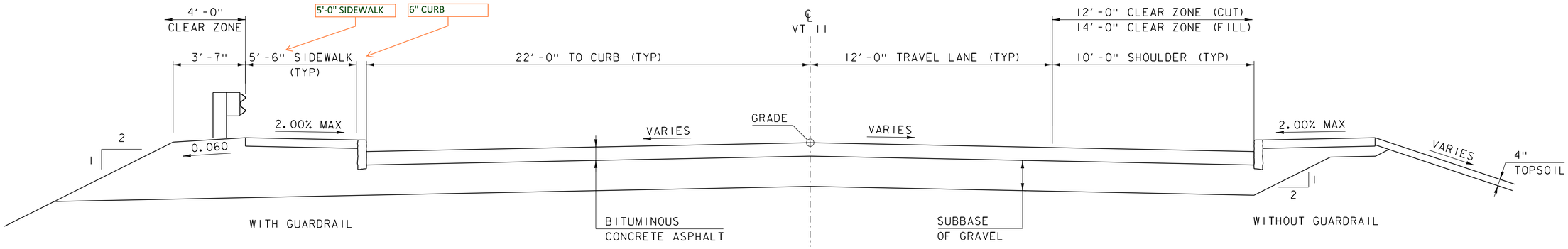
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: BF 0134(49)

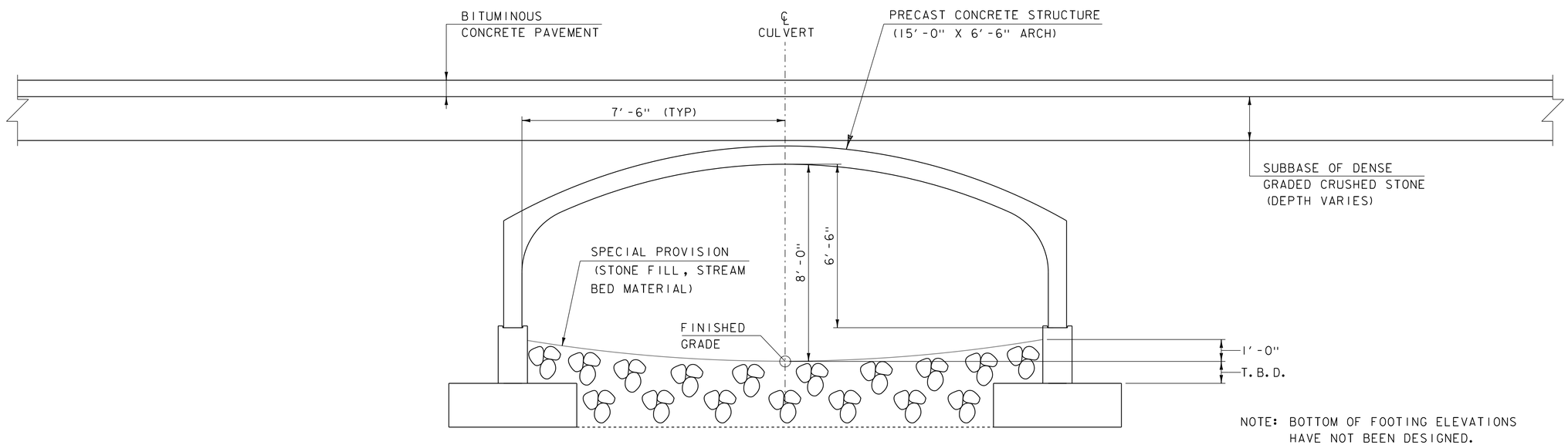
FILE NAME: 16b068/sl6b068profile.dgn
PROJECT LEADER: ------
DESIGNED BY: G.SWEENY
ALTERNATIVE 1B PROFILE SHEET

PLOT DATE: 23-FEB-2017
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 6 OF 12



PROPOSED VT 11 ALTERNATIVE 2 TYPICAL SECTION

SCALE 3/8" = 1'-0"



NOTE: BOTTOM OF FOOTING ELEVATIONS HAVE NOT BEEN DESIGNED.

ALTERNATIVE 2 TYPICAL SECTION

N.T.S.

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	BF 0134(49)
FILE NAME: 16b068\sl6b068typical.dgn	PLOT DATE: 23-FEB-2017
PROJECT LEADER: ------	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
ALTERNATIVE 2 TYPICAL SECTIONS	SHEET 7 OF 12

EXISTING CURVE 1
DELTA = 105°04'11"
D = 18°16'20"
R = 313.57'
T = 409.17'
L = 575.03'
E = 201.93'

197+07.69' MAINLINE
=52+00.00' CHAN
Δ = 44°RT

EXISTING TOWN ROW

VT ROUTE 11
TO VT ROUTE 106

TH-336
FAIRGROUND ROAD

BENCHMARK
TOP OF BOLT
AT BURY 6-0
ELEV = 450.34

PAVED DRIVE

CHAIN LINK FENCE

GRAVEL DRIVE

GREEN MOUNTAIN POWER SUBSTATION

CHESTER BROOK

FLOW

9'-0" X 14'-3" CGMPPA

ARCH

PIPE FLOW

COMB

49+74
50+00
51+00
52+00
53+00
53+94
196+00
197+00
198+00
199+00
200+00
201+00
202+

PC STA 195+92.23

PT STA 201+67.26

POB STA 195+17.86

VT ROUTE 11
TO CHESTER

EXISTING TOWN ROW

N

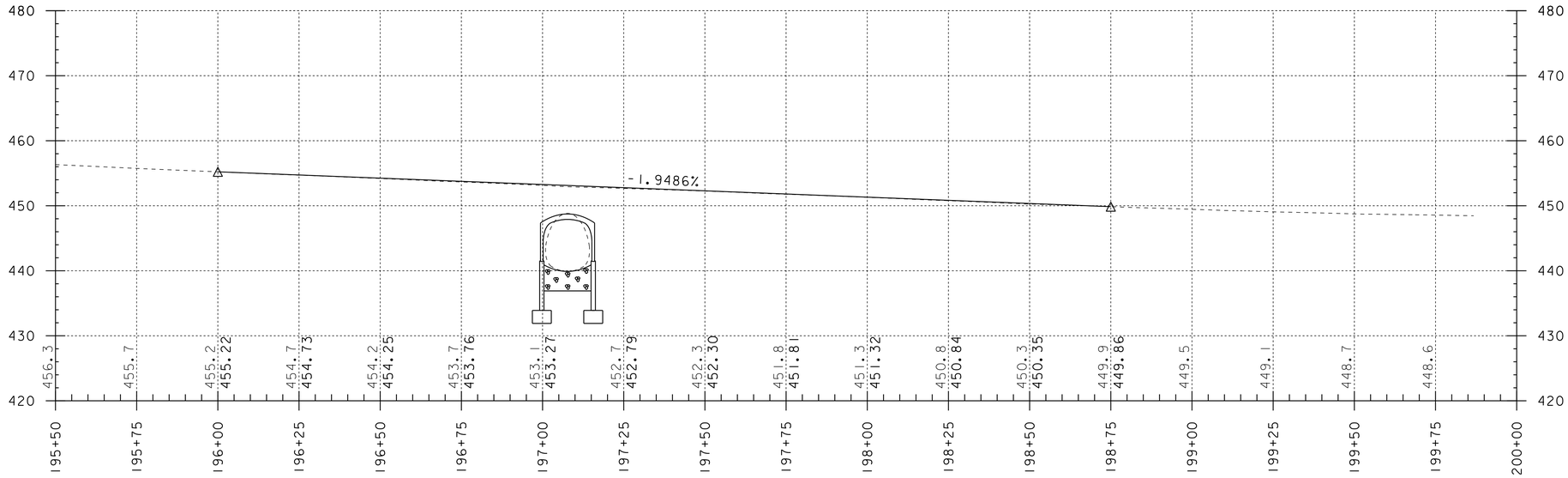
VT STATE PLANE GRID

ALTERNATIVE 2 LAYOUT

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

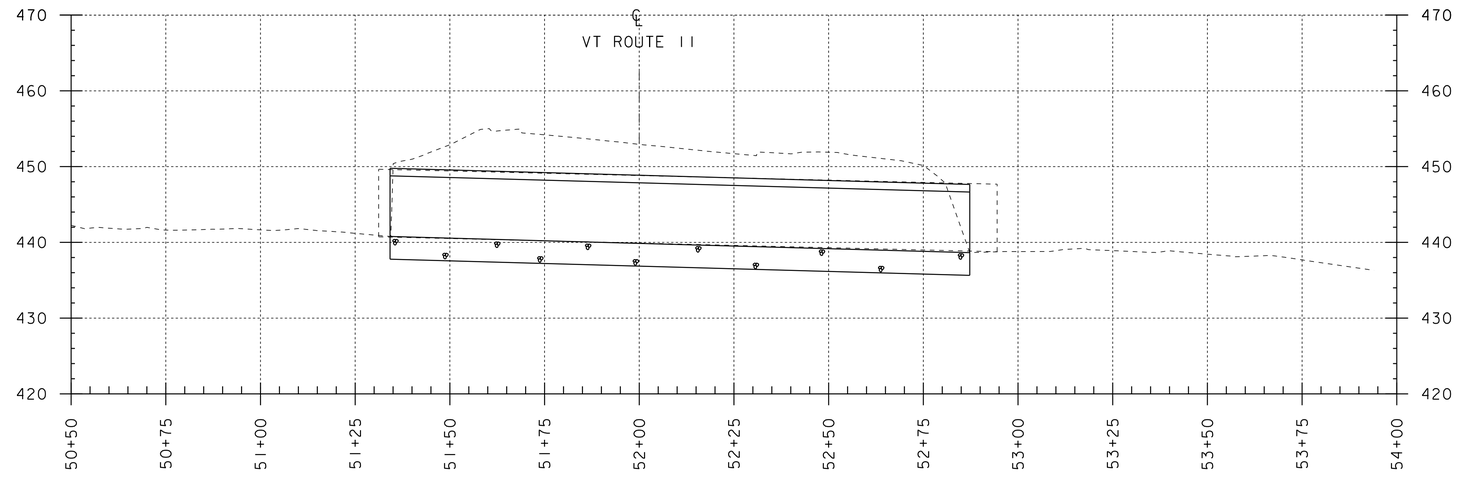
EXISTING BRIDGE INFORMATION
SPAN 14'-3", RISE 8'-11", LENGTH 164'-0"
CGMPPA BUILT 1960
4' AVERAGE COVER
101 SF WATERWAY AREA

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	BF 0134(49)
FILE NAME:	l6b068/sl6b068border.dgn
PROJECT LEADER:	------
DESIGNED BY:	G.SWEENY
ALTERNATIVE 2 LAYOUT SHEET	
PLOT DATE:	23-FEB-2017
DRAWN BY:	D,D,BEARD
CHECKED BY:	G.SWEENY
SHEET	8 OF 12



VT ROUTE 11 ALTERNATIVE 2 PROFILE

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



CULVERT 61 ALTERNATIVE 2 CHANNEL PROFILE

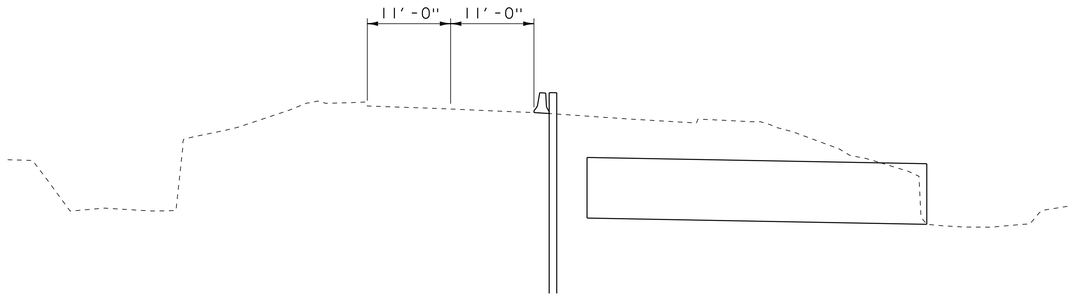
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

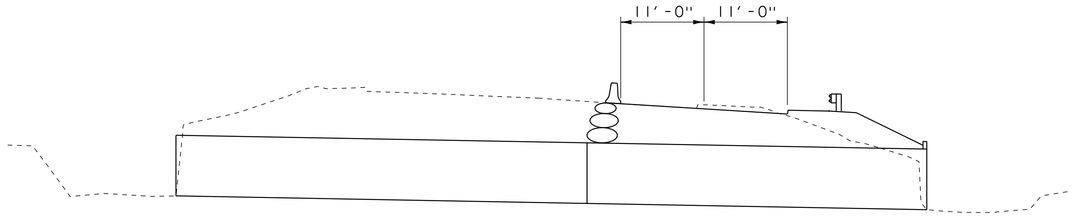
PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: BF 0134(49)

FILE NAME: 16b068/sl6b068profile.dgn
PROJECT LEADER: ------
DESIGNED BY: G.SWEENY
ALTERNATIVE 2 PROFILE SHEET

PLOT DATE: 23-FEB-2017
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 9 OF 12

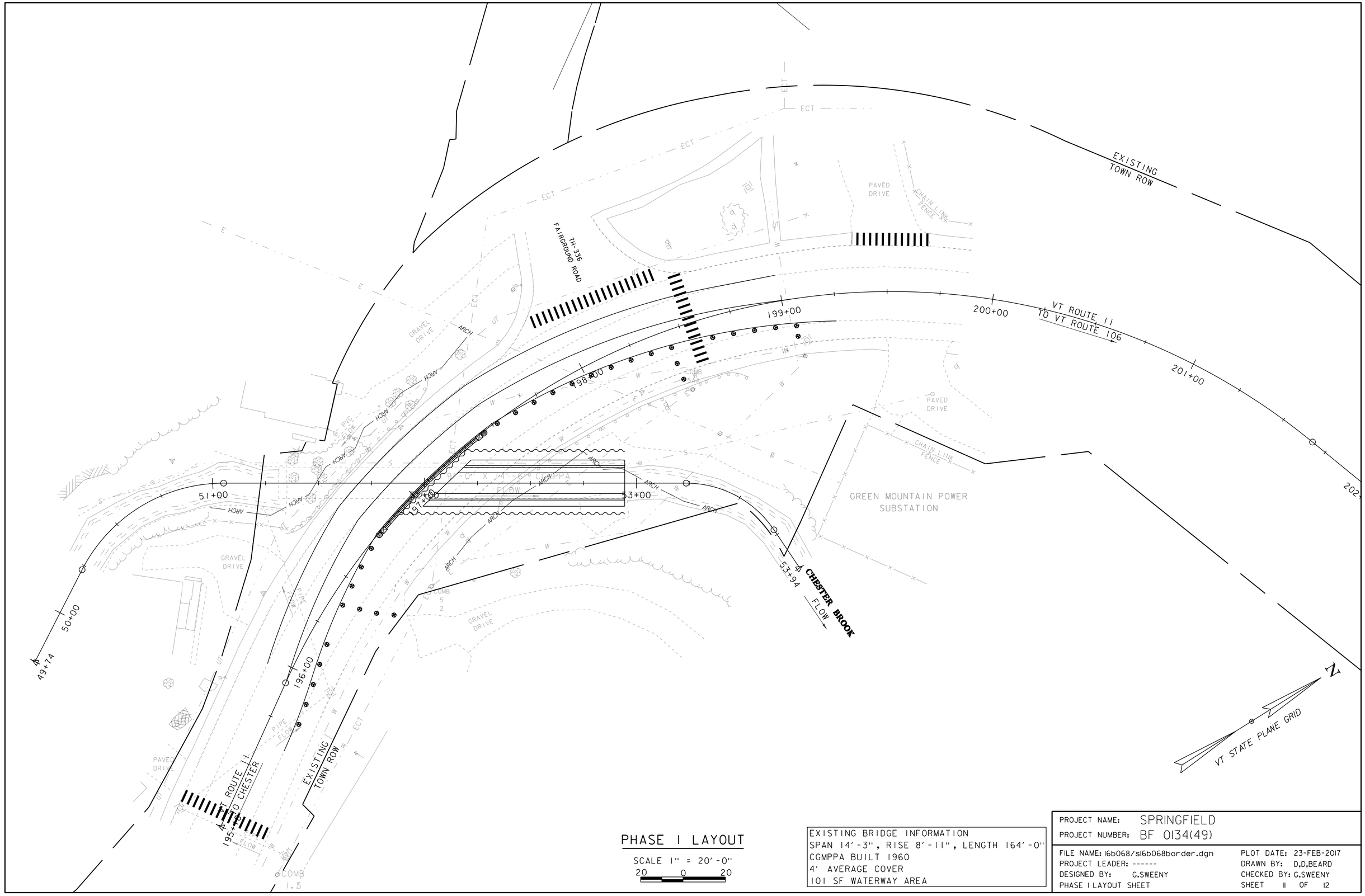


PHASE 1 PROFILE



PHASE 2 PROFILE

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	BF 0134(49)
FILE NAME: I6b068/sI6b068phasing.dgn	PLOT DATE: 23-FEB-2017
PROJECT LEADER: ------	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
PHASING PROFILES	SHEET 10 OF 12



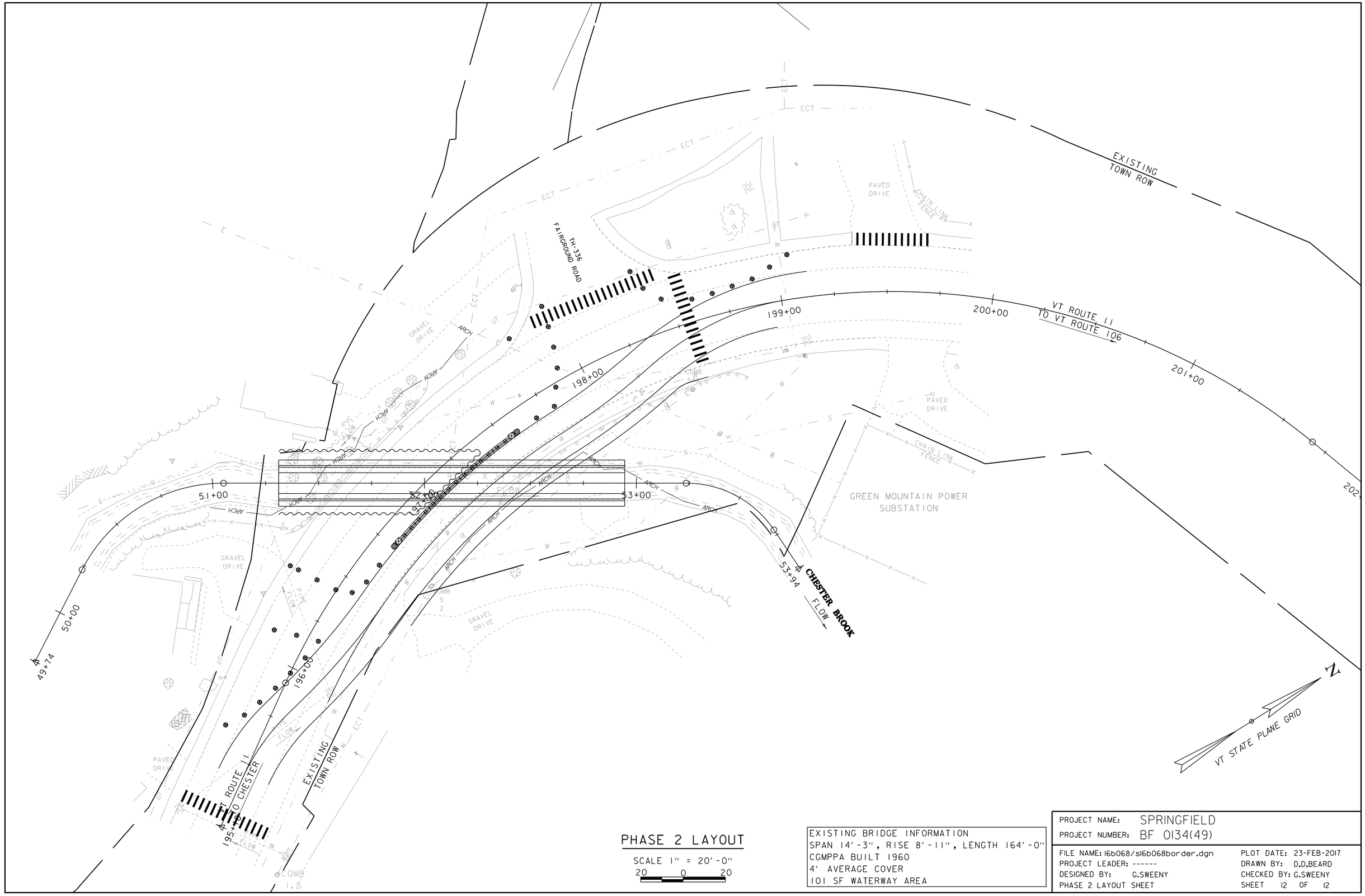
PHASE I LAYOUT

SCALE 1" = 20'-0"

20 0 20

EXISTING BRIDGE INFORMATION
SPAN 14'-3", RISE 8'-11", LENGTH 164'-0"
CGMPPA BUILT 1960
4' AVERAGE COVER
101 SF WATERWAY AREA

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	BF 0134(49)
FILE NAME:	16b068/sl6b068border.dgn
PROJECT LEADER:	------
DESIGNED BY:	G.SWEENY
PHASE I LAYOUT SHEET	
PLOT DATE:	23-FEB-2017
DRAWN BY:	D,D,BEARD
CHECKED BY:	G.SWEENY
SHEET	11 OF 12



PHASE 2 LAYOUT

SCALE 1" = 20'-0"

20 0 20

EXISTING BRIDGE INFORMATION
SPAN 14'-3", RISE 8'-11", LENGTH 164'-0"
CGMPPA BUILT 1960
4' AVERAGE COVER
101 SF WATERWAY AREA

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	BF 0134(49)
FILE NAME:	I6b068/sI6b068border.dgn
PROJECT LEADER:	------
DESIGNED BY:	G.SWEENY
PHASE 2 LAYOUT SHEET	
PLOT DATE:	23-FEB-2017
DRAWN BY:	D,D,BEARD
CHECKED BY:	G.SWEENY
SHEET	12 OF 12