STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Springfield IM 091-1(83)

I-91 Bridges 28 N&S over US Route 5

August 25, 2020

I. Contents

I. Site Information

Bridges 28 N&S are located along Interstate 91 (I-91) at the interchange of exit 7 at mile marker 41.6 and cross over US Route 5 in the Town of Springfield. The existing conditions were gathered from a combination of a Site Visit, the Inspection Report, the Route Log and Orthophotos. See correspondence in the Appendix for more detailed information.

Roadway Classification	I-91: Principal Arterial – Interstate, National Highway System US Route 5: Major Collector
Bridge Type	28N: 4 Span Rolled Beam 28S: 4 Span Rolled Beam
Bridge Lengths	28N: 202-feet 28S: 207-feet
Year Built	1965
Ownership	State of Vermont

Need

Bridges 28 N&S carry Interstate 91 over US Route 5. The following is a list of deficiencies of Bridges 28 N&S in this location:

1. While the deck on bridges 28N and 28S are rated as fair and satisfactory respectively, they have minor maintenance needs as follows:

    - *Wearing surface:* There are patched areas in the pavement surrounding the joints along with some depressions and minor cracking. Potholes are likely to form in the near future.
    - *Curbs:* The curbs are concrete with granite facing. The concrete areas of the curbs have large areas of spalling with deep voids, scaling, and exposed reinforcing. The curb ends surrounding the bridge joints have large spalled-out openings that allow runoff to fall onto the substructures and beam ends below.
    - *Joints:* The Replacement fabric troughs have moderate debris build up. Additionally, the finger plate joints have some minor rust staining.
    - *Fascia:* The bridge fascias are in fair condition, with scattered areas of spalling with scaling and exposed reinforcing due to the spalled-out joint ends and curbs.
    - *Reinforced concrete deck:* The deck has patched areas scattered throughout and transverse cracks with minor saturation and small delaminations.

2. While the superstructure on bridges 28N and 28S are rated as fair and satisfactory respectively, they have minor maintenance needs as follows:

    - *Lateral Bracing:* The channel diaphragms are in good to satisfactory condition. The diaphragms over the middle pier and abutments have rust scale with minor to moderate pitting/section loss, due to the saturation of the surrounding area of the joints.
    - *Rolled Beams:* The beams have scattered paint peel with exposed primer and some minor rust scale, mostly along the fascia beams. The beam ends at the abutments and pier 2 have rust scale with minor to moderate section loss, mostly along the west fascia.

- *Bearings:* The pedestal bearings have areas of rust scale with minor to moderate section loss at the abutments and at pier 2. Some of the swedge bolts in the west ends have significant section loss.

3. While the substructure on bridges 28N and 28S are rated as fair and satisfactory respectively, they have minor maintenance needs as follows:

    - *Reinforced concrete backwalls:* The backwalls have large areas of saturation with map cracking and scattered rust staining. Additionally, there are areas of minor spalling in the west ends.
    - *Abutment 1 and 2 seat/stem:* The abutments are in satisfactory condition with some minor to moderate distress. There are scattered areas with saturation, map cracking, and small areas of rust staining.
    - *Wingwalls:* The wingwalls have some map cracking with light staining.
    - *Piers seat/caps:* The caps of piers 1 and 3 are in good condition. The cap of pier 2 has fine map cracks in the ends and some scattered delaminations. The west end has moderate saturation and some scattered small areas of rust staining.
    - *Pier columns:* The pier columns are in fair condition with moderate distress. The columns of piers 1 and 3 are in good condition while the west column of pier 2 has vertical cracking with delaminations and spalling in the base with exposed reinforcing.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2024 and 2044.

Section	AADT		DHV		%T		%D		ADTT		ESALs	
	2024	2044	2024	2044	2024	2044	2024	2044	2024	2044	(2024~2044)	(2024~2044)
1	8,600	9,400	1,400	1,600	13.8	20.1	100	100	1,500	2,400	10,392,000	23,970,000
2	4,200	4,700	860	960	13.9	20.3	100	100	830	1,400	5,651,000	13,133,000

Section 1 – Bridge 28 Northbound
Section 2 – Bridge 28 Southbound

The 2018 AADT on US Route 5 under Bridges 28 N&S is 3,470 vehicles per day.

Design Criteria

The design standards for this project are the Vermont State Standards (VSS), dated October 22, 1997, A Policy on Geometric Design of Highways and Streets (Green Book), 7th Edition, the VTrans Structures Design Manual, dated 2018, and Interstate Scoping Guidance, dated 2014. Minimum standards are based on the traffic volumes listed above and a design speed of 70 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	Green Book Chapter 8.2	4'-12'-12'-10' (38')	4'-12'-12'-10' (38')	
Bridge Lane and Shoulder Widths	Green Book Chapter 8.2	NB: 3'-12'-12'-12'-3' (42') SB: 3'-12'-12'-3' (30')	NB: 4'-12'-12'-12'-10' (50') SB: 4'-12'-12'-10' (38')	Substandard shoulder widths both northbound and southbound
Clear Zone Distance	VSS Table 3.4	Clear or Shielded	26' fill / 20' cut	
Banking	VSS Section 3.13	NB: 5.6% SB: 8%	8% (max)	Northbound slightly substandard
Speed		65 mph (Posted)	70 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	$R_{NORTHBOUND}$ = 2,865' $R_{SOUTHBOUND}$ = 1,910'	R_{min}= 2,790' @ 6.6% R_{min}= 1,810' @ 8%	Northbound slightly substandard
Vertical Grade	AASHTO Green Book Table 8-1	NB: -2.71% (max) SB: -1.01% max)	4% (max) for rolling terrain	
K Values for Vertical Curves	AASHTO Green Book Table 3-35	$K_{CREST-NB}$ = 210 $K_{CREST-SB}$ = 312	247 crest / 181 sag	Northbound slightly substandard
Vertical Clearance Issues	VSS Section 5.8	14'-11" (below 28N) 17'-4" (below 28S)	14'-3" (min)	
Stopping Sight Distance	AASHTO Green Book Table 3-35	NB: 673' SB: 821'	730'	Northbound slightly substandard
Bicycle/Pedestrian Criteria		None	N/A	Limited Access
Bridge Railing (and Approach Railing)	Structures Design Manual Section 13.2	2-rail curb mounted box beam	TL-5	Substandard
Structural Capacity	Structures Design Manual Section 3.4.1	Structurally Sufficient (28N&S)	Design Live Load: HL-93	

Inspection Report Summary

Bridge	Deck Rating	Superstructure Rating	Substructure Rating	Channel Rating
28 N	5	5	5	N/A
28 S	6	6	6	N/A

Bridge 28 N:

5/17/2018 – This structure should be considered for a deck replacement project, eliminating the joint over pier 2 and new joints installed over the abutments. Concrete repairs are needed to pier 2 and abutment 2, removing all loose concrete and delams. The west fascia beam ends over pier 2 need to have steel repairs made. New bearings should be set in areas below the joints, mostly along the west fascia. ~JW/MC

5/16/2016 – This structure needs to have concrete repairs to the curbs with new seals installed especially in the ends surrounding the joints. The finger plate joints should be considered for replacement with Vermont joints and should extended to the fascias with scuppers installed.

Concrete repairs are needed to abutment 2, piers 2 and 3 with all loose concrete/delams removed and then patched. ~JW/AC

5/15/2014 – Curbs need major repair soon. Weep tubes should be extended below the beams. Bearing have been greased however the heavy rusting should have been cleaned. the bearing on abutment #1 side under beam #1 and #5 should be cleaned and reset as bearing #5 on abut#1 could fail. Erosion in the slopes at the drain troughs should be repaired. Beams should be spot cleaned and painted. ~FRE/TJB

5/22/2012 – Curbs should be cleaned and patched along with the columns on pier #3. ~FRE/SJH

Bridge 28 S:

5/18/2018 – This structure should be considered for a deck replacement project, or new fascias installed to replace the heavily deteriorated cubs and affected soffit below. New joints over the abutments should be installed as well. The beams need general cleaning and painting. ~JW/MC

5/16/2016 – This structure needs to have concrete repairs to the curbs with new seals installed especially in the ends surrounding the joints. The finger plate joints should be considered for replacement with Vermont joints and should extended to the fascias with scuppers installed. ~JW/AC

5/15/2014 – Curbs should be cleaned of all loose material and patched. Beams should be spot cleaned and painted. ~FRE/TJB

5/22/2012 – Curbs should be cleaned and patched along with the spalling in the fascias. ~FRE/SJH

04/12/2010 – Left top rail near abutment No.2 needs repair or replacement. Column No.1 of pier No.2 needs repair. The curb areas on both sides are in need of repairs. ~PLB

Hydraulics

Bridge 28 N&S is a dry crossing, so hydraulics is not applicable.

Utilities

Aerial Utilities:

- There are no known aerial utilities within the project limits.
- Approximately 615 feet to the south of the bridges there is an aerial crossing for a power service. These should not be impacted by the project. FirstLight has buried fiber in bike path/Toonerville Trail approximately 660 feet south of bridges. It is not expected that this will be impacted by the project.

Underground Utilities:

- There are no known underground utilities within the project limits.

Municipal Utilities:

- No known water or sewer lines exist within the project limits.

Right of Way

The existing approximate Right-of-Way is shown on the Existing Conditions Layout sheet.

It is anticipated that Right-of-Way acquisitions will not be required for any work associated with this project.

Resources

The resources present at this project are shown on the Existing Condition Layout sheets.

Archaeological:
There are no archaeologically sensitive areas within the project area.

Historic:
The project is considered EXEMPT for above-ground historic resources per the Section 106 Exemption Regarding Effects to the Interstate Highway System adopted by the Advisory Council on Historic Preservation on March 10, 2005.

Natural Resources:

Wetlands/Watercourses

There are no wetlands or watercourses within the review area.

Wildlife Habitat

There is very limited wildlife habitat at this location.

Rare, Threatened and Endangered Species

The only listed species in the project area is the federally threatened northern long-eared bat. The bridge does not provide useful roosting habitat, so restrictions caused by this animal are unlikely.

Agricultural Soils

There are no mapped agricultural soils in the review area.

Hazardous Materials:
There are no hazardous waste sites located in the immediate vicinity of the bridge. The hazardous waste sites located in the project area are shown on the map to the right. There are several hazardous waste sites in close proximity to the project area.

Stormwater:
No known issues.

II. Safety

Crashes from the last 5-year period are shown to the right. Each black dot on the map represents a crash.

Interstate 91: There have been 9 crashes located in the project area along Interstate 91 in Springfield within the last 5-year period.

US Route 5: There have been 19 crashes located along US Route 5 and at the I-91 ramps at exit 7 in Springfield within the last 5-year period.

The following High Crash Locations are located within the project area:

High Crash Location Segment:

Route	Town	Mileage	# of Crashes	# of Fatalities	# of Injuries
I-91	Springfield	41.5 – 41.8	11	0	2

The VTrans Traffic Safety Engineer evaluated the project site with the following findings:

High Crash Segment, I-91, MM 41.5 – 41.8

This section of I-91 includes Bridges 28 N & S as well as the I-91 NB on ramp and the I-91 SB on ramp at exit 7.

Crashes from 2010 and up were reviewed by the VTrans Highway Safety Engineer with the following findings:

"The project area was identified as a high crash location between mile points 41.5 and 41.8 in the 2010-2014 HCL report. The project was not identified as a high crash location in subsequent HCL reports (2012-2016 and draft 2014-2018).

A review of crashes since 2010 indicates that most of the crashes happened in the southbound direction (a collision diagram is attached for reference).

From the data available, it appears that the area of the bridge, in the southbound direction, is prone or was prone to black ice and being slippery. The following two statements from crash narratives from two different years are indicative of this: “Interstate 91 was clear and dry in either direction about a mile from the scene”; “The bridge in this area had more slush ice than other areas on the interstate”.

I followed up with the District to see if they had more information about this issue. The District indicated that the bridge has had inherent joint issues and that the plows have to be raised a little so they do not catch the steel joint. They indicated that this tends to leave some residue on the bridge deck at times which could cause ice and did mention that they put salt to all of the bridges at a higher rate.

Because there are several crashes listed at mile point 41 that do not have information (since they are considered non-reportable) but that may well have happened in the area of the bridge, we contacted the VSP Westminster barracks to obtain more details. While some of the more recent “non-reportable” crashes have involved vehicles that slide off, the data is inconclusive as to whether these happened at the bridge.

Based on the above discussion, there has been an issue with the bridge icing (potentially because of issues with the steel joint and the need for the plows to be lifted slightly), and this caused crashes in the past. It is not clear if this type of crash is still happening. The District mentioned that they are putting more salt on the bridges. In light of this, I do not have any suggestions to reduce the frequency of crashes.”

III. 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. The following options have been considered:

Option 1: Off-Site Detour

This option would close the section of I-91 between the on and off ramps at exit 7.

I-91 Northbound: Traffic traveling northbound on I-91, would utilize US Route 5 between exit 6 and exit 8. The through distance on the US Route 5 detour is almost identical at 20.8 miles versus the 17.7 miles on I-91, with travel times estimated at 28 minutes for the detour route and 19 minutes for traveling on I-91.

I-91 Southbound: The detour would utilize the on and off ramps at exit 7 for southbound traffic. This detour would not add any distance to the through route. The median between US Route 5 northbound and southbound currently restricts traffic from traveling straight across and would need to be modified to allow traffic to cross over US Route 5 during construction.

It is recommended that a detour only be utilized for brief closure periods during off peak hours, such as nights or weekends, in order to rapidly replace the deck or superstructures. The methods available to replace a deck or superstructure during a short closure period include: lateral slide, self-propelled modular transporters (SPMTs), and prefabricated bridge elements. Each of these methods is discussed briefly below.

Lateral Slide

A lateral slide consists of constructing an entire superstructure adjacent to the location where it is intended and physically pushing or pulling the structure into its design location along lubricated rails. This allows traffic to be maintained on the existing bridges while construction of the bridges takes place. Traffic would then be detoured for approximately 3 days while the existing bridge is removed and the new bridge is moved into place.

[Images from "Accelerated Bridge Construction - Experience in Design, Fabrication and Erection of Prefabricated Bridge Elements and Systems" from FHWA (2011).]

One of the disadvantages of utilizing a lateral slide for Bridges 28 N&S is that the construction still needs to take place over US Route 5. There are some height restrictions and worker safety issues when construction occurs over busy roadways.

Self-Propelled Modular Transporters (SPMT)

There are several methods of constructing the bridge in a safer, less restricted environment before moving it into place. One of those methods utilizes SPMTs. Similar to a lateral slide, SPMT placement requires that the entire superstructure is constructed near but not in its intended location, allowing traffic to be maintained on the existing bridges while the new bridges are constructed. Instead of sliding the superstructure into place, it is lifted off its temporary blocking, moved a short distance to its design location, and lowered into place. This method can also be used in reverse to remove the existing superstructure.

Superstructures have been removed and replaced utilizing SPMTs during 12 hour stretches overnight. This type of technology has been used in several states, including Florida, Louisiana, Minnesota, Rhode Island, New York, Illinois, Washington, and Utah. It is reasonable to assume that the I-91 closure period would be similar to that for a lateral slide to incorporate the site

preparation work, the cleanup and backfilling that may be required after the superstructure has been replaced. One of the disadvantages of using SPMTs is that US Route 5, in addition to I-91, needs to be closed to traffic while the move is taking place. While this is an additional inconvenience, it does not rule out the use of SPMTs because there are alternate methods for traffic to get to the other side of I-91 on US Route 5.

Prefabricated Bridge Units (PBU)

Another method of constructing the bridge in a safer and less restricted environment over US Route 5 is to prefabricate portions of the bridge structure and deliver those pieces to the construction site to be joined together to form the bridge. These bridge superstructure pieces are referred to as Prefabricated Bridge Units, or PBUs. Many substructure pieces can be prefabricated as well and lifted into place before the PBUs are placed. Using rapid setting concrete for the joint closure pours, the closure period can be reduced to 3 days per bridge for this method of superstructure replacement as well.

Installation Costs

The baseline method of installing the superstructure is using a crane to lift the PBUs into place. These costs are included in the baseline bridge costs. The extra engineering and temporary supports required for a lateral slide are approximately $150,000 per bridge, and the costs paid to an SPMT subcontractor would be around $200,000 per bridge for a dry crossing.

A map of the detour route can be found in Appendix N.

Advantages: The costs associated with signing the detour are much lower than the construction costs associated with the other maintenance of traffic options. By detouring traffic away from construction activities, it creates a safer working environment for the construction workers. By not constructing the structure in phases, there will be no vibrations or deflections from adjacent traffic to affect the quality of the closure pours joining the phases. By not requiring the construction and removal of temporary approaches, temporary bridges and temporary crossovers, the length of construction can be reduced over those other options.

Disadvantages: Traffic will not be maintained along the existing corridor for a limited portion of construction. Through traffic will see an increase in travel times during the closure period.

Option 2: Temporary Bridges

The standard maintenance of traffic option based on the length of the bridges and the traffic volumes at these locations would be a one lane temporary bridge for each barrel of I-91. There is sufficient Right-of-Way located along this section of I-91 that a temporary bridge could be located east of the existing bridges while the northbound bridges are under construction and west of the existing bridges while the southbound bridges are under construction.

A one lane Mabey bridge is approximately 24' wide. The distance between the northbound and southbound bridges varies between 85' and 110'. Thus, it would seem that a temporary bridge could be launched between the north and south bound bridges to be utilized in turn for both the north and southbound traffic without being moved while work is being performed on each bridge.

This is the configuration shown in the Appendix and considered further in this report.

Advantages: A temporary bridge maintains traffic along the existing corridor during construction.

Disadvantages: There are extra costs associated with constructing or launching temporary bridges. Changes in traffic patterns can increase the probability of accidents and the increased time associated with constructing temporary approaches and launching the temporary bridges puts the construction workers at increased risk for accidents. In order to minimize the length of median affected by the temporary roadwork, the design speed should probably be reduced to more safely allow vehicles to navigate the temporary roadway. This decrease in speed would cause slight traffic delays.

Option 3: Phased Construction

Phased construction is the maintenance of one lane of traffic on the existing bridge while working on the other lane. The project begins with traffic being constricted to one lane, while work is done on the other. After completion of improvements to the first lane, traffic is switched to the completed lane and work proceeds on the second lane. Traffic flow is constant, although delayed due to slower speeds in the work zone. In the case of Interstate bridges, phasing is usually appropriate only for repairs or replacement of deck and/or railing. For bridge 28 N, the DHV volume of 1,400 vehicles per hour is slightly above the 1,250 vehicles per hour cutoff that guidance allows for one lane during peak hours, therefore phasing should be considered for a reasonable period of time without needing to reopen both lanes, but should be limited in order to reduce traffic congestion. For bridge 28 S, the DHV volume of 860 vehicles per hour is well below the 1,250 vehicles per hour cutoff that guidance allows for one lane during peak hours, therefore phasing could be considered for a reasonable period of time without needing to reopen both lanes. Periodic short-term lane closures or shifts on US Route 5 may be necessary to provide access to crews working on the superstructures from below. These shifts or closures would not be advised during peak hours.

Advantages: Traffic flow is maintained through the corridor during the project. Phasing the work allows the work to proceed one lane at a time without the expense of a temporary bridge or crossovers and without the inconvenience of a closure and detour.

Disadvantages: Compared to a closure and detour or a temporary bridge scenario, it takes longer and costs more to construct, rehabilitate, or repair a bridge project in phases because some of the construction tasks have to be performed multiple times and cannot be performed concurrently. Additional permit requirements may come into play. The safety risks for both workers and travelers are also increased due to the close proximity to each other. Some structural qualities, such as joints, demand more coordination time and may suffer in quality as well. Periodic lane closures outside of peak hours on US Route 5 may be required.

Option 4: On-Site Detour with Crossovers

Another method for maintaining traffic on parallel structures with multiple lanes of unidirectional traffic is creating a crossover in the median before and after the structures to get all traffic off one structure and on to the parallel structure. This option is rarely available for most projects, because

most non-interstate structures in Vermont do not have parallel bridges. The possibilities on interstates may even be limited based on site distance, traffic patterns or obstructions in the median.

Bridges 27 N&S over the Toonerville rail trail are located 600 feet south of Bridges 28 N&S. North of Bridges 28 N&S, the northbound and southbound barrels split from each other, with some large trees located in the median area. Additionally, the elevation of the northbound and southbound lanes have nearly a 10-foot difference between them just north of the bridges, requiring a large amount of fill for a crossover. While feasible, this makes the site not ideal for a crossover.

IV. Alternatives Discussion

While bridges 28 N&S are not structurally deficient there are major maintenance needs as described in the Needs section above.

Maintenance Schedule:
It is desired to keep the northbound and southbound direction for each bridge on the same maintenance cycle. Therefore, the recommended scope for Bridge 28N should be the same for Bridge 28S.

No Action

This alternative would involve leaving the bridges in their current condition. A good rule of thumb for the "No Action" alternative is to determine whether the existing bridge can stay in place without any work being performed on it during the next 10 years. While Bridges 28 N&S are in fair to satisfactory condition, there are maintenance issues that need to be addressed in order to extend the useful life of the structure and slow down the current deterioration. Since some work is required within the next 10 years, the No Action alternative will not be considered further in this report.

Alternative 1: Rehabilitation

This rehabilitation option includes the minimal amount of work necessary to extend the useful lives of the bridges. While the substructure, superstructure, and deck are rated as being in fair to satisfactory condition, there are maintenance issues that would need to be addressed with any rehabilitation. A rehabilitation for the bridges would include the following:

- Northbound substructure work: While piers 1 and 3 are in good condition, the middle pier has patched areas and significant cracking with large delaminations throughout. The superstructure should be shored at the middle pier, and new pier columns and a cap should be poured, or the existing pier should be encased in concrete. While the northern abutment is in satisfactory condition, the southern abutment has large areas of saturation with cracking and surrounding delaminations throughout. Additionally, there is a large area of spalling in the west end that is starting to undermine the bearing. Extensive concrete repairs or a new abutment stem should be poured.

- Southbound substructure work: While piers 1 and 3 are in good condition, the middle pier has patched areas and significant cracking with large delaminations throughout. The superstructure should be shored at the middle pier, and new pier columns and a cap should be poured, or the existing pier should be encased in concrete. There are scattered areas of fine cracking in the wingwalls and abutments. These areas should be prepared for concrete repair and repaired with the appropriate concrete class.

- The beams have some heavy rust scale with minor to heavy section loss, localized at the beam ends at the abutments and piers. The northbound bridge has a beam with a large hole in the web and has minimal section remaining in the flange, bending could soon occur. This beam should be repaired, and all other beams should be painted and repaired as needed.

- The concrete curbs behind the granite facing have a significant amount of map cracking with some heavily spalled areas with exposed reinforcing. The bridge fascias would be removed, and new fascias, curbing, and railing would be constructed.

- All exposed concrete on the bridges should be sprayed with silane water repellant. This should protect the degrading concrete for several years against moisture damage, at which point, a new application should occur.

- The existing decks would be membraned and paved.

The existing bridge components are in fair to satisfactory condition. It is reasonable to assume that with the repairs listed above, the existing substructure and beams can safely carry anticipated traffic loads for an additional 30 years.

The current curb to curb width of bridges 28N and 28S is approximately 42 feet and 30 feet wide respectively, which is substandard by 8-feet on each of the bridges. The overhangs may be increased slightly to provide a wider shoulder over the bridges. Any possible widening will be determined in design.

Advantages: This option provides the lowest upfront cost to extend the life of the structure.

Disadvantages: Having newer non-chloride laced concrete adjacent to the existing concrete usually exacerbates the rate of deterioration of the remaining concrete which surrounds the repairs. This can be mitigated for approximately 30 years with the addition of sacrificial anodes into the patched structure.

Maintenance of traffic: Most of this work can be accomplished with single lane closure utilizing phased construction on I-91. Individual lanes on US Route 5 may need to be closed as well while substructure and overhead repair work is occurring.

This alternative will address the deterioration issues of the existing bridges.

Alternative 2: Deck Replacement

A deck replacement for this bridge would include a new deck, curbs and railings, along with substructure concrete repairs. This option would include the following:

- The existing deck would be removed, and a new cast-in-place deck would be poured. The fascia detail would be modified to allow for a slightly wider structure. Along with the new decks, new backwalls would be poured and new bridge joints would be installed.

- Northbound substructure work: While piers 1 and 3 are in good condition, the middle pier has patched areas and significant cracking with large delaminations throughout. The superstructure should be shored at the middle pier, and new pier columns and a cap should be poured, or the existing pier should be encased in concrete. While the northern abutment

is in satisfactory condition, the southern abutment has large areas of saturation with cracking and surrounding delaminations throughout. Additionally, there is a large area of spalling in the west end that is starting to undermine the bearing. Extensive concrete repairs or a new abutment stem should be poured.

- Southbound substructure work: While piers 1 and 3 are in good condition, the middle pier has patched areas and significant cracking with large delaminations throughout. The superstructure should be shored at the middle pier, and new pier columns and a cap should be poured, or the existing pier should be encased in concrete. There are scattered areas of fine cracking in the wingwalls and abutments. These areas should be prepared for concrete repair and repaired with the appropriate concrete class.

- The beams have some heavy rust scale with minor to heavy section loss, localized at the beam ends at the abutments and piers. The northbound bridge has a beam with a large hole in the web and has minimal section remaining in the flange, bending could soon occur. This beam should be repaired, and all other beams should be painted and repaired as needed.

- The concrete curbs behind the granite facing have a significant amount of map cracking with some heavily spalled areas with exposed reinforcing. The bridge fascias would be removed, and new fascias, curbing, and railing would be constructed.

- All exposed concrete on the bridges should be sprayed with silane water repellant. This should protect the degrading concrete for several years against moisture damage, at which point, a new application should occur.

- The new decks would be membraned and paved.

The existing bridge components are in fair to satisfactory condition. It is reasonable to assume that with the repairs listed above, the existing substructure and beams can safely carry anticipated traffic loads for an additional 40 years.

The current curb to curb width of bridges 28N and 28S is approximately 42 feet and 30 feet wide respectively, which is substandard by 8-feet on each of the bridges. The overhangs may be increased slightly to provide a wider shoulder over the bridges. Any possible widening will be determined in design.

Advantages: This alternative would address the immediate concerns of the superstructure and substructure conditions and maintenance issues of the decks, with minimal upfront cost. The effects on the adjacent properties, resources, and wildlife would be minimal. The width of the existing bridges would be slightly widened.

Disadvantages: Having newer non-chloride laced concrete adjacent to the existing concrete usually exacerbates the rate of deterioration of the remaining concrete which surrounds the repairs.

Maintenance of Traffic: Traffic could be maintained on an offsite detour, a temporary bridge, crossovers or with phased construction.

Alternative 3: Superstructure Replacement

A superstructure replacement option for this bridge would include a new deck, railings, and beams, with substructure repairs as follows:

- The existing deck and beams would be removed, and new beams would be set, and a new cast-in-place deck would be poured. The fascia detail would be modified to allow for a slightly wider structure.

- The existing bridge seats would be cut down, and new bridge seats along with a new backwall would be poured to accommodate the new bearings and superstructure.

- Northbound substructure work: While piers 1 and 3 are in good condition, the middle pier has patched areas and significant cracking with large delaminations throughout. The superstructure should be shored at the middle pier, and new pier columns and a cap should be poured, or the existing pier should be encased in concrete. While the northern abutment is in satisfactory condition, the southern abutment has large areas of saturation with cracking and surrounding delaminations throughout. Additionally, there is a large area of spalling in the west end that is starting to undermine the bearing. Extensive concrete repairs or a new abutment stem should be poured.

- Southbound substructure work: While piers 1 and 3 are in good condition, the middle pier has patched areas and significant cracking with large delaminations throughout. The superstructure should be shored at the middle pier, and new pier columns and a cap should be poured, or the existing pier should be encased in concrete. There are scattered areas of fine cracking in the wingwalls and abutments. These areas should be prepared for concrete repair and repaired with the appropriate concrete class.

- All exposed concrete on the bridges should be sprayed with silane water repellant. This should protect the degrading concrete for several years against moisture damage, at which point, a new application should occur.

- The new decks would be membraned and paved.

The existing bridge components are in fair to satisfactory condition. It is reasonable to assume that with the repairs listed above, the existing substructure and beams can safely carry anticipated traffic loads for an additional 40 years.

The current curb to curb width of bridges 28N and 28S is approximately 42 feet and 30 feet wide respectively, which is substandard by 8-feet on each of the bridges. The overhangs may be increased slightly to provide a wider shoulder over the bridges. Any possible widening will be determined in design.

Advantages: This alternative would address the immediate concerns of the maintenance issues of the decks and beams, with minimal upfront cost. The effects on the adjacent properties, resources, and wildlife would be minimal. The width of the existing bridges would be slightly widened.

Disadvantages: Having newer non-chloride laced concrete adjacent to the existing concrete usually exacerbates the rate of deterioration of the remaining concrete which surrounds the repairs.

Maintenance of Traffic: Traffic could be maintained on an offsite detour while utilizing accelerated bridge construction techniques, a temporary bridge, crossovers or with phased construction.

Alternative 4: Complete Replacement

This alternative would replace the existing bridges with new superstructures as well as new substructures at the existing location. While the current horizontal alignment does not meet current standards for minimum radius and banking, this can be brought up to standard with modified banking. As such, an on-alignment option should be considered to reduce permanent impacts to adjacent properties and resources.

The various considerations under this option include: the bridge width and length, skew, superstructure type and substructure type.

a. Bridge Width

The current curb to curb width of bridges 28N and 28S is approximately 42 feet and 30 feet wide respectively, which is substandard by 8-feet on each of the bridges. Since a new 100-year bridge is being proposed, the bridge geometry should meet the minimum standards. As such, the standard typical section of 4'-12'-12'-12'-10' (50' curb-to-curb) for the northbound bridge and typical section of 4'-12'-12'-10' (38' curb-to-curb) for the southbound bridge will be proposed.

b. Bridge Length and Skew

The existing bridges are each comprised of 4-spans totaling 202 and 207 feet-long with a skew of approximately 10 degrees and a maximum span of 55-feet. If a new steel beam bridge is proposed, the number of spans and span length could remain the same to allow for deep foundations similar to the existing configuration or be reduced down to two or one spans with taller abutments. The final bridge length will be determined in design.

c. Superstructure Type

The most economical superstructure type for this span is a steel girder superstructure with a cast-in-place composite concrete deck. If an offsite detour is chosen to be the preferred method of traffic control, then accelerated bridge construction methods would be recommended. These are explained in section III: Maintenance of Traffic of this report and could include a lateral slide, self-propelled Modular Transporters, or prefabricated elements. The most common type of prefabricated superstructure elements that can satisfy the anticipated span length are Prefabricated Precast Bridge Units (PBUs) or prefabricated precast deck slabs on steel beams.

The current vertical clearance over Bridge 28 N is 14'-11". This meets the minimum standard of 14'-3". However, it is recommended that the existing clearance does not decrease.

d. Substructure Type

The existing abutments and piers are founded on steel piles. The preliminary geotechnical report indicates that new abutments and piers could be founded on either spread footings bearing on suitable foundation soils, or deep foundations such as driven piles or drilled shafts extending to bedrock. Sufficient subsurface information should be obtained in design to verify the in-situ conditions and determine the best foundation type. The preliminary geotechnical report can be found in Appendix D.

Maintenance of Traffic: Traffic could be maintained on an offsite detour, a temporary bridge, crossovers or with phased construction.

V. Alternatives Summary

Based on the existing site conditions and bridge condition, there are several viable alternatives:

Bridges 28 North & South
Alternative 1a: Rehabilitation with Traffic Maintained on an Offsite Detour
Alternative 1b: Rehabilitation with Traffic Maintained via Phased Construction
Alternative 1c: Rehabilitation with Traffic Maintained on a Temporary Bridge
Alternative 1d: Rehabilitation with Traffic Maintained on Crossovers
Alternative 2a: Deck Replacement with an Offsite Detour
Alternative 2b: Deck Replacement with Traffic Maintained via Phased Construction
Alternative 2c: Deck Replacement utilizing a Temporary Bridge
Alternative 2d: Deck Replacement with Traffic Maintained on Crossovers
Alternative 3a: Superstructure Replacement with an Offsite Detour
Alternative 3b: Superstructure Replacement with Traffic Maintained via Phased Construction
Alternative 3c: Superstructure Replacement utilizing a Temporary Bridge
Alternative 3d: Superstructure Replacement with Traffic Maintained on Crossovers
Alternative 4a: Full Bridge Replacement with Traffic Maintained on an Offsite Detour
Alternative 4b: Full Bridge Replacement with Traffic Maintained via Phasing
Alternative 4c: Full Bridge Replacement with Traffic Maintained on a Temporary Bridge
Alternative 4d: Full Bridge Replacement with Traffic Maintained on Crossovers

VI. Bridge 28 N&S Cost Matrix[1]

	Springfield IM 091-1(83)	Do Nothing	Alternative 1: Rehabilitation				Alternative 2: Deck Replacement				Alternative 3: Superstructure Replacement				Alternative 4: Full Bridge Replacement			
			a. Offsite Detour	b. Phased Construction	c. Temporary Bridge	d. Crossovers	a. Offsite Detour	b. Phased Construction	c. Temporary Bridge	d. Crossovers	a. Offsite Detour	b. Phased Construction	c. Temporary Bridge	d. Crossovers	a. Offsite Detour	b. Phased Construction	c. Temporary Bridge	d. Crossovers
COST	Bridge Cost	$0	2,411,000	2,772,600	2,411,000	2,411,000	3,756,200	2,826,600	2,458,000	2,458,000	4,744,600	3,010,200	2,617,600	2,617,600	7,017,200	7,078,800	6,155,400	6,155,400
	Removal of Structure	$0	0	0	0	0	806,400	927,360	806,400	806,400	806,400	927,360	806,400	806,400	1,656,000	1,904,400	1,656,000	1,656,000
	Roadway	$0	62,000	90,000	62,000	62,000	538,000	606,000	422,000	422,000	488,000	632,000	440,000	440,000	642,000	848,000	590,000	590,000
	Maintenance of Traffic	$0	238,600	593,200	854,040	1,518,480	238,600	593,200	854,040	1,518,480	238,600	593,200	854,040	1,518,480	238,600	593,200	854,040	1,518,480
	Construction Costs	$0	2,711,600	3,455,800	3,327,040	3,991,480	5,339,200	4,953,160	4,540,440	5,204,880	6,277,600	5,162,760	4,718,040	5,382,480	9,553,800	10,424,400	9,255,440	9,919,880
	Construction Engineering & Contingencies	$0	677,900	691,160	665,408	798,296	800,880	742,974	681,066	780,732	941,640	774,414	707,706	807,372	1,624,146	2,084,880	1,851,088	2,479,970
	Accelerated Premium	$0	0	0	0	0	373,744	0	0	0	439,432	0	0	0	668,766	0	0	0
	Total Construction Costs w CEC	$0	3,389,500	4,146,960	3,992,448	4,789,776	6,513,824	5,696,134	5,221,506	5,985,612	7,658,672	5,937,174	5,425,746	6,189,852	11,846,712	12,509,280	11,106,528	12,399,850
	Preliminary Engineering	$0	542,320	691,160	499,056	798,296	533,920	495,316	454,044	520,488	941,640	774,414	707,706	807,372	1,433,070	1,563,660	1,851,088	1,983,976
	Right of Way	$0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Project Costs	$0	3,931,820	4,838,120	4,491,504	5,588,072	7,047,744	6,191,450	5,675,550	6,506,100	8,600,312	6,711,588	6,133,452	6,997,224	13,279,782	14,072,940	12,957,616	14,383,826
	Annualized Costs	$0	131,061	161,271	149,717	186,269	176,194	154,786	141,889	162,653	172,006	134,232	122,669	139,944	132,798	140,729	129,576	143,838
SCHEDULEING	Project Development Duration		3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years
	Construction Duration		6 months	9 months	2 years	2 years	9 months	2 years	2 years	2 years	9 months	2 years	2 years	2 years	2 years	2 years	3 years	3 years
	Closure Duration (If Applicable)		2 weeks each bridge	NA	NA	NA	4 weeks each bridge	NA	NA	NA	1 week each bridge	NA	NA	NA	2 weeks each bridge	NA	NA	NA
ENGINEERING	Typical Section - Roadway (feet)	38'	38'	38'	38'	38'	38'	38'	38'	38'	38'	38'	38'	38'	38'	38'	38'	38'
	Typical Section - Bridge (feet)	NB: (42’) SB: (30’)	NB: 3'-12'-12'-12’-3' (42’) SB: 3'-12'-12'-3' (30’)				NB: 3'-12'-12'-12’-3' (42’) SB: 3'-12'-12'-3' (30’)				NB: 3'-12'-12'-12’-3' (42’) SB: 3'-12'-12'-3' (30’)				NB: 4’-12'-12'-12'-10' (50’) SB: 4’-12'-12'-10' (38’)			
	Geometric Design Criteria	Substandard shoulder width	Substandard shoulder width on both bridges				Substandard shoulder width on both bridges				Substandard shoulder width on both bridges				Meets Minimum Standards			
	Traffic Safety	Structurally Sufficient	Improved				Improved				Improved				Improved			
	Alignment Change	No Change	No Change				No Change				No Change				No Change			
	Bicycle Access	LAH	Limited Access Highway				Limited Access Highway				Limited Access Highway				Limited Access Highway			
	Pedestrian Access	LAH	Limited Access Highway				Limited Access Highway				Limited Access Highway				Limited Access Highway			
	US Route 5 Vertical Clearance	14'-11" (Minimum)	Meets Minimum Standards				Meets Minimum Standards				Meets Minimum Standards				Meets Minimum Standards			
	Utilities	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
OTHER	ROW Acquisition	No Change	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
	Road Closure	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No
	Design Life (years)	<10	30	30	30	30	40	40	40	40	50	50	50	50	100	100	100	100

[1] Costs are estimates only, used for comparison purposes.

VII. Conclusion

Alternative 4c is recommended: a full bridge replacement while maintaining traffic on a temporary bridge during construction.

Discussion:
While all components of Bridges 28 N&S are rated in fair to satisfactory condition, both bridges are substandard in width by 8-feet. The bridge widths would remain substandard with any rehabilitation project. Additionally, the pier columns of both the north and south bridges are only in fair condition with moderate distress, including vertical cracking with delaminations and spalling in the base of the columns with exposed reinforcing. Due to the amount of concrete repair required at the piers and abutments, a full bridge replacement has comparable annualized costs.

A full bridge replacement will provide 2 new widened bridges with an anticipated design life of 100-years. By replacing the entire bridge, the number of spans can be reduced. The existing pier columns in the US Route 5 median are not adequately protected. By replacing the existing 4-span structure with a new 3-span cantilever bridge that spans US Route 5, the unprotected median pier columns will be eliminated. By decreasing the number of spans, future maintenance needs will also be reduced. Geotechnical borings should be requested early in the design phase to determine the in-situ soil conditions.

Traffic Control:
It is recommended that traffic is maintained on a temporary bridge during construction. Due to the large elevation difference between the northbound and southbound barrels as well as a wide median north of Bridges 28 N&S, a crossover is not ideal at this location. Additionally, the temporary bridge option is the most cost-effective method of traffic maintenance and has the least impact to traffic flow. The temporary bridge can be constructed in the median between Bridge 28N and 28S. That allows the temporary bridge to be used by both barrels of the interstate and reduces overall cost.

VIII. Appendices

Appendix A: Site Pictures
Appendix B: Town Map
Appendix C: Bridge Inspection Reports
Appendix D: Preliminary Geotechnical Information
Appendix E: Resource ID Completion Memo
Appendix F: Natural Resources Memo
Appendix G: Hazardous Waste Sites
Appendix H: Archaeology Memo
Appendix I: Historic Memo
Appendix J: Utility Investigation
Appendix K: Local Input
Appendix L: Operations Input
Appendix M: Crash Data
Appendix N: Detour Routes
Appendix O: Plans

Appendix A: Site Pictures

Bridge 28 North

Rolled beam deterioration at joint

Pier column and cap condition

Pier column and cap condition

Deck and superstructure condition

Abutment Condition (Note saturation due to leaky joint)

Looking north over Bridge 28N

Bridge fascia

Pier Condition

Abutment Condition

Abutment Condition

Abutment Condition

Deterioration around bridge joints

Looking South over Bridge 28N

Pier Condition

Bridge 28 South

Pier column condition

Deterioration around bridge joint

Deterioration at fascia and joint

Bridge deck and superstructure condition

Pier condition

Pier cap condition

Looking South over Bridge 28S

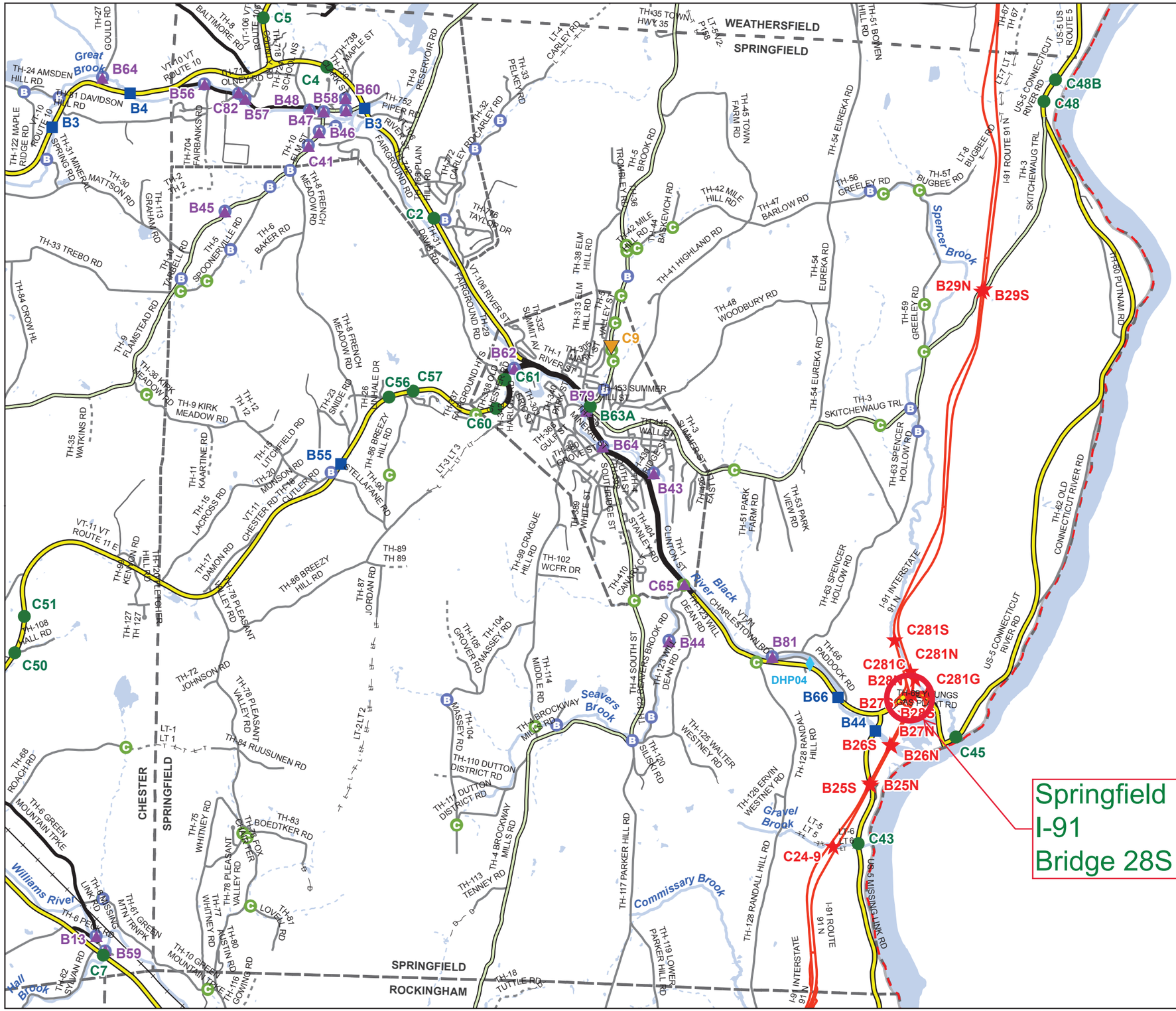
Abutment condition

Pier condition

Bridge seat and bearing condition

Looking north over bridge 28S

Appendix B: Town Map



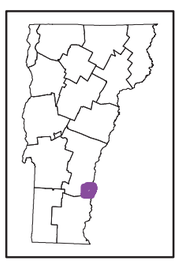
Scale: 1:49,340

N

- INTERSTATE
- STATE LONG
- STATE SHORT
- TOWN LONG
- FAS/FAU
- BIKE PATH
- INTERSTATE
- STATE HIGHWAY
- CLASS 1
- CLASS 2
- CLASS 3
- CLASS 4
- LT — LT LEGAL TRAIL
- PRIVATE
- D — D DISCONTINUED
- FAS/FAU HWY
- MAINTENANCE DISTRICT
- POLITICAL BOUNDARY
- VTRANS REGION BOUNDARY
- NAMED RIVER-STREAM
- UNNAMED RIVER-STREAM
- B Point from Local Bridge Data *
- C Point from Local Culvert Data *

* Points are from local town bridge and culvert inventories. Some points may overlap where VTrans has also conducted an inventory on the Town highway.
Data source: VOBCIT aka VTCulverts

Produced by:
Mapping Section
Division of Policy, Planning and Intermodal Development
Vermont Agency of Transportation
May 2017



SPRINGFIELD

COUNTY-TOWN CODE: **1418-0**
WINDSOR COUNTY
DISTRICT # 2
District Long Name: Dummerston District
VTrans Four Region: Southeast

This map was funded in part through grants from the Federal Highway Administration, U.S. Department of Transportation. The representation of the authors expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

Appendix C: Bridge Inspection Reports

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for SPRINGFIELD **bridge no.:** 0028N **District:** 2

Located on: I 00091 ML **over** I 91 OVER US 5 **approximately** I 91 EXIT 7 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 5 FAIR

Superstructure Rating: 5 FAIR

Substructure Rating: 5 FAIR

Channel Rating: N NOT APPLICABLE

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200091028N14182

Federal Sufficiency Rating: 069

Deficiency Status of Structure: ND

AGE and SERVICE

Year Built: 1965 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 1 HIGHWAY

Lanes On the Structure: 03

Lanes Under the Structure: 04

Bypass, Detour Length (miles): 00

ADT: 005500 **% Truck ADT:** 13

Year of ADT: 1999

GEOMETRIC DATA

Length of Maximum Span (ft): 0055

Structure Length (ft): 000202

Lt Curb/Sidewalk Width (ft): 0.7

Rt Curb/Sidewalk Width (ft): 0.7

Bridge Rdwy Width Curb-to-Curb (ft): 42

Deck Width Out-to-Out (ft): 47

Appr. Roadway Width (ft): 045

Skew: 11

Bridge Median: 1 OPEN MEDIAN

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

Feature Under: HIGHWAY BENEATH STRUCTURE

Min Vertical Underclr (ft): 14 FT 11 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: 4 SPAN ROLLED BEAM

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

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane: 2 PREFORMED FABRIC

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: 3 INTOLERABLE, CORRECTIVE ACTION NEEDED

Waterway Adequacy: N NOT OVER WATER

Approach Roadway Alignment: 6 EQUAL TO MINIMUM CRITERIA

Scour Critical Bridges: N NOT OVER WATERWAY

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): 1 LOAD FACTOR (LF)

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: 4 H 20

INSPECTION and CROSS REFERENCE

X-Ref. Route: US5

Insp. Date: 052018 **Insp. Freq. (months)** 24 **X-Ref. BrNum:** 0044B

INSPECTION SUMMARY and NEEDS

5/17/2018 This structure should be considered for a deck replacement project, eliminating the joint over pier 2 and new joints installed over the abutments. Concrete repairs are needed to pier 2 and abutment 2, removing all loose concrete and delams. The west fascia beam ends over pier 2 need to have steel repairs made. New bearings should be set in areas below the joints, mostly along the west fascia. JW/MC

5/16/2016 This structure needs to have concrete repairs to the curbs with new seals installed especially in the ends surrounding the joints. The finger plate joints should be considered for replacement with Vermont joints and should extended to the fascias with scuppers installed. Concrete repairs are needed to abutment 2, piers 2 and 3 with all loose concrete/delams removed and then patched. JW/AC

5/15/2014 Curbs need major repair soon. Weep tubes should be extended below the beams. Bearing have been greased however the heavy rusting should have been cleaned. the bearing on abutment #1 side under beam #1 and #5 should be cleaned and reset as bearing #5 on abut#1 could fail. Erosion in the slopes at the drain troughs should be repaired. Beams should be spot cleaned and painted. ~FRE/TJB

5/22/2013 Curbs should be cleaned and patched along with the columns on pier #3 ~FRE/SHJ

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for SPRINGFIELD **bridge no.:** 0028S **District:** 2

Located on: I 00091 ML **over** I 91 OVER US 5 **approximately** I 91 EXIT 7 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 6 SATISFACTORY

Superstructure Rating: 7 GOOD

Substructure Rating: 6 SATISFACTORY

Channel Rating: N NOT APPLICABLE

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200091028S14182

Federal Sufficiency Rating: 081

Deficiency Status of Structure: ND

AGE and SERVICE

Year Built: 1965 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 1 HIGHWAY

Lanes On the Structure: 02

Lanes Under the Structure: 04

Bypass, Detour Length (miles): 00

ADT: 005375 **% Truck ADT:** 13

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0056

Structure Length (ft): 000207

Lt Curb/Sidewalk Width (ft): 0.7

Rt Curb/Sidewalk Width (ft): 0.7

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

Deck Width Out-to-Out (ft): 35

Appr. Roadway Width (ft): 036

Skew: 12

Bridge Median: 1 OPEN MEDIAN

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

Feature Under: HIGHWAY BENEATH STRUCTURE

Min Vertical Underclr (ft): 17 FT 04 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: 4 SPAN ROLLED BEAM

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

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane: 2 PREFORMED FABRIC

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: 6 EQUAL TO MINIMUM CRITERIA

Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal: 4 MEETS MINIMUM TOLERABLE CRITERIA

Waterway Adequacy: N NOT OVER WATER

Approach Roadway Alignment: 7 BETTER THAN MINIMUM CRITERIA

Scour Critical Bridges: N NOT OVER WATERWAY

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): 1 LOAD FACTOR (LF)

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: US5

Insp. Date: 052018 **Insp. Freq. (months)** 24 **X-Ref. BrNum:** 0044A

INSPECTION SUMMARY and NEEDS

5/18/2018 This structure should be considered for a deck replacement project, or new fascias installed to replace the heavily deteriorated cubs and affected soffit below. New joints over the abutments should be installed as well. The beams need general cleaning and painting. JW/MC

5/16/2016 This structure needs to have concrete repairs to the curbs with new seals installed especially in the ends surrounding the joints. The finger plate joints should be considered for replacement with Vermont joints and should extended to the fascias with scuppers installed. JW/AC

5/15/2014 Curbs should be cleaned of all loose material and patched. Beams should be spot cleaned and painted. ~FRE/TJB

5/22/2012 Curbs should be cleaned and patched along with the spalling in the fascias. ~FRE/SJH

04/12/10 Left top rail near abutment No.2 needs repair or replacement. Column No.1 of pier No.2 needs repair. The curb areas on both sides are in need of repairs. PLB

Appendix D: Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Nick Wark, P.E., P.I.I.T. Program Manager

From: August Arles, Geotechnical Engineer, via Callie Ewald, P.E., Geotechnical Engineering Manager

Date: February 24th, 2020

Subject: Springfield IM 091-1(83) Preliminary Geotechnical Information

1.0 INTRODUCTION

As requested, we have completed the preliminary geotechnical investigation of Bridges 28N/S on Interstate 91 over VT Route 11 in the Town of Springfield. Bridges 28N/S are four-span rolled beam steel bridges that are part of the Exit 7 interchange. The subject project consists of replacing or rehabilitating the existing structures. This review included the examination of as-built record plans, in-house historical boring log files, well log data, and hazardous site information on file at the Vermont Agency of Natural Resources (ANR), as well as published geologic maps relating to surficial and bedrock data.

2.0 SUBSURFACE INFORMATION

2.1 Published Geologic Data

Mapping conducted in 1970 for the Surficial Geologic Map of Vermont shows the project site consists of glaciolacustrine deposits of littoral sediment, predominantly sand (Doll, 1970).

According to the Bedrock Map of Vermont from 2011, published by the USGS and State of Vermont, the project site is underlain with bedrock consisting of slate and quartzite of the Waits River Formation and is close to the boundary of schist and conglomerate of the Waits River Formation (Ratliffe, et. al, 2011).

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 borings from a previous project within a 0.5-mile radius. Four borings were advanced at the intersection of VT Route 11 and Missing Link Rd in February 2017 for the Springfield STP 016-2(23) project. In general, soils encountered during this investigation consisted of varying amounts of silty-sand, gravelly-sand, and silts. Bedrock was encountered between depths of 10.1 feet and 23.0 feet, corresponding to elevations of 299.6 ft and 289.5 ft, respectively as was classified as moderately to medium hard phyllite, and medium hard schist. Ground water was encountered in all borings and ranged from five feet to fifteen feet below ground surface elevation. The boring logs and boring location plan from this project are attached.

2.2 Water Well Logs

The Vermont ANR maintains a record of private and public wells drilled in their Atlas database. Published online, these logs may provide general characteristics of the soil strata and depth to bedrock in the area. The three closest logs of wells, TAG 290, WRN 102, and WRN 276, were located approximately 909 feet, 1067 feet, and 1879 feet from the project site and reported bedrock at a depth of 8 feet, 14 feet, and 3 feet respectively.

2.3 Hazardous Materials and Underground Storage Tanks

The ANR Atlas also maintains a database of all known hazardous waste sites and underground storage tanks. According to their published data there are five sites within a 0.5-mile radius, consisting of four hazardous waste generators and two hazardous sites, and two underground storage tanks. The project itself does not lie on a hazardous site, and there is no anticipated impact on the project from the surrounding sites.

2.4 Record Plans

Record plans from the intersection construction dated 1965 were also reviewed as part of this investigation. The record plans included a layout sheet and a plan and elevation sheet for the Bridge 28 Southbound. The P&E detail sheet indicates that the concrete abutments for the southbound bridge are founded on 3 rows of 12BP53 steel piles with a design load of 24 tons and an estimated length of 30 feet. The design bottom of pile cap elevation for Abutment's No.1 and No. 2 are shown as 353.15 ft and 353.11 ft, respectively. The P&E sheet also details that the reinforced concrete piers for the southbound bridge, consisting of three 3-ft diameter columns per pier, are founded on spread footing foundations with a design bottom of footing elevation of 328 ft at Pier No.1, and an elevation of 334 ft for Piers No. 2 and 3.

3.0 FIELD OBSERVATIONS

A site investigation was not conducted by Geotechnical Section staff however photos from bridge inspection reports and satellite imagery were reviewed to evaluate feasibility of boring operations and assess general site conditions as they relate to the proposed project.

No overhead obstructions were observed along I-91 that would interfere with any potential boring operations. Borings advanced for the bridge abutments can likely be located in the median of I-91 and from either the side slopes of I-91 or from the roadway of VT Route 11 and the adjacent slopes. For borings advanced for potential piers, if drilling is to be conducted from the roadway of VT Route 11, then borings will likely need to be located outside of the footprint of the existing bridge structures due to limited overhead clearance under the bridges. If borings are deemed to be required close to the center of the existing pier locations, then borings could be advanced through the bridge deck from the travel lanes of I-91 which would likely require significant traffic control coordination, closure of one lane of the interstate, and possibly closure of one lane of VT Route 11.

Bedrock was not visible in any of the available imagery. Bridge abutments were armored with stone fill as shown in Figure 3.1. Figure 3.2 through Figure 3.4 illustrate the overhead clearance limitations along VT Route 11 that may restrict drilling from directly beneath the existing structures.

Figure 3.1: *Stone fill armoring at bridge abutment underneath Interstate 91 Bridge 28 Southbound. [Inspection photo dated 2018]*

Figure 3.2: *Facing I-91 Bridge 28 Southbound south abutment; note limited overhead clearance for drilling operations under existing bridge. [Inspection photo dated 2018]*

Figure 3.3: *Facing I-91 Bridge 28 Southbound north abutment; note limited overhead clearance for drilling operations under existing bridge deck. [Inspection photo dated 2016]*

Figure 3.4: *Facing east, Bridge 28 Southbound. [Inspection photo dated 2016]*

4.0 RECOMMENDATIONS

4.1 Preliminary Foundation Alternatives

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

Abutments

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

Piers

- Reinforced concrete piers on spread footings
- Pile caps supported by H-Piles
- Pier columns supported on drilled shafts

4.2 Proposed Subsurface Investigation

Once proposed alignments for the replacement bridges are chosen as well as preferred foundation alternatives, we recommend assessing the existing subsurface information and developing a subsurface investigation program that augments the existing information to verify the subsurface conditions at the site including, but not limited to, the soil properties, groundwater conditions, and depth to bedrock. If drilled shafts are contemplated, final borings should be aligned with the shaft location(s) to the degree possible given access restrictions.

5.0 CLOSING

When a design alternative, as well as a preliminary alignment has been chosen, the Geotechnical Engineering Section can assist in designing 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.

6.0 REFERENCES

Doll, C. G., 1970, Surficial Geologic Map of Vermont, Vermont Geological Survey, Montpelier, VT.

Ratcliffe, N. M., Stanley, R. S., Gale, M. H., Thompson, P. J., Walsh, G. J., 2011, Bedrock Geologic Map of Vermont, Vermont Geological Survey, Montpelier, VT.

Vermont Agency of Natural Resources Department of Environmental Conservation, Natural Resources Atlas, www.anr.vermont.gov/maps/nr-atlas%20, accessed 2/10/2020.

Enclosures: Boring Location Plan (1 Page)
Boring Logs (4 Pages)

cc: Laura Stone, P.E., P.I.I.T. Project Manager
Electronic Read File/MG

Project File/CEE
AJA

Z:\Highways\CMB\GeotechEngineering\Projects\Springfield IM 091-1(83)\REPORTS\Springfield IM 091-1(83) Preliminary Geotechnical Report.docx

N

MATCH LINE SEE SHEET 9
MATCH LINE SEE SHEET 10

VT STATE PLANE GRID

EXISTING R.O.W.

PREFERRED MOTOR INNS OF NEW ENGLAND

EXISTING R.O.W.

PCC
STA 429+97.44

PCC
STA 430+56.93

PI
STA 4000+66.41

PT
STA 4000+06.00

RC
STA 4000+70.20

STA 4000+00

MATCH LINE SEE SHEET 12

STA 4000+60.00 POB

B-104

B-102

cz

WESTBOUND VT ROUTE 11

EASTBOUND

SPRINGFIELD

430+00

431+00

120+00

121+00

122+00

123+00

WESTBOUND

US ROUTE 5
VT ROUTE 11

EASTBOUND

SPRINGFIELD

PI
STA 119+64.33

PT
STA 4001+00.94

B-103

PI
STA 122+41.80

STA 429+65.80

B-101

PT
STA 118+47.51

119+00

118+00

WESTBOUND

EASTBOUND

CURVE (1)
DELTA = 18°06'37"
D = 7°09'43"
R = 800.00'
T = 127.50'
L = 252.87'
E = 10.10'

CURVE (3)
DELTA = 24°42'34"
D = 4°37'14"
R = 1240.00'
T = 271.60'
L = 534.76'
E = 29.40'

BORING CHART

HOLE NO.	STATION	OFFSET	NORTHING	EASTING
B-101	2005+50.97	63.07' RT	278672.912	1657015.566
B-102	2005+57.53	26.27' LT	278765.000	1657003.040
B-103	120+33.93	45.95' RT	278714.204	1657138.602
B-104	120+44.68	62.29' LT	278820.268	1657114.014

0 20 40
SCALE IN FEET

PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: STP 016-2(23)

FILE NAME: z14+189bdr.dgn
PROJECT LEADER: S. SAWYER
DESIGNED BY: C. THOMPSON
GENERAL PLAN (2 OF 2)

PLOT DATE: 11-09-16
DRAWN BY: S. KELLY
CHECKED BY: B. LYON
SHEET 10 OF 30

STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

Springfield
STP 016-2(23)
US-5 VT-11

Boring No.: **B-101**
Page No.: 1 of 1
Pin No.: 14t189
Checked By: SPM

Boring Crew: Judkins, Garrow, Warner
Date Started: 2/01/17 Date Finished: 2/01/17
VTSPG NAD83: N 278672.90 ft E 1657015.60 ft
Station: 431+51 Offset: 44.0 RT
Ground Elevation: 312.5 ft

	Casing	Sampler
Type:	H.S.A.	SS
I.D.:	3.25 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 45C SKID	C_E = 1.42

Groundwater Observations

Date	Depth (ft)	Notes
02/01/17	6.3	W.T. during drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		A-1-b, GrSa, brn, Moist, Rec. = 0.5 ft, Lab Note: Some decomposing plant material was within sample				3-3-3-3 (6)	24.3	34.8	47.5	17.7
		A-4, SaSi, brn, Moist, Rec. = 1.7 ft				2-2-2-3 (4)	25.5		48.1	51.9
5		A-2-4, Sa, brn, Moist, Rec. = 1.2 ft				3-2-3-2 (5)	15.4	0.1	81.5	18.4
		A-1-a, SaGr, brn, Moist, Rec. = 0.3 ft				4-4-4-5 (8)	5.2	65.1	29.3	5.6
		A-4, Si, brn, Moist, Rec. = 1.7 ft				3-2-3-3 (5)	28.5	12.4	12.6	75.0
10		A-4, GrSi, brn, Moist, Rec. = 0.4 ft				3-3-3-4 (6)	24.5	25.7	19.8	54.5
15		A-4, Si, brn, Moist, Rec. = 1.8 ft, Lab Note: Some clay was within sample. Sample tested non-plastic				1-2-1-1 (3)	36.8		1.4	98.6
20		A-4, Si, gry, Moist, Rec. = 2.0 ft, Lab Note: Some clay was within sample. Sample tested non-plastic				1-1-2-2 (3)	32.3	0.1	16.4	83.5
25		23.0 ft - 28.0 ft, Gray to dark gray, Carbonaceous muscovite-quartz-plagioclase PHYLLITE, with pyrite. Moderately hard, Unweathered, Fair rock, NX, RMR=60	1 (80-90)	92 (80)	4 3 3 3 2	Top of Bedrock @ 23.0 ft				
30		28.0 ft - 33.0 ft, Gray to dark gray, Carbonaceous muscovite-quartz-plagioclase PHYLLITE, with pyrite. Rust stained sub-vertical joint from 31.25 feet to 32.70 feet with secondary mineral precipitation in vugs. Medium hard, Slightly weathered, Fair rock, NX, RMR=52	2 (80)	94 (68)	3 2 2 2 4					
35		Hole stopped @ 33.0 ft								

Remarks:
Hole collapsed at 25.0 feet.

1. Changed to wash bore drilling at 23 feet due to suspected bed rock.

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.

BORING LOG 2 SPRINGFIELD STP 016-2(23).GPJ VERMONT AOT.GDT 10/18/18

STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

Springfield
STP 016-2(23)
US-5 VT-11

Boring No.: **B-102**
Page No.: 1 of 1
Pin No.: 14t189
Checked By: SPM

Boring Crew: Emerson, Garrow, Olden
Date Started: 12/28/17 Date Finished: 12/28/17
VTSPG NAD83: N 278765.00 ft E 1657003.00 ft
Station: 431+60 Offset: 48.5 LT
Ground Elevation: 309.7 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 45C SKID	C_E = 1.42

Groundwater Observations

Date	Depth (ft)	Notes
12/28/17	5.8	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		A-1-b, GrSa, brn, Moist, Rec. = 1.3 ft				1-1-3-7 (4)	12.1	29.0	58.7	12.3
2.5		A-1-b, GrSa, brn, Moist, Rec. = 1.2 ft				9-8-9-11 (17)	11.5	30.0	51.5	18.5
5.0		A-1-b, SaGr, brn, Moist, Rec. = 1.4 ft Field Note:, NXDC, Cleaned out casing				9-20-15-14 (35)	10.8	42.9	39.0	18.1
7.5		A-1-b, GrSa, brn, Moist, Rec. = 0.3 ft Field Note:, NXDC, Cleaned out casing				9-7-7-4 (14)	14.5	24.1	68.8	7.1
		A-3, GrSa, brn, Moist, Rec. = 0.7 ft, Lab Note: Broken rock was within sample Field Note:, NXDC, Cleaned out casing				5-2-15-15 (17)	18.4	26.7	67.9	5.4
10.0		Visual Description:, Broken Rock, gry, Moist, Rec. = 0.1 ft	1 (65-75)	100 (69)	4	R@1" (R)	Top of Bedrock @ 10.1 ft			
		10.1 ft - 15.1 ft, Gray, Carbonaceous muscovite-quartz-plagioclase PHYLLITE, with pyrite. Penetrative rust staining along joints. Medium hard, Slightly weathered, Fair rock, NX, RMR=46			3					
12.5					3					
					3					
					4					
15.0		15.1 ft - 20.1 ft, Light gray to gray, Carbonaceous muscovite-quartz-plagioclase gneissic SCHIST, with pyrite. Rust and sulfur stained sub-vertical joint from 15.2 feet to 17.0 feet with secondary mineral precipitation in vugs. Medium hard, Slightly to moderately weathered, Poor rock, NX, RMR=36	2 (80)	100 (18)	5					
					5					
17.5					6					
					5					
					5					
20.0		Hole stopped @ 20.1 ft								
		Remarks: Hole collapsed at 6.0 feet.								
22.5										

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.

BORING LOG 2 SPRINGFIELD STP 016-2(23).GPJ VERMONT AOT.GDT 10/18/18

STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

Springfield
STP 016-2(23)
US-5 VT-11

Boring No.: **B-103**
Page No.: 1 of 1
Pin No.: 14t189
Checked By: SPM

Boring Crew: Garrow, Emerson
Date Started: 1/31/17 Date Finished: 1/31/17
VTSPG NAD83: N 278714.20 ft E 1657138.60 ft
Station: 120+34 Offset: 45.9 RT
Ground Elevation: 315.5 ft

	Casing	Sampler
Type:	H.S.A.	SS
I.D.:	3.25 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 45C SKID	C_E = 1.42

Groundwater Observations

Date	Depth (ft)	Notes
01/31/17	15.6	W.T. during drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		A-2-4, SiGrSa, brn, Moist, Rec. = 1.0 ft	4-2-2-4 (4)	15.4	23.1	55.3	21.6
		A-4, SaSi, brn, Moist, Rec. = 1.6 ft	2-2-3-3 (5)	26.7	1.5	33.7	64.8
5		A-4, SaSi, brn, Moist, Rec. = 1.6 ft	2-2-2-6 (4)	29.1	0.1	23.9	76.0
		A-2-4, SiSa, brn, Moist, Rec. = 1.9 ft	4-3-3-3 (6)	18.1	0.3	64.7	35.0
		A-4, SiSa, brn, Moist, Rec. = 1.7 ft	2-3-5-5 (8)	24.8	4.2	58.7	37.1
10		A-1-b, GrSa, brn, Moist, Rec. = 1.2 ft	7-7-7-10 (14)	10.2	30.2	57.0	12.8
15		A-4, SiSa, brn, MTW, Rec. = 1.0 ft	2-2-2-3 (4)	29.9	3.7	55.0	41.3
20		A-4, Si, brn, MTW, Rec. = 1.7 ft	1-1-2-1 (3)	39.2	0.3	3.0	96.7
25		A-4, Si, brn, MTW, Rec. = 1.8 ft, Lab Note: Some clay was within sample. Sample tested non-plastic	1-2-2-4 (4)	37.0		2.6	97.4
		Hole stopped @ 27.0 ft					
30		Remarks: Hole collapsed at 12.8 feet.					

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.

BORING LOG 2 SPRINGFIELD STP 016-2(23).GPJ VERMONT AOT.GDT 10/18/18

STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

Springfield
STP 016-2(23)
US-5 VT-11

Boring No.: **B-104**
Page No.: 1 of 1
Pin No.: 14t189
Checked By: SPM

Boring Crew: Emerson, Garrow, Olden
Date Started: 12/27/17 Date Finished: 12/27/17
VTSPG NAD83: N 278820.30 ft E 1657114.00 ft
Station: 120+45 Offset: 62.4 LT
Ground Elevation: 314.0 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:		Auto/AWJ
Rig:	CME 45C SKID	C_E = 1.42

Groundwater Observations

Date	Depth (ft)	Notes
12/27/17	6.4	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		A-2-4, SiSa, Rec. = 1.2 ft	2-2-3-7 (5)	14.5	18.2	61.0	20.8
		A-2-4, SiSa, Rec. = 1.4 ft	5-7-7-6 (14)	14.7	2.3	74.7	23.0
5		A-2-4, SiSa, Rec. = 2.0 ft	5-5-4-6 (9)	26.4	0.7	70.6	28.7
		A-1-b, GrSa, Rec. = 1.1 ft Field Note:, NXDC, Cleaned out casing	7-10-16-16 (26)	6.1	43.4	46.4	10.2
		A-1-b, SaGr, Rec. = 1.0 ft Field Note:, NXDC, Cleaned out casing	16-18-15-10 (33)	9.2	49.2	39.6	11.2
10		Field Note:, No Recovery	6-5-4-4 (9)				
15		A-4, Si, Rec. = 1.6 ft, Lab Note: A small amount of clay was within sample. Sample tested non-plastic	2-2-2-2 (4)	36.8	0.2	3.6	96.2
20		Field Note:, No Recovery	2-3-3-3 (6)				
25		Field Note:, No Recovery	3-4-4-3 (8)				
		Hole stopped @ 27.0 ft					
30		Remarks: Hole colapsed at 21.8 feet.					

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.

BORING LOG 2 SPRINGFIELD STP 016-2(23).GPJ VERMONT AOT.GDT 10/18/18

Appendix E: Resource ID Completion Memo

OFFICE MEMORANDUM

AOT - PDB - ENVIRONMENTAL SECTION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Laura Stone, Project Manager
FROM: Lee Goldstein, Environmental Specialist, SE Region
DATE: October 28, 2019
Project: **Springfield IM 091-1(83)-12a568**

ENVIRONMENTAL RESOURCES:

Archaeological Site:	___ Yes	X No	See Archaeological Resource ID Memo
Historic/Historic District:	___ Yes	X No	See Historic Resource ID Memo
Wetlands:	___ Yes	X No	See Natural Resource ID Memo
Agricultural Land:	___ Yes	X No	See Natural Resource ID Memo
Fish & Wildlife Habitat:	___ Yes	X No	See Natural Resource ID Memo
Wildlife Habitat Connectivity:	___ Yes	X No	See Natural Resource ID Memo
Endangered Species:	X Yes	___ No	See Natural Resource ID Memo
Stormwater:	___ Yes	X No	See Stormwater Resource ID Memo
6(f) Property:	___ Yes	X No	
Hazardous Waste/ ANR Urban Background Soils:	___ Yes	X No	See ANR map
USDA-Forest Service Lands:	___ Yes	X No	
Scenic Highway/ Byway:	___ Yes	X No	
Act 250 Permits:	___ Yes	X No	See ANR map
FEMA Floodplains:	___ Yes	X No	See ANR map
Flood Hazard Area/ River Corridor:	___ Yes	X No	See ANR map
US Coast Guard:	___ Yes	X No	
Lakes and Ponds:	___ Yes	X No	See ANR map
303D List/ Class A Water/ Outstanding Resource Water:	___ Yes	X No	See ANR map
Surface and Ground Water (SPA) Source Protection Area:	___ Yes	X No	See ANR map
Groundwater Classification:	___ Yes	X No	See ANR map
Public Water Sources/ Private Wells:	___ Yes	X No	See ANR map
Other:	___ Yes	X No	no .dgn created

cc:
Project File

Appendix F: Natural Resources Memo

VERMONT

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: Project File

From: James Brady, VTrans Environmental Biologist

Date: October 23, 2019

Subject: Springfield IM 091-1(83) - 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.

Bridges 0028N and 0028S, Interstate 91

Wetlands/Watercourses
There are no wetlands or watercourses within the review area.

Wildlife Habitat
There is very limited wildlife habitat at this location.

Rare, Threatened and Endangered Species
The only listed species in the project area is the federally threatened northern long-eared bat. The bridge does not provide useful roosting habitat, so restrictions caused by this animal are unlikely.

Agricultural Soils
There are no mapped agricultural soils in the review area.

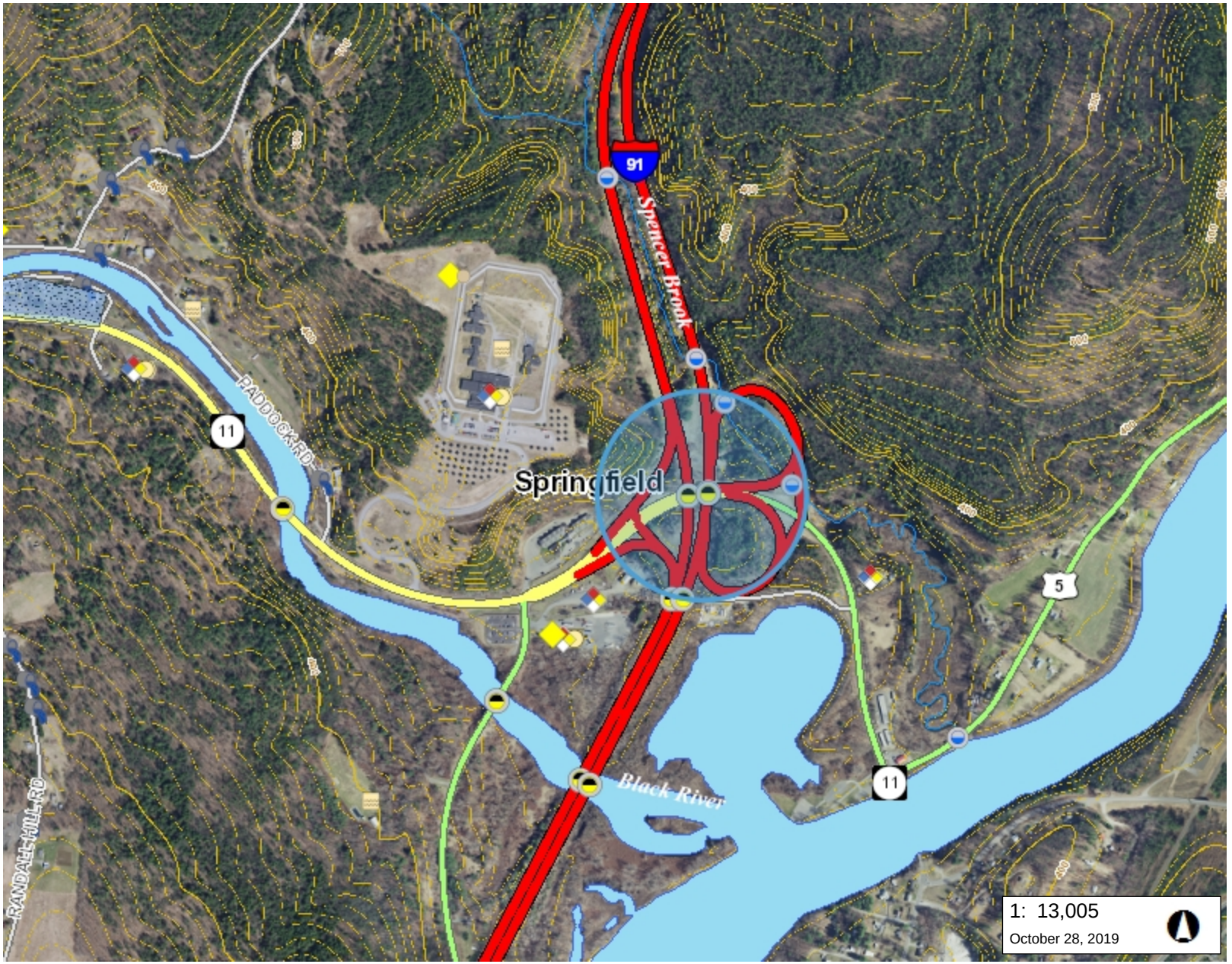
Appendix G: Hazardous Waste Sites

VERMONT

Natural Resources Atlas

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Landfills
  - OPERATING
  - CLOSED
- Land Use Restrictions
  - Class IV GW Reclass
  - Class VI GW Reclass
  - Deed Restriction
  - Easement
  - Land Record Notice
  - Other
- Hazardous Site
- Hazardous Waste Generators
- Brownfields
- Salvage Yard
- Aboveground Storage Tank
- Underground Storage Tank (w
- Dry Cleaner
- Urban Soil Background Areas
- Act250 Permits **INCOMPLET
- VTRANS State and Town Long
- VTRANS State Short Structure
- Town Bridge
- Town Culvert
- Railroads
- Roads
  - Interstate
  - Principal Arterial
  - Minor Arterial

NOTES

Springfield IM 091-1(83)-No HazMat or Urban Background Soils within project likely area. Map created 10/28/2019 using ANR's Natural Resources Atlas.

661.0 0 330.00 661.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1084 Ft. 1cm = 130 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Appendix H: Archaeology Memo

VERMONT

Brennan Gauthier
VTrans Senior 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

To: Lee Goldstein, VTrans Environmental Specialist
From: Brennan Gauthier, VTrans Senior Archaeologist
Date: 7/31/2019
Subject: Springfield IM 091-1(83) Archaeological Resource Identification

lee,

I have completed my field inspection and background research for the pair of I-91 bridges that span Vermont Route 5 in the town of Springfield, Windsor County, Vermont. Although unscoped, I assumed a wide Area of Potential Effect(APE) in order to identify resources that may be worth identifying if the project scope change to include a larger area.

I have concluded that there are no mappable archaeological resources within the area around bridges 28S and 0004S. This area was heavily altered during the construction of I-91 in 1965. Additionally, this project will be cleared as exempt once the Section 106 request is submitted since it involves work on a facility of the Interstate Highway System as per the ACHP notice of 2005.

Please feel free to reach out with any questions or concerns that may arise as part of this process.

Sincerely,

Brennan

Brennan

VTrans Working to Get You There
Vermont Agency of Transportation

Images and Illustrations

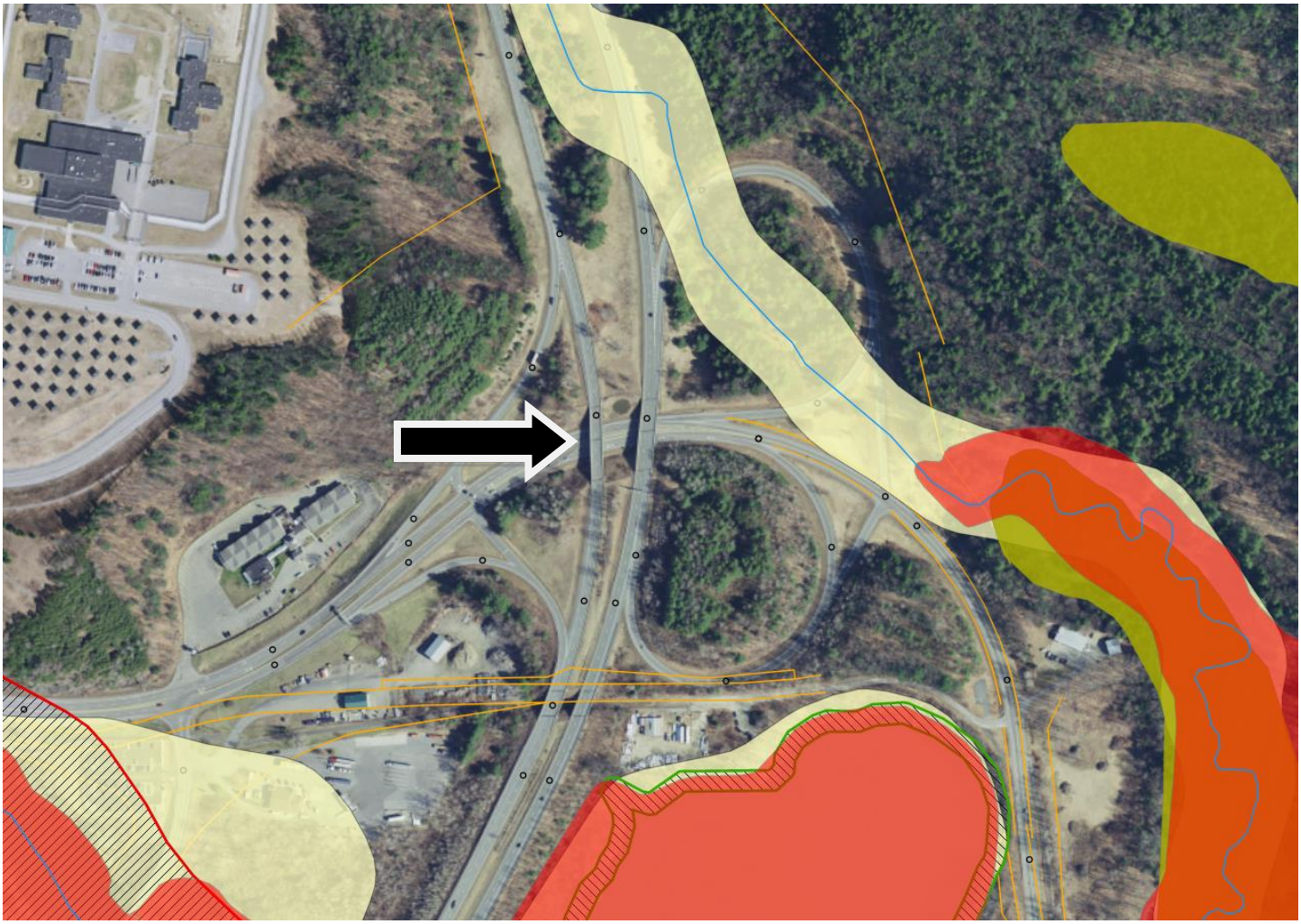


Figure 1: Bridge Locations.

Appendix I: Historic Memo

Goldstein, Lee

From: Fernandez, Gabrielle
Sent: Thursday, August 15, 2019 10:53 AM
To: Goldstein, Lee; Obenauer, Kyle
Subject: Springfield IM 091-1(83) exempt resource ID

Hi Lee:

This project (Springfield IM 091-1(83)) is considered EXEMPT for above-ground historic resources per the Section 106 Exemption Regarding Effects to the Interstate Highway System adopted by the Advisory Council on Historic Preservation on March 10, 2005. (See Federal Register Vol.70/No.46)

The determination of effect for the overall project will be based on findings for archaeology.

Kyle will update VPINS to note that the project is exempt for above ground resources and Historic review is complete for this project.

Kyle will save this email in the project's NEPA/Specialist Reviews/Historic folder.

Thanks,
Gabrielle

Gabrielle Fernandez | AOT Technical Apprentice IV
Vermont Agency of Transportation
1 National Life Drive
Montpelier, VT 05603
(802) 793-3738

Appendix J: Utility Investigation

Springfield IM 091-1(83)

Existing Utilities within Project Limits Report 08-21-2019

Bridge 28N&S on Interstate I-91 over US 5 in Springfield, Vt.

AERIAL

-No know Aerial Utilities near bridges.

UNDERGROUND

-No know Aerial Utilities near bridges.

MUNICIPAL

There is No known Water and Sewer in vicinity of the bridge.

- **Approximately 615 feet to the south of the bridges there is an aerial crossing for a power service. These should not be impacted by the project. FirstLight has buried fiber in bike path/Toonerville Trail approximately 660 feet south of bridges. It is not expected that this will be impacted by the project.**

Appendix K: Local Input

Local & Regional Input Questionnaire

Project Summary

This project, IM 091-1(83), focuses on bridge 28S on Interstate 91 South over US Route 5 in Springfield, Vermont. The bridge is deteriorating and is in need of either a major maintenance action or replacement. Potential options being considered for this project include major deck repairs or removal of the existing bridge and replacement with a new bridge placed in the same location. It is possible that VTrans will recommend a road closure and detour traffic off of the interstate for the duration of the work. Efforts will be made to limit the detour to State roads.

Community Considerations

1. Are there regularly 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 annual bike races, festivals, parades, cultural events, weekly farmers market, concerts, etc. that could be impacted? If yes, please provide approximate date, location and event organizers' contact info. **Not in this location**

2. Is there a "slow season" or period of time from May through October where traffic is less or no events are scheduled? **No**

3. Please describe the location of the Town garage, emergency responders (fire, police, ambulance) and emergency response routes that might be affected by the closure of the bridge, one-way traffic, or lane closures and provide contact information (names, address, email addresses, and phone numbers. **This location is on the far eastern side of the Town and all emergency and essential service facilities are located miles away. As long as Route 5 is not closed during construction there will be no issues traveling east and west. For north bound travel a total closure of the bridges will present an issue for all emergency services and do not think total closure is a viable option.**

4. Are there businesses (including agricultural operations and industrial parks) or delivery services (fuel or goods) that would be adversely impacted either by a detour or due to work zone proximity? **No**

5. 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**

6. What other municipal operations could be adversely affected by a road/bridge closure or detour? **None other than emergency servicds. As long as Route 5 is not closed during construction there will be no issues traveling east and west.**

7. Are there any town highways that might be adversely impacted by traffic bypassing the construction on other local roads? Please indicate which roads may be affected and their condition (paved/unpaved, narrow, weight-limited bridges, etc), including those that may be or go into other towns. **None. As long as Route 5 is not closed during construction there will be no issues traveling east and west.**

8. Is there a local business association, chamber of commerce, regional development corporation, or other downtown group that we should be working with? If known, please provide name, organization, email, and phone number.

   Springfield On The Move: 96 A Main Street, Springfield, VT 05156
   Jessica Martin, Executive Director @ (802) 885-1527
   Email: springfieldonthemove@gmail.com

   Springfield Regional Chamber of Commerce: 56 Main Street, Suite 2, Springfield, VT 05156
   Caitlin Christiana, Executive Director @ (802) 885-2779
   Email: springfieldrcoc@vermontel.net

   Springfield Regional Development Corporation: 14 Clinton Street, Suite 7, Springfield, VT 05156
   Robert "Bob" Flint, Executive Director @ (802) 885-3061
   Email: bobf@springfielddevelopment.org

9. Are there any public transit services or stops that use the bridge or transit routes in the vicinity that may be affected if they become the detour route?

   The Current: 706 Rockingham Road, Bellows Falls, VT 05101
   Phone: (888) 869-6287

   The Bus: 158 Spruce Street, Rutland, VT 05701
   Phone: (802) 773-3244

Schools

1. Where are the schools in your community and what are their yearly schedules (example: first week in September to third week in June)?

   School generally starts the last week in September and finishes the third/fourth week in June.

   Springfield School District Administrative Offices: 60 Park Street, Springfield, VT 05156
   Dr. Zach McLaughlin, Superintendent @ (802) 885-5141 or (802) 885-5109.

   Springfield High School: 303 South Street, Springfield, VT 05156
   Bindy Hathorn, Principal @ (802) 885-7900

   Riverside Middle School: 13 Fairground Road, Springfield, VT 05156

Steve Cone, Principal @ (802) 885-8490

Union Street School: 43 Union Street, Springfield, VT 05156
Phil Trejo, Principal @ (802) 885-5155

Elm Hill School: 10 Hoover Street, Springfield, VT 05156
Dr. Christine Pereira, Principal @ (802) 885-5154

2. Is this project on specific routes that school buses or students use to walk to and from school? **Yes**

3. Are there recreational facilities associated with the schools nearby (other than at the school)?**There is a bicycle and pedestrian path that terminates about ¼ mile east of this location. The path does not go under the bridges.**

Pedestrians and Bicyclists

1. Is pedestrian and bicycle traffic heavy enough on VT Route 5 (10A?) that it should be accommodated during construction? **No**

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

3. 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? **No**

Design Considerations

1. Are there any concerns with the alignment of the existing bridge? For example, if the bridge is located on a curve, has this created any problems that we should be aware of? **No**

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

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

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

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

6. Are there any utilities (water, sewer, communications, power) attached to the existing bridge? Please provide any available documentation. **No**

7. Are there any existing, pending, or planned municipal utility projects (communications, lighting, drainage, water, wastewater, etc.) near the project that should be considered? **No**

8. Are there any other issues that are important for us to understand and consider? **No**

Land Use & Zoning

1. Please provide a copy of your existing and future land use map or zoning map, if applicable. **N/A**
2. Are 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 or intercity transit service in the project area? Please provide the name and contact information for the relevant public transit provider. **No**

Communications

1. Please identify any local communication outlets that are available for us to use in communicating with the local population. Include weekly or daily newspapers, blogs, radio, public access TV, Facebook, Front Page Forum, etc. Also include any unconventional means such as local low-power FM. **The Springfield Reporter (a weekly newspaper) and The Eagle Times (daily newspaper from Claremont) are the local newspapers. WCFR 106.5= radio station. The Town and Police Department have Facebook pages.**

2. Other than people/organizations already referenced in this questionnaire, are there any others who should be kept in the loop as the project moves forward? **No**

Appendix L: Operations Input

Bridge Scoping Project IM 091-1(83)
Operations Input Questionnaire

The Structures Section has begun the scoping process for IM 091-1(83), Bridges 28N&S, over US Route 5. These are rolled beam/concrete deck bridges constructed in 1965. The Structure Inspection, Inventory, and Appraisal Sheet (attached) for bridge 28N rates the deck as 5 (fair), the superstructure as 5 (fair), and the substructures as 5 (fair), the Structure Inspection, Inventory, and Appraisal Sheet (attached) for bridge 28S rates the deck as 6 (satisfactory), the superstructure as 7 (good), and the substructures as 6 (satisfactory). We are interested in hearing your thoughts regarding the items listed below. Leave it blank if you don't wish to comment on a particular item.

1. What are your thoughts on the general condition of these bridges and the general maintenance effort required to keep it in service?
   The deck and abutments are in fair condition, however there is significant rot on the southbound bridge north side, right lane abutment.

2. What are your comments on the current geometry and alignment of the bridges (curve, sag, banking, sight distance)?
   The bridge geometry is fine.

3. Do you feel that the posted speed limit is appropriate?
   The speed limit is fine.

4. Are the current bridges and approach roadways width adequate for winter maintenance including snow plowing?
   The approaches are adequate, but the southbound bridge could certainly be wider.

5. Are the joints salvageable or would you recommend replacement?
   Most of the joints have been replaced with plug joint material and that only lasts a few years. The joints that are left have been repaired numerus times with welds and/or new steel plates. All joints need to be replaced.

6. Are the railings constantly in need of repair or replacement? What type of railing works best for your district? (We are recommending more and more box beam guardrail on our bridges because of crash-worthiness and compatibility with accelerated projects).
   The railings are fine, however, the concrete they are bolted to is not in the best condition. There is a lot of rot and broken curbing.

7. Are you aware of abutting property owners that are likely to need special attention during the planning and construction phases? These could be people with disabilities, elderly, or simply folks who feel they have been unfairly treated in the past.
   There are no abutting property owners here, it is all state land.

8. Are you familiar with traffic volumes in the area of this project?

9. Do you think a closure with off-site detour and accelerated construction would be appropriate? Do you have any opinion about a possible detour route, assuming that we use State route for State projects and any route for Town projects? Are there locations on a potential detour that are already congested that we should consider avoiding?
   This bridge goes over Rt 11 which is a 4 lane road (2 lanes headed east and two lanes headed west). There are also the exit 7 north and southbound entrance ramps to take into consideration. I would avoid complete closure and possibly go with a shift to the northbound bridge and visa versa when it is time to replace the southbound.

10. Please describe any larger projects that you have completed that may not be reflected on the attached Appraisal sheet, such as deck patches, paving patches, railing replacement with new type, steel coating, etc.
    Joint repairs, removing finger joints and replacing with plug joint material. Grinding out crumbling asphalt in front of finger joints and replacing with new. (Southbound bridge)

11. Are there any drainage issues that we should address on this project?
    None that I know of.

12. Are you aware of any complaints that the public has about issues that we can address on this project?
    None that I know of.

13. Is there anything else we should be aware of?

Appendix M: Crash Data

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

WHERE Year of Crash >= 2012 AND Year of Crash <= 2016

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
							driving						
	VTVSP0400/15D100344	Springfield	41.00	02/02/2015	09:44	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/15D101873	Springfield	41.00	06/13/2015	22:49	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/15D102222	Springfield	41.00	07/14/2015	08:48	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/15D102552	Springfield	41.00	08/10/2015	08:14	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/15D103287	Springfield	41.00	10/24/2015	17:24	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/16D100312	Springfield	41.00	02/09/2016	08:01	[No Weather]		[No Direction of Collision]	0	0	0		SH State Owned
	VTVSP1600/16D001283	Springfield	41.00	08/23/2016	22:55	[No Weather]		[No Direction of Collision]	0	0	0		SH State Owned
	VTVSP0400/12D100235	Springfield	41.17	01/18/2012	09:40	Clear	Failure to keep in proper lane, Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner, No improper driving	Same Direction Sideswipe	0	0	0	N	SH
	VTVSP0400/12D102132	Springfield	41.35	07/10/2012	13:21	Cloudy	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	S	SH
	VTVSP0400/13D104113	Springfield	41.35	12/29/2013	18:04	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/13D104107	Springfield	41.50	12/29/2013	17:40	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/12D103963	Springfield	41.55	12/09/2012	08:02	Cloudy	Driving too fast for conditions	Single Vehicle Crash	0	0	0	S	SH
	VTVSP0400/14D101365	Springfield	41.55	05/08/2014	18:35	Clear	Distracted	Single Vehicle Crash	0	0	0	S	SH
	VTVSP1600/16D003100	Springfield	41.60	10/27/2016	21:58	Snow	Driving too fast for conditions, Failure to keep in proper lane	Other - Explain in Narrative	0	0	0	S	SH State Owned
	VTVSP0400/12D101006	Springfield	41.67	03/29/2012	17:40	Cloudy	Failure to keep in proper lane, Driving too fast for conditions	Single Vehicle Crash	1	0	0	N	SH
	VTVSP0400/12D102701	Springfield	41.70	08/23/2012	15:54	Clear	Made an improper turn, No improper driving	Same Direction Sideswipe	0	0	0	N	SH
	VTVSP0400/13D100244	Springfield	41.71	01/21/2013	19:46	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0	N	SH
	VTVSP0400/13D104111	Springfield	41.72	12/29/2013	18:01	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/12D102315	Springfield	41.95	07/28/2012	14:47	Rain	Driving too fast for conditions	Single Vehicle Crash	0	0	0	N	SH
	VTVSP0400/13D100446	Springfield	42.00	02/11/2013	10:07	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0	N	SH
	VTVSP0400/13D103779	Springfield	42.00	11/30/2013	14:11	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/14D100897	Springfield	42.00	03/20/2014	16:09	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/15D100345	Springfield	42.00	02/02/2015	10:15	Snow	Driving too fast for conditions, Followed too closely, No improper driving	Rear End	1	0	0	S	SH
	VTVSP0400/15D102152	Springfield	42.00	07/08/2015	10:03	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP0400/15D103859	Springfield	42.00	12/29/2015	10:18	[No Weather]		[No Direction of Collision]	0	0	0		SH

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

Vermont Agency of Transportation

Statewide Sections - Route Log Order /2 - Statewide

Years: 2010 - 2014

H.C.L No.	/3. Route	System	Town	Mileage	ADT	Years	Crashes	Fatalities	Injuries	PDO Crashes	Critical Rate	Actual Rate	Ratio Actual/Critical	Severity Index ($/Accident/1.)
	503 I-91	Interstate, Rural (r)	Vernon, Guilford	5.000 - 5.300	16700	5	12	0	1	11	1.168	1.312	1.124	$14,733
	504 I-91	Interstate, Rural (r)	Guilford	6.000 - 6.300	16700	5	12	0	1	11	1.168	1.312	1.124	$14,733
	521 I-91	Interstate, Urban (r)	Brattleboro	7.600 - 7.900	18900	5	11	0	1	10	0.967	1.063	1.099	$15,264
	290 I-91	Interstate, Urban (r)	Brattleboro	8.500 - 8.800	18900	5	14	0	4	11	0.967	1.352	1.399	$29,536
	111 I-91	Interstate, Urban (r)	Brattleboro	9.000 - 9.300	22774	5	22	0	5	17	0.926	1.764	1.904	$24,809
	505 I-91	Interstate, Urban (r)	Brattleboro	9.800 - 10.100	22800	5	13	0	0	13	0.926	1.041	1.124	$8,900
	394 I-91	Interstate, Rural (r)	Dummerston	17.800 - 18.100	14600	5	12	0	5	9	1.205	1.501	1.246	$39,550
	530 I-91	Interstate, Rural (r)	Putney	18.400 - 18.700	10200	5	8	0	1	7	1.314	1.432	1.09	$17,650
	310 I-91	Interstate, Rural (r)	Putney	19.000 - 19.300	10200	5	10	0	1	9	1.314	1.79	1.363	$15,900
	417 I-91	Interstate, Rural (r)	Putney	19.600 - 19.900	10200	5	9	0	1	8	1.314	1.611	1.226	$16,678
	308 I-91	Interstate, Rural (r)	Putney	21.000 - 21.300	10200	5	10	0	4	7	1.314	1.79	1.363	$37,790
	415 I-91	Interstate, Rural (r)	Westminster	24.000 - 24.300	10200	5	9	0	4	7	1.314	1.611	1.226	$41,989
	186 I-91	Interstate, Rural (r)	Westminster, Rockingham	31.000 - 31.300	12400	5	14	0	7	10	1.253	2.062	1.646	$45,807
	620 I-91	Interstate, Rural (r)	Rockingham	35.000 - 35.300	11155	5	8	0	1	7	1.285	1.309	1.019	$17,650
	276 I-91	Interstate, Rural (r)	Rockingham	36.400 - 36.700	10900	5	11	0	5	7	1.292	1.843	1.426	$41,527
	277 I-91	Interstate, Rural (r)	Rockingham	37.900 - 38.200	10900	5	11	0	0	11	1.292	1.843	1.426	$8,900
	458 I-91	Interstate, Rural (r)	Rockingham, Springfield	39.000 - 39.300	10900	5	9	0	3	7	1.292	1.508	1.166	$33,222
	457 I-91	Interstate, Rural (r)	Springfield	40.000 - 40.300	10900	5	9	0	5	6	1.292	1.508	1.166	$49,767
	76 I-91	Interstate, Rural (r)	Springfield	40.800 - 41.100	10900	5	16	0	2	14	1.292	2.681	2.074	$17,650
	266 I-91	Interstate, Rural (r)	Springfield	41.500 - 41.800	10650	5	11	0	2	9	1.3	1.886	1.451	$21,627
	416 I-91	Interstate, Rural (r)	Springfield	42.100 - 42.400	10200	5	9	0	3	6	1.314	1.611	1.226	$32,233
	414 I-91	Interstate, Rural (r)	Springfield	43.000 - 43.300	10200	5	9	0	5	5	1.314	1.611	1.226	$48,778

Appendix N: Detour Routes

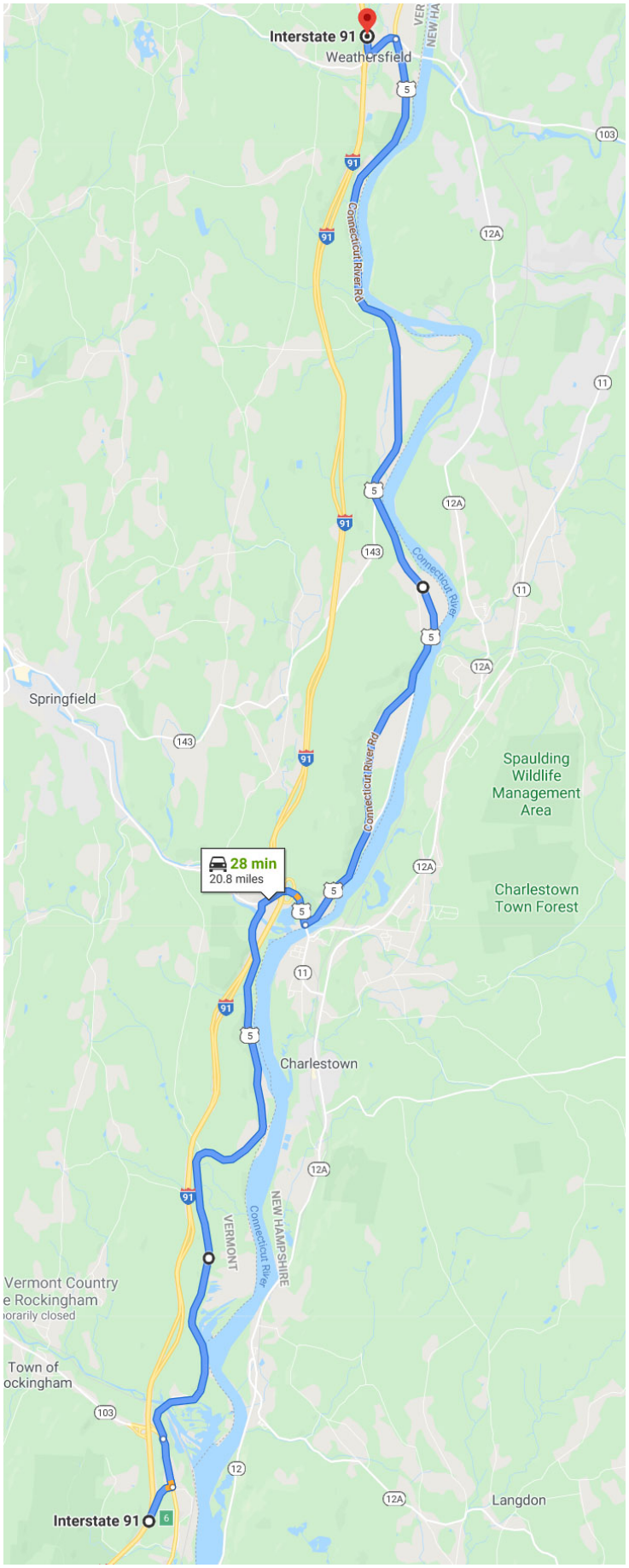
This option would close the section of I-91 between the on and off ramps at exit 7.

I-91 Northbound: Traffic traveling northbound on I-91, would utilize US Route 5 between exit 6 and exit 8. The through distance on the US Route 5 detour is almost identical at 20.8 miles versus the 17.7 miles on I-91, with travel times estimated at 28 minutes for the detour route and 19 minutes for traveling on I-91.

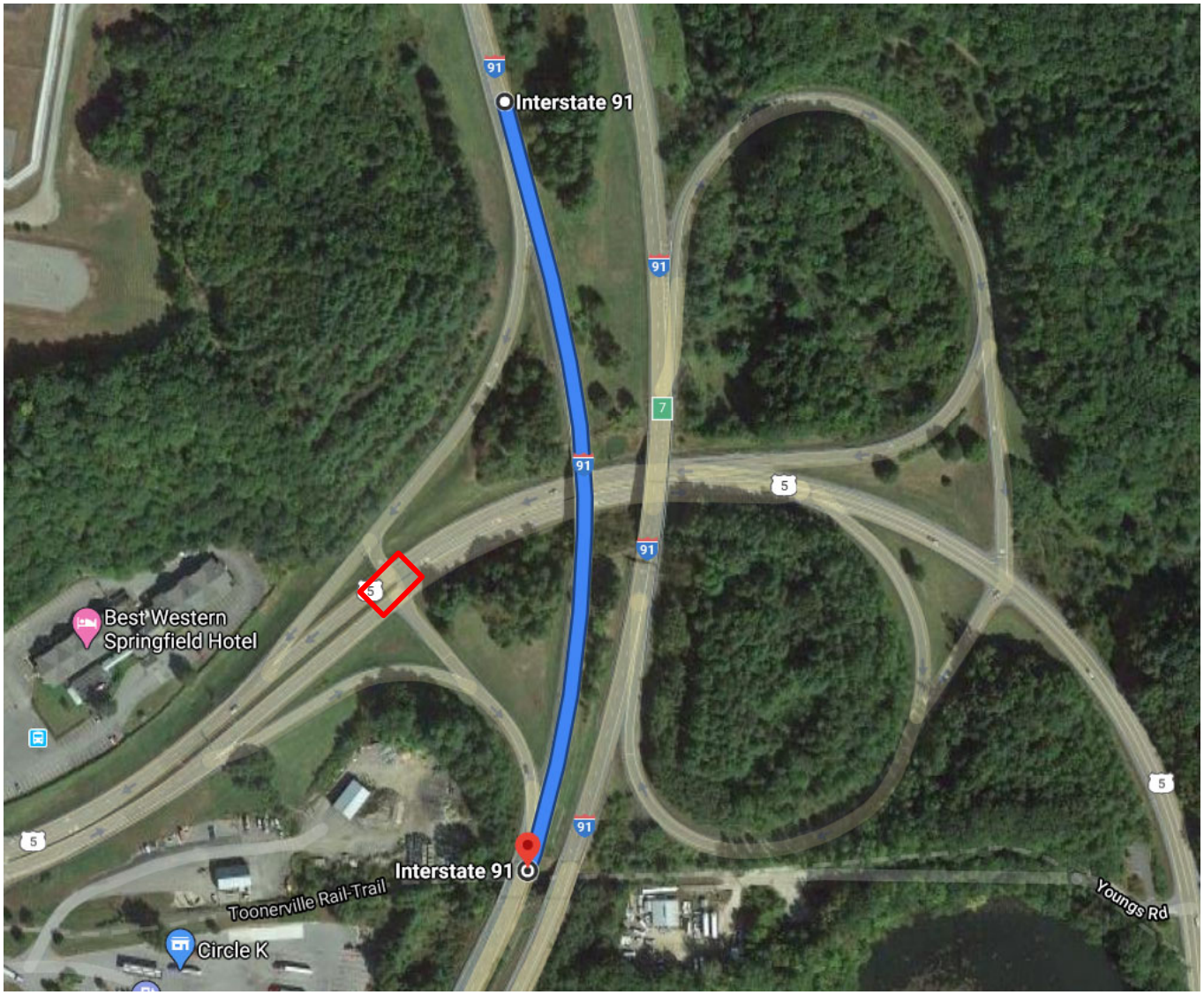
I-91 Southbound: The detour would utilize the on and off ramps at exit 7 for southbound traffic. This detour would not add any distance to the through route.

It is recommended that a detour only be utilized for brief closure periods during off peak hours, such as nights or weekends, in order to rapidly replace the deck or superstructures. The methods available to replace a deck or superstructure during a short closure period include: lateral slide, self-propelled modular transporters (SPMTs), and prefabricated bridge elements.

I-91 Northbound Detour:
Traffic traveling northbound on I-91, would utilize US Route 5 between exit 6 and exit 8. The through distance on the US Route 5 detour is almost identical at 20.8 miles versus the 17.7 miles on I-91, with travel times estimated at 28 minutes for the detour route and 19 minutes for traveling on I-91.



I-91 Southbound Detour:
Traffic traveling Southbound on I-91, would utilize the on and off ramps at exit 7 for southbound traffic. This detour would not add any distance to the through route. The median between US Route 5 northbound and southbound would need to be modified to allow traffic to cross over Route 5 during construction.



Appendix O: Plans

WOVEN WIRE FENCE

POB STA 2164+03.17

SIGN D2-2 (BELLOWS FALLS 9 BRATTLEBORO 32)

SIGN D10-2A (41.0)

I-91 SB TO ROCKINGHAM

2164+03 2165+00 2166+00 2167+00 2168+00

POB STA 2164+04.36

D1

2164+04 2165+00 2166+00 2167+00

I-91 NB TO WEATHERSFIELD

2168

SIGN D10-2A (41.0)

D1

MATCH LINE STA 2168+00.00 NB

RESOURCE SITE PLAN 1

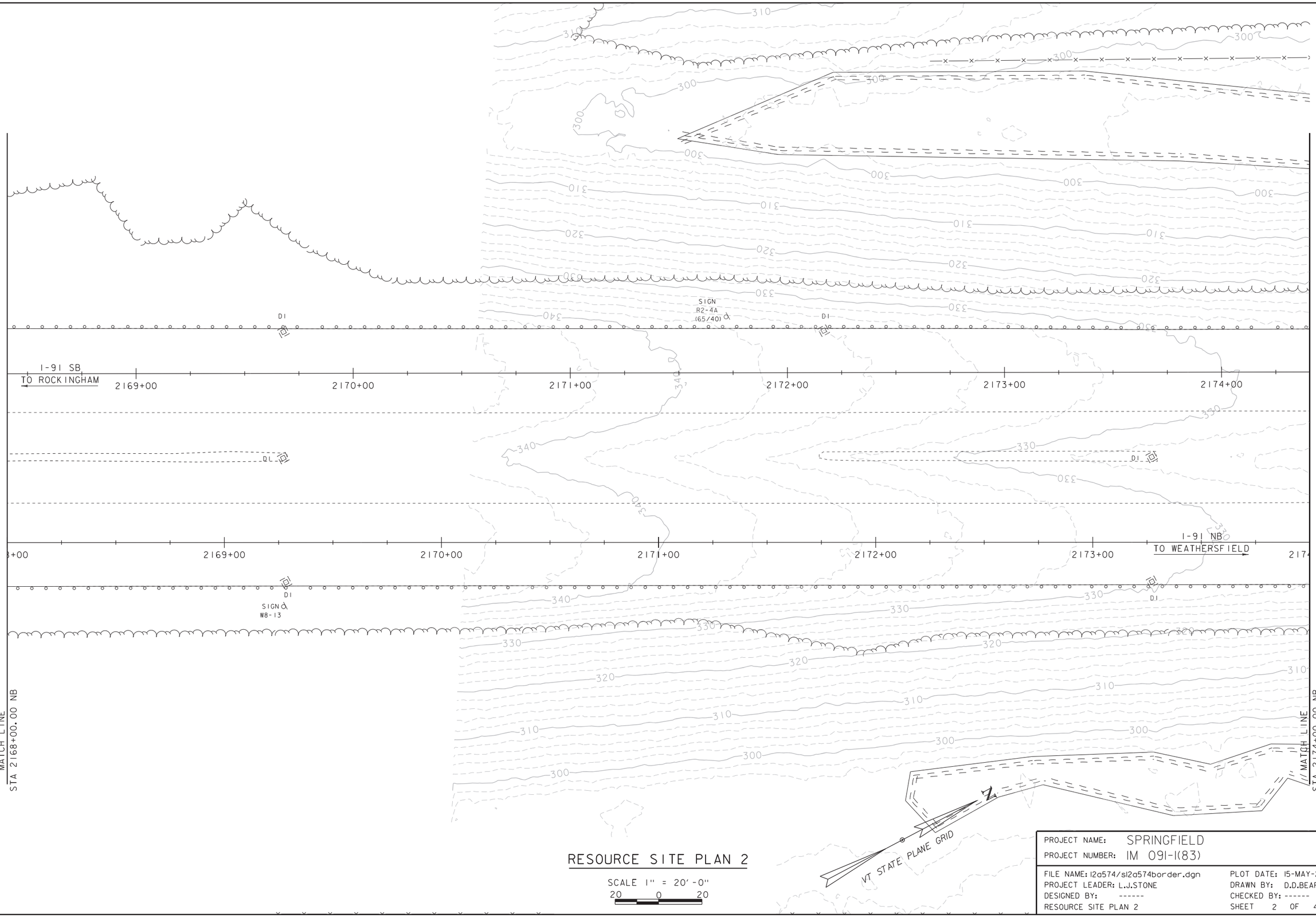
SCALE 1" = 20'-0"

20 0 20

VT STATE PLANE GRID

N

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: l2a574/sl2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
RESOURCE SITE PLAN 1	SHEET 1 OF 47



RESOURCE SITE PLAN 2

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME:	12a574/si2a574border.dgn
PROJECT LEADER:	L.J.STONE
DESIGNED BY:	------
RESOURCE SITE PLAN 2	
PLOT DATE:	15-MAY-2020
DRAWN BY:	D.D.BEARD
CHECKED BY:	------
SHEET	2 OF 47

WOVEN WIRE FENCE

BLACK RIVER
FLOW

STONE FILL

SIGN
W8-15
W8-15P

I-91 SB
TO ROCKINGHAM

2175+00 2176+00 2177+00 2178+00 2179+00 2180+00

DI DI

SIGN
OM3-L

SIGN
I-3
(BLACK RIVER)

SIGN
VD-701
(BR 26
I-91)

SIGN
OM3-R

I-91 NB
TO WEATHERSFIELD

MATCH LINE
STA 2174+00.00 NB

MATCH LINE
STA 2180+00.00 NB

WOVEN WIRE FENCE

RESOURCE SITE PLAN 3

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

N
VT STATE PLANE GRID

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: 12a574/sl2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
RESOURCE SITE PLAN 3	SHEET 3 OF 47

STONE FILL

SIGN OM3-R

SIGN VD-701 (BR 26 I-91)

SIGN I-3 (BLACK RIVER)

SIGN M1-1 (91) M3-3

SIGN W8-13

I-91 SB TO ROCKINGHAM

2181+00 2182+00 2183+00 2184+00 2185+00 2186+00

SIGN OM3-L

DI

SIGN R3-4

SIGN R3-4

I-91 NB TO WEATHERSFIELD

2181+00 2182+00 2183+00 2184+00 2185+00 2186

INTERCHANGE ADVANCE GUIDE SIGN (EXIT 7 SPRINGFIELD NEXT RIGHT)

MATCH LINE STA 2180+00.00 NB

MATCH LINE STA 2186+00.00 NB

RESOURCE SITE PLAN 4

SCALE 1" = 20'-0"

20 0 20

N

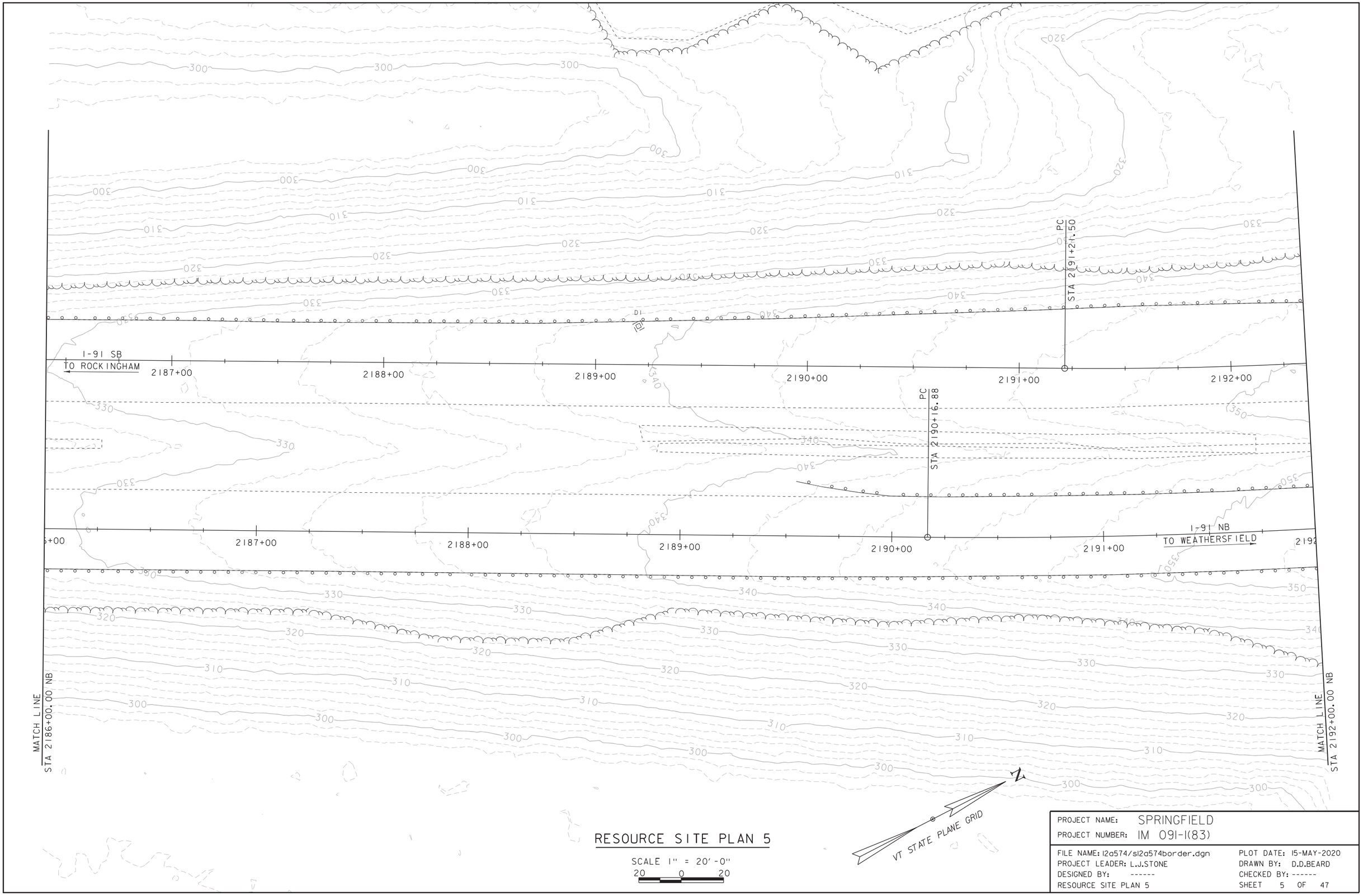
VT STATE PLANE GRID

PROJECT NAME: SPRINGFIELD

PROJECT NUMBER: IM 091-1(83)

FILE NAME: I2a574/sI2a574border.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
RESOURCE SITE PLAN 4

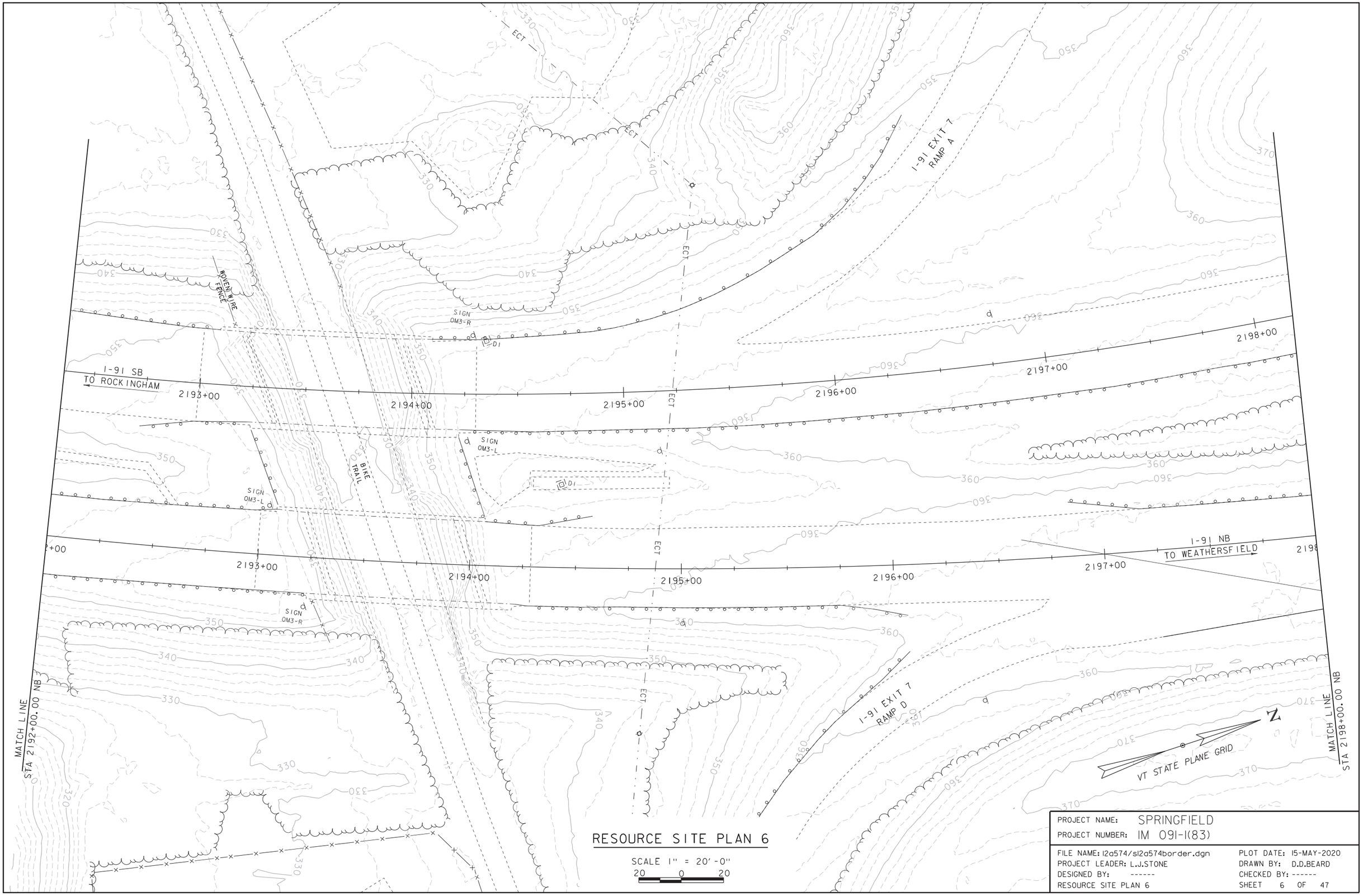
PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 4 OF 47



RESOURCE SITE PLAN 5

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: I2a574/sl2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
RESOURCE SITE PLAN 5	SHEET 5 OF 47



RESOURCE SITE PLAN 6

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)

FILE NAME: I2a574/sI2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
RESOURCE SITE PLAN 6	SHEET 6 OF 47

US ROUTE 5
TO ROCKINGHAM

I-91 SB
TO ROCKINGHAM

I-91 NB
TO WEATHERSFIELD

US ROUTE 5
TO WEATHERSFIELD

2199+00
2200+00
2201+00
2202+00
2203+00

MATCH LINE
STA 2198+00.00 NB

PI
STA 2198+85.15

I-91 SOUTHBOUND CURVE 1
DELTA = 43°35'17"
D = 3°00'00"
R = 1909.86'
T = 763.66'
L = 1452.93'
E = 147.02'

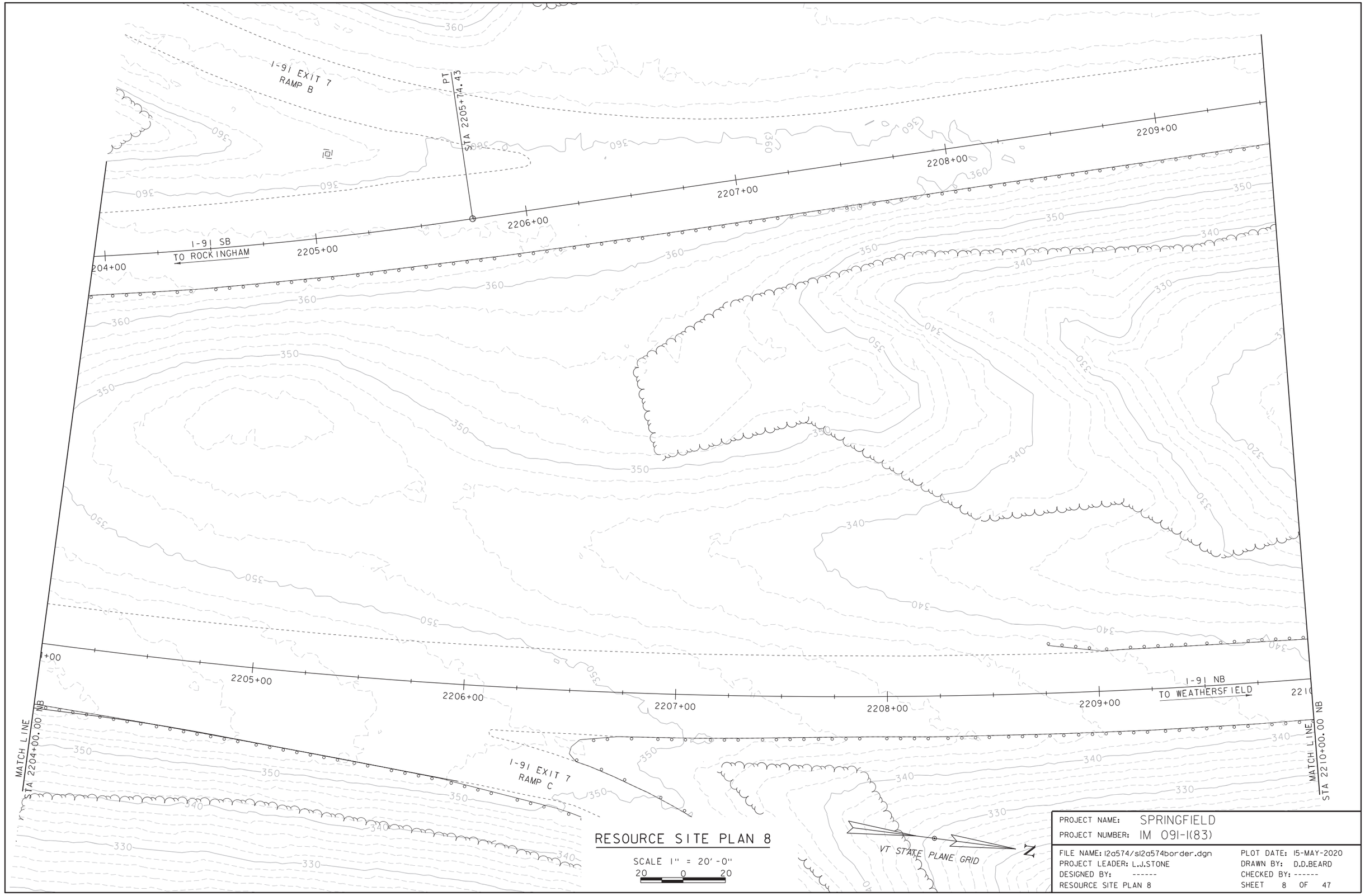
MATCH LINE
STA 2204+00.00 NB

N
VT STATE PLANE GRID

RESOURCE SITE PLAN 7

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

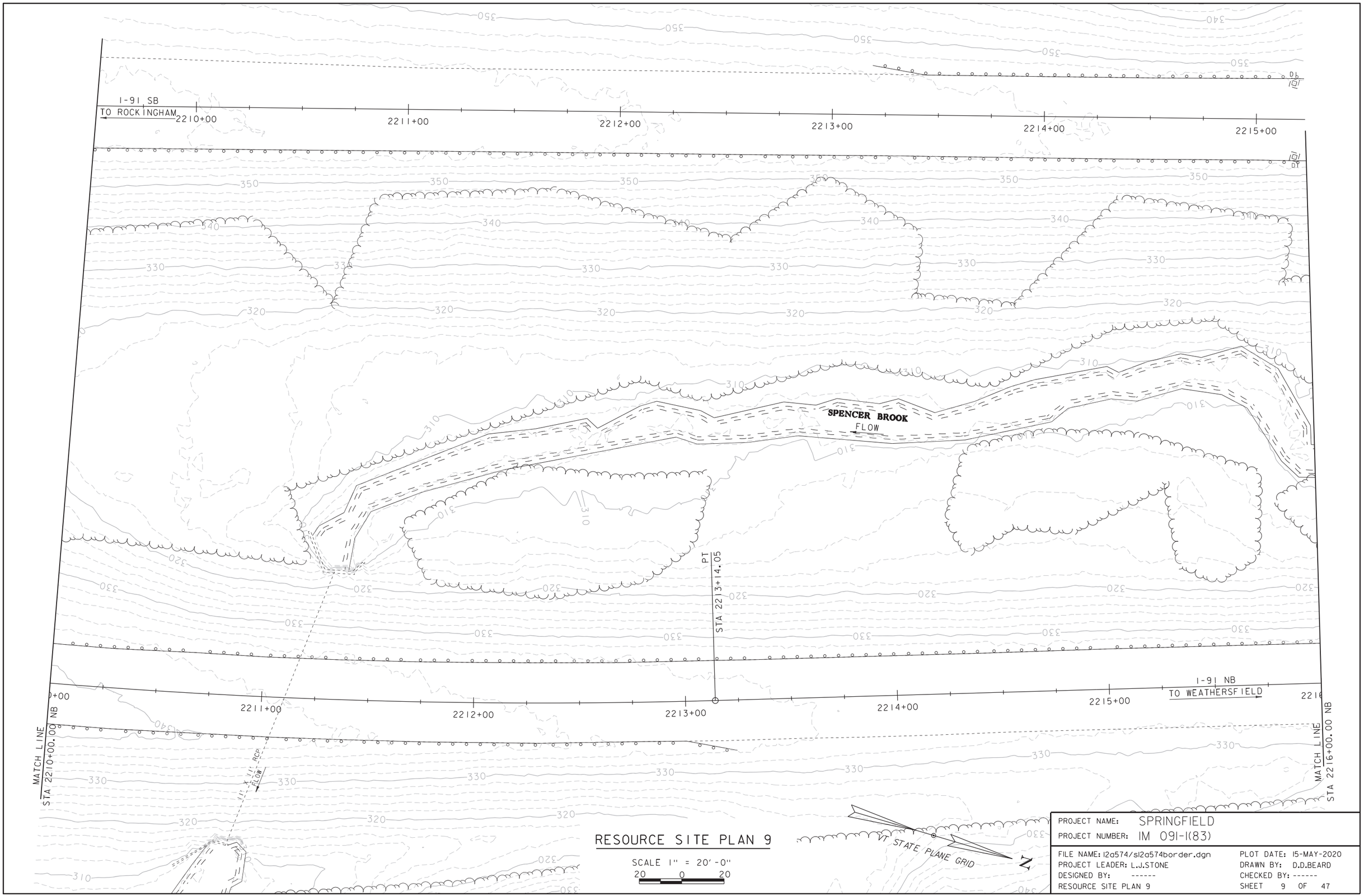
PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: I2a574/sI2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
RESOURCE SITE PLAN 7	SHEET 7 OF 47



RESOURCE SITE PLAN 8

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME:	I2a574/sI2a574border.dgn
PROJECT LEADER:	L.J.STONE
DESIGNED BY:	------
RESOURCE SITE PLAN 8	
PLOT DATE:	15-MAY-2020
DRAWN BY:	D.D.BEARD
CHECKED BY:	------
SHEET	8 OF 47



RESOURCE SITE PLAN 9

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: I2a574/sI2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
RESOURCE SITE PLAN 9	SHEET 9 OF 47

I-91 SB
TO ROCKINGHAM

2216+00

2217+00

2218+00

2219+00

2220+00

2221+00

POE
STA 2221+02.97

2222+03

SPENCER BROOK
FLOW

I-91 NB
TO WEATHERSFIELD

2217+00

2218+00

2219+00

2220+00

2221+00

2222

MATCH LINE
STA 2216+00.00 NB

MATCH LINE
STA 2222+00.00 NB

VT STATE PLANE GRID

N

RESOURCE SITE PLAN 10

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: 12a574/sl2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
RESOURCE SITE PLAN 10	SHEET 10 OF 47

I-91 SB
TO ROCKINGHAM

1'-6" X 1'-0" RCP
FLOW

SPENCER BROOK
FLOW

POE
STA 2222+06.54

2222+07

MATCH LINE
STA 2222+00.00 NB

I-91 NB
TO WEATHERSFIELD

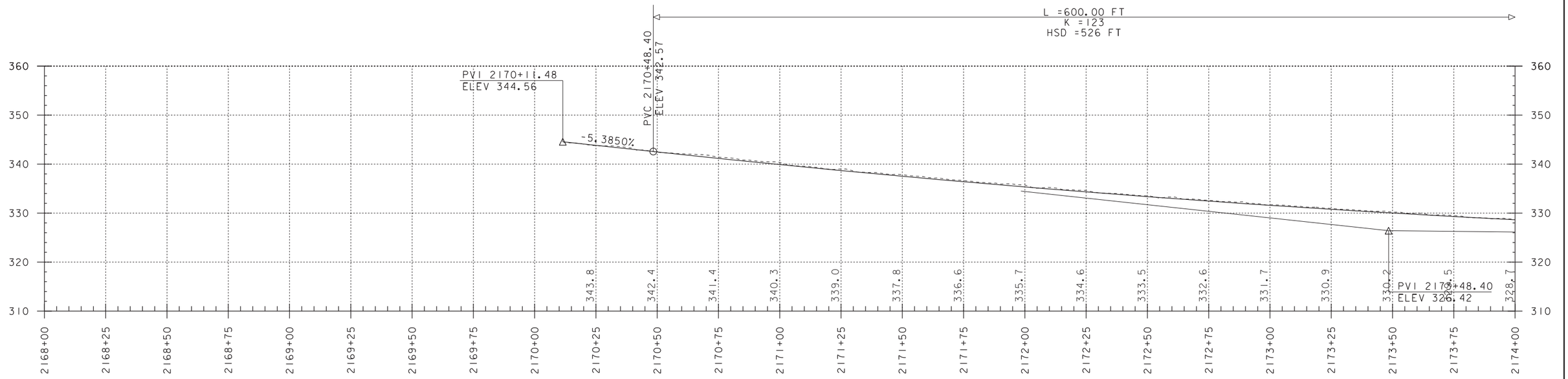
VT STATE PLANE GRID

N

RESOURCE SITE PLAN II

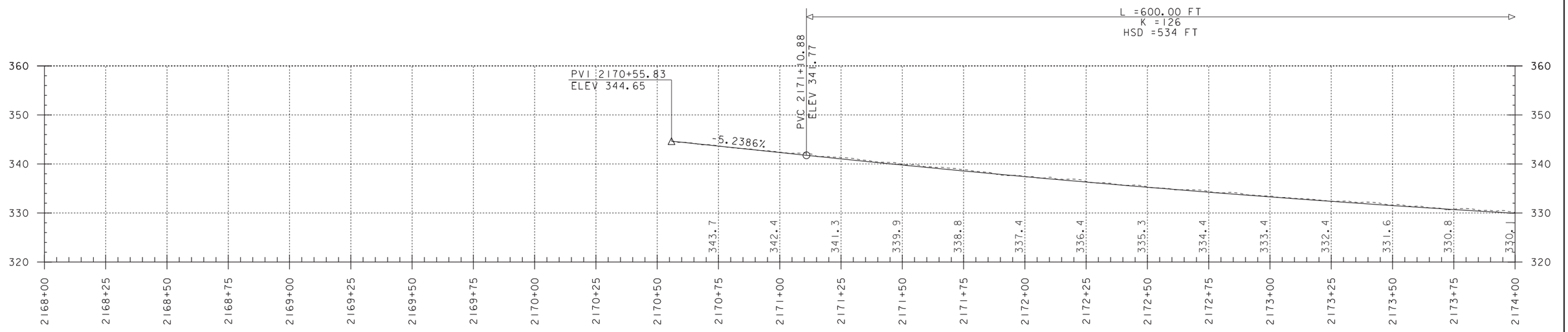
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: I2a574/sI2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
RESOURCE SITE PLAN II	SHEET II OF 47



INTERSTATE 91 NB PROFILE

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



INTERSTATE 91 SB PROFILE

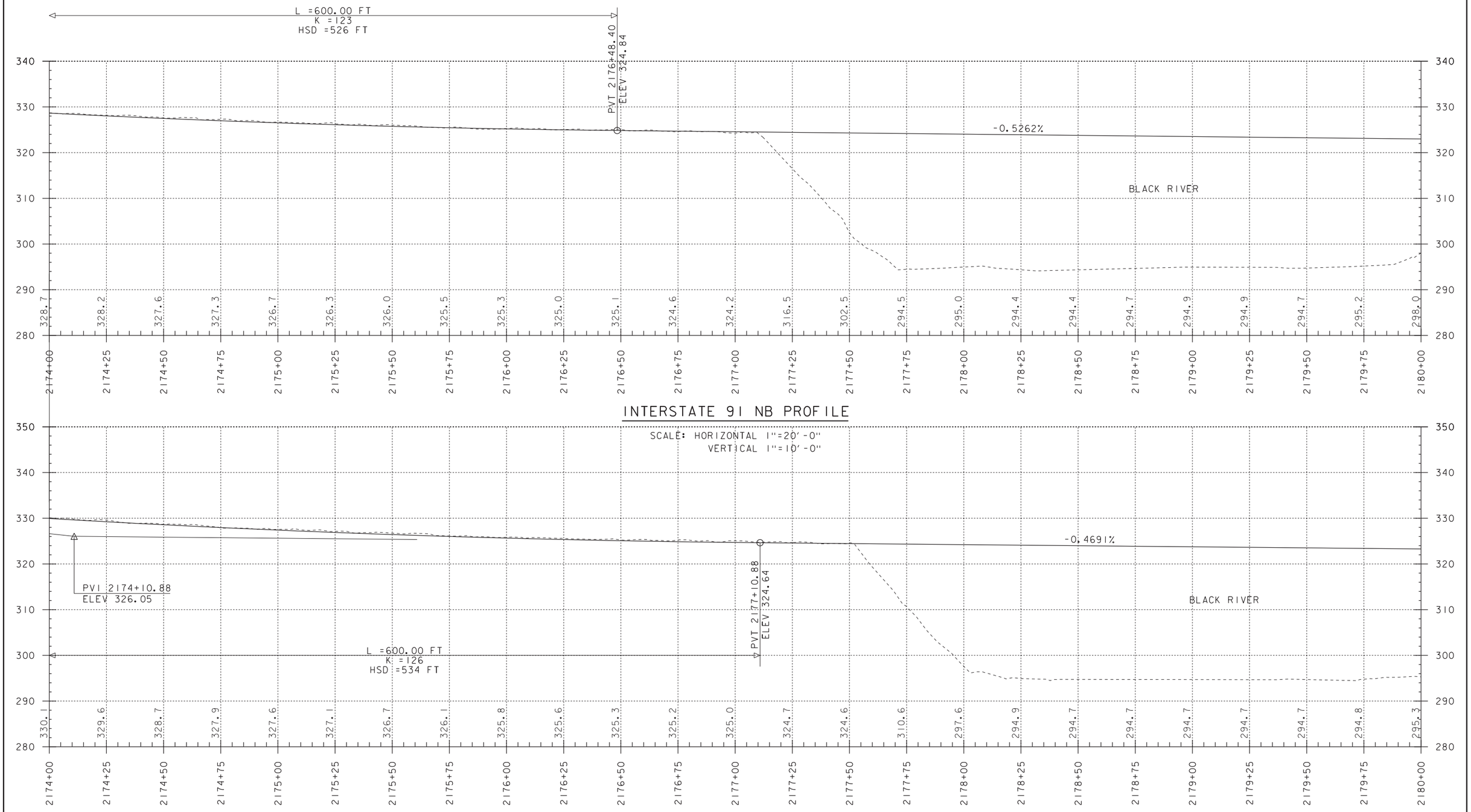
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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: IM 091-1(83)

FILE NAME: 12a574/sl2a574profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
INTERSTATE 91 PROFILE SHEET 1

PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 12 OF 47



INTERSTATE 91 NB PROFILE

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

INTERSTATE 91 SB PROFILE

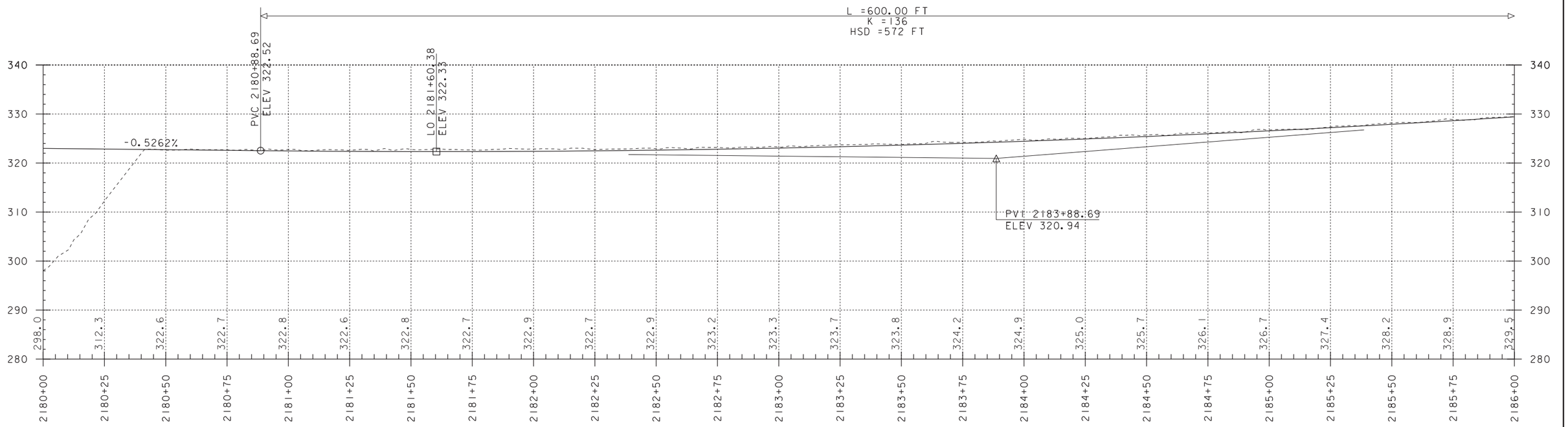
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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: IM 091-1(83)

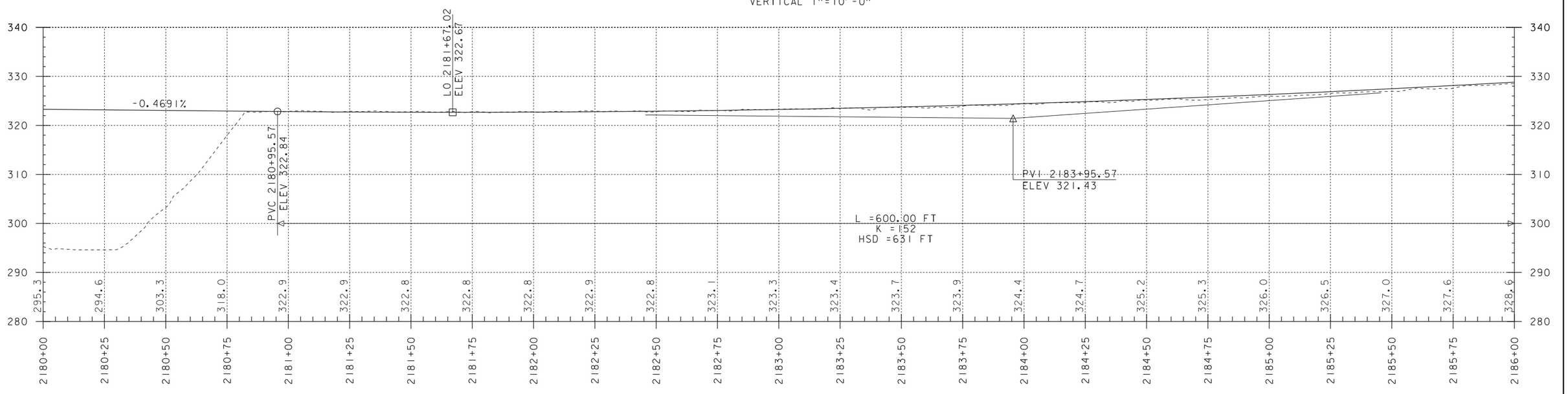
FILE NAME: 12a574/sl2a574profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
INTERSTATE 91 PROFILE SHEET 2

PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 13 OF 47



INTERSTATE 91 NB PROFILE

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

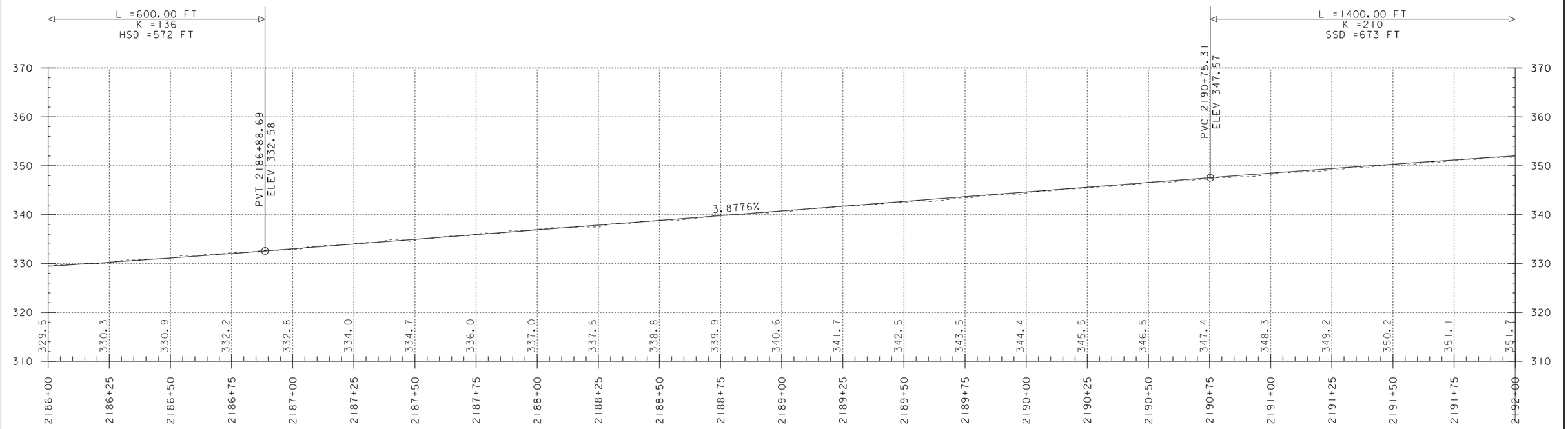


INTERSTATE 91 SB PROFILE

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

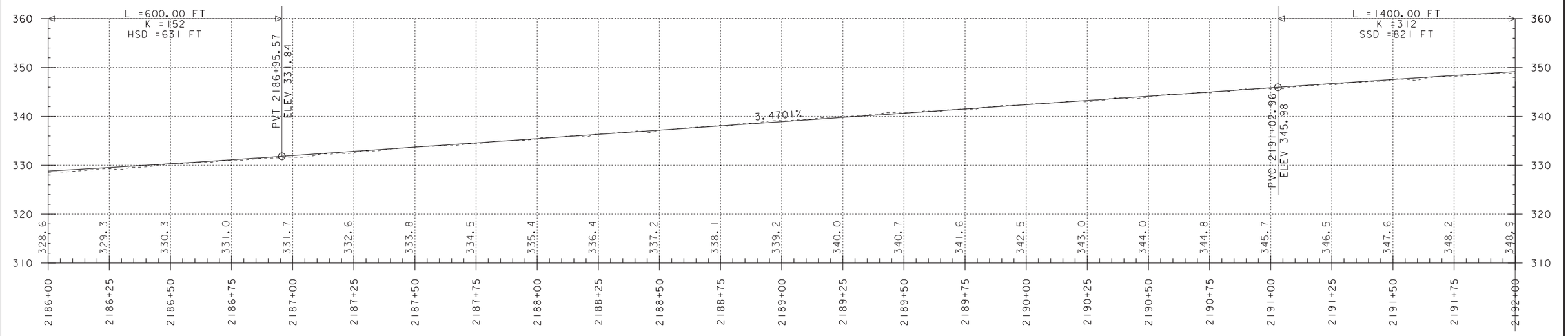
NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: 12a574/sl2a574profile.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
INTERSTATE 91 PROFILE SHEET 3	SHEET 14 OF 47



INTERSTATE 91 NB PROFILE

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

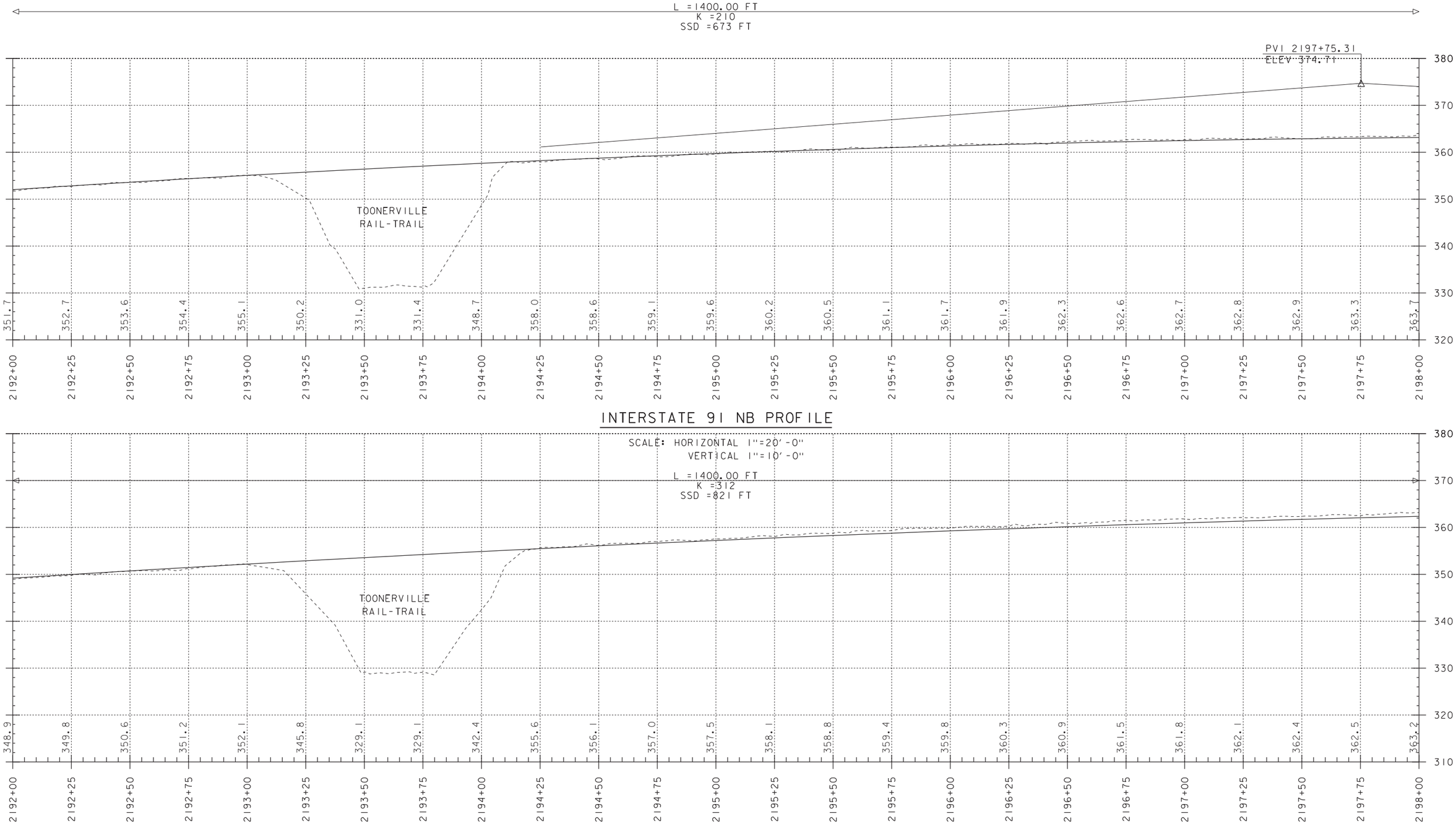


INTERSTATE 91 SB PROFILE

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: IM 091-1(83)	
FILE NAME: I2a574/sI2a574profile.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
INTERSTATE 91 PROFILE SHEET 4	SHEET 15 OF 47



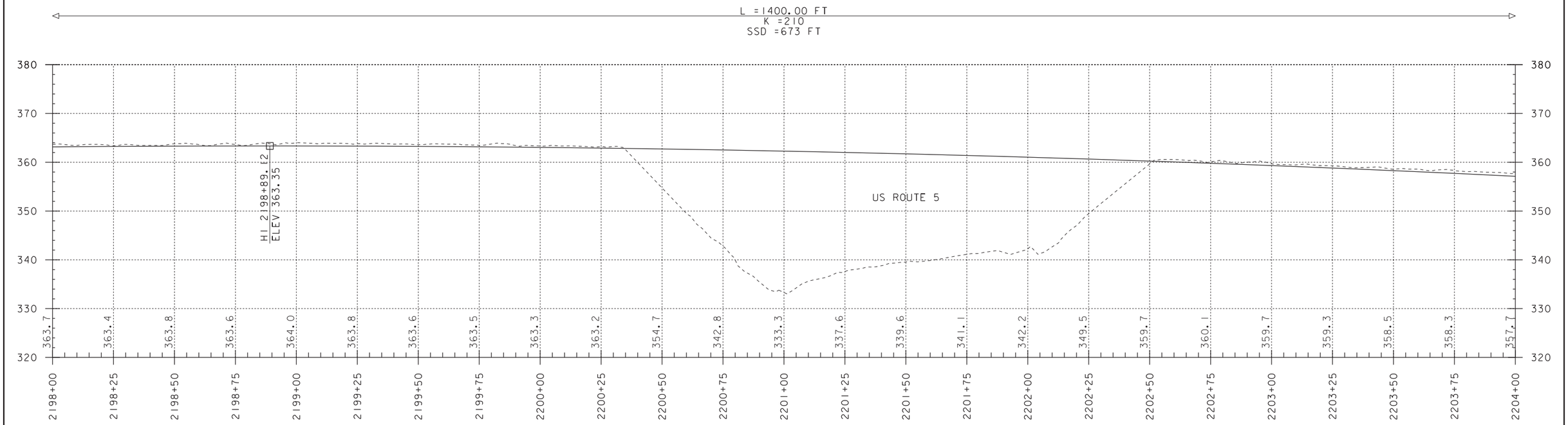
INTERSTATE 91 NB PROFILE

INTERSTATE 91 SB PROFILE

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

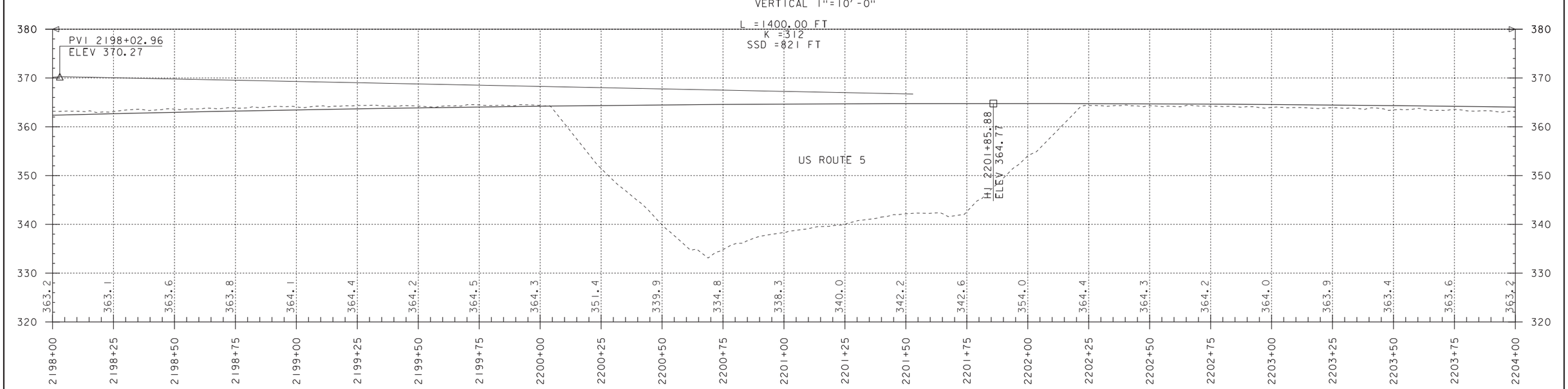
NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: 12a574/sl2a574profile.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
INTERSTATE 91 PROFILE SHEET 5	SHEET 16 OF 47



INTERSTATE 91 NB PROFILE

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



INTERSTATE 91 SB PROFILE

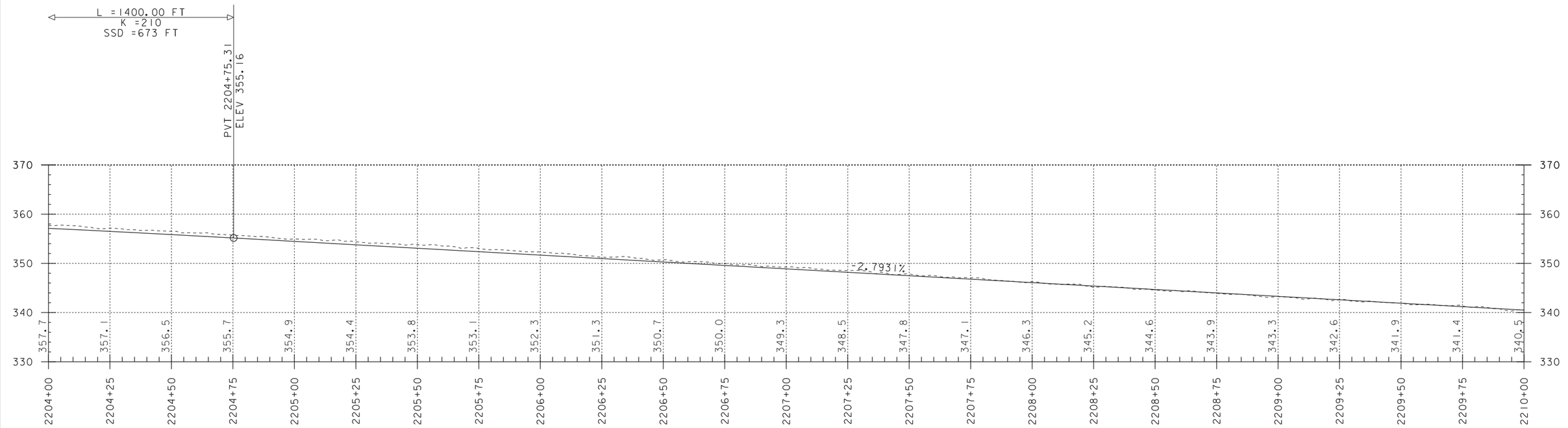
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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: IM 091-1(83)

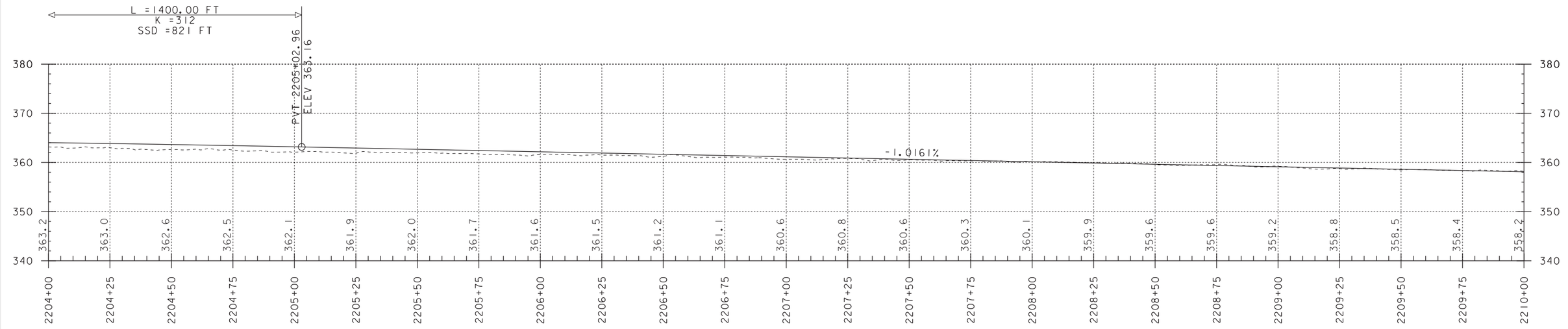
FILE NAME: 12a574/sl2a574profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
INTERSTATE 91 PROFILE SHEET 6

PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 17 OF 47



INTERSTATE 91 NB PROFILE

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



INTERSTATE 91 SB PROFILE

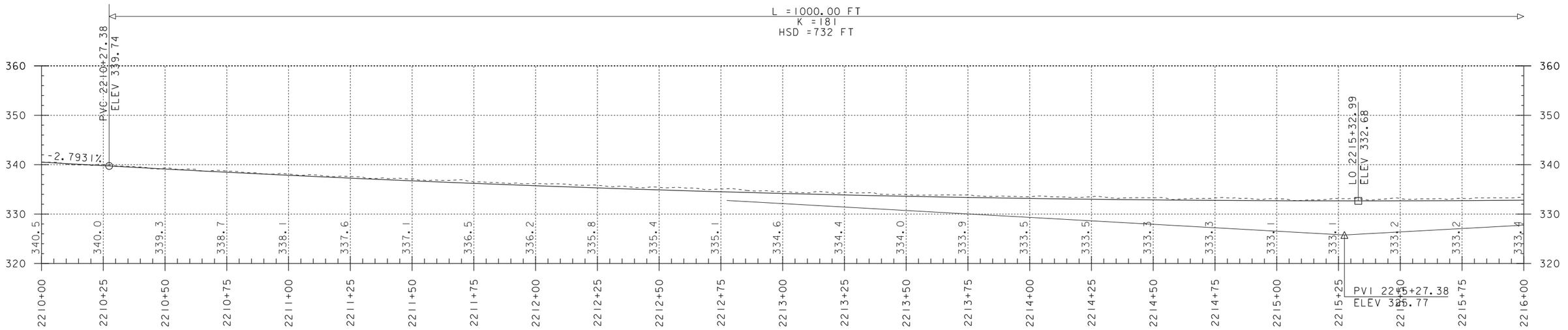
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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: IM 091-1(83)

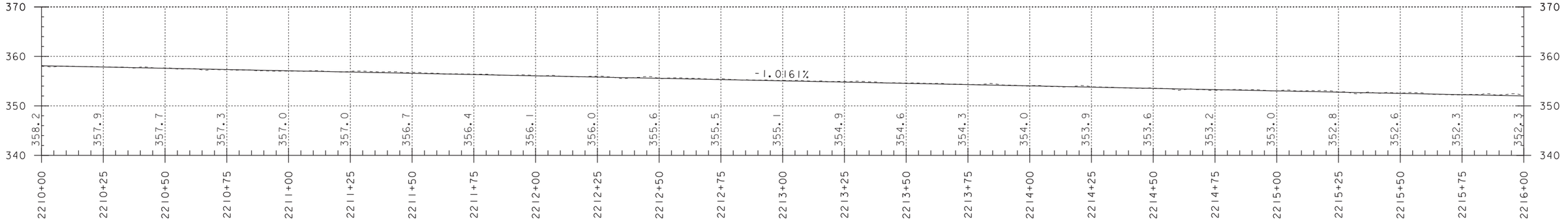
FILE NAME: 12a574/sl2a574profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
INTERSTATE 91 PROFILE SHEET 7

PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 18 OF 47



INTERSTATE 91 NB PROFILE

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



INTERSTATE 91 SB PROFILE

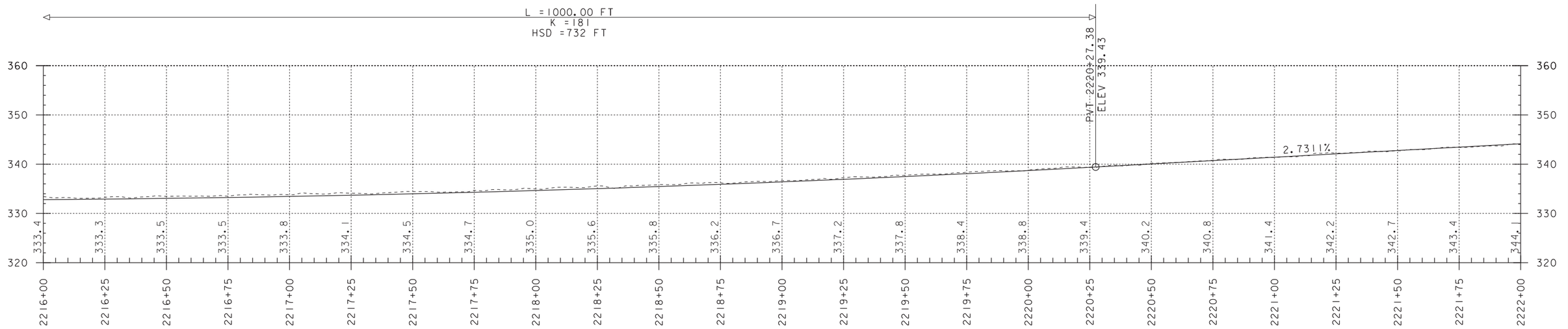
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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: IM 091-1(83)

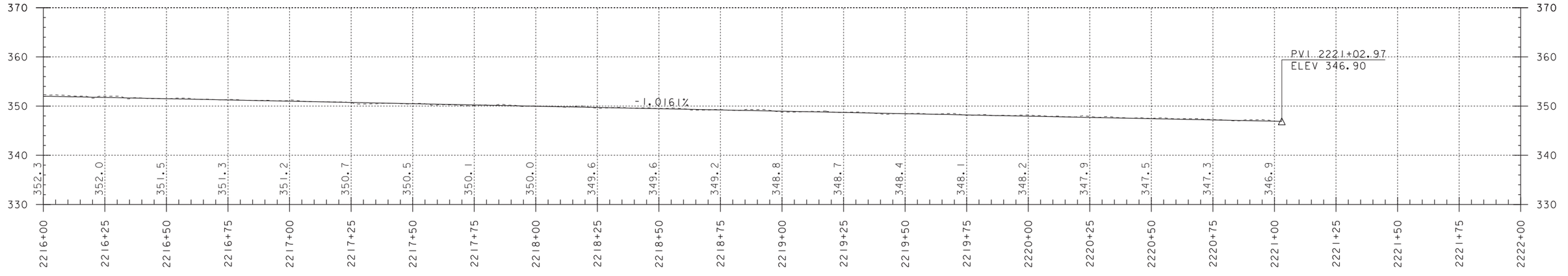
FILE NAME: 12a574/sl2a574profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
INTERSTATE 91 PROFILE SHEET 8

PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 19 OF 47



INTERSTATE 91 NB PROFILE

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



INTERSTATE 91 SB PROFILE

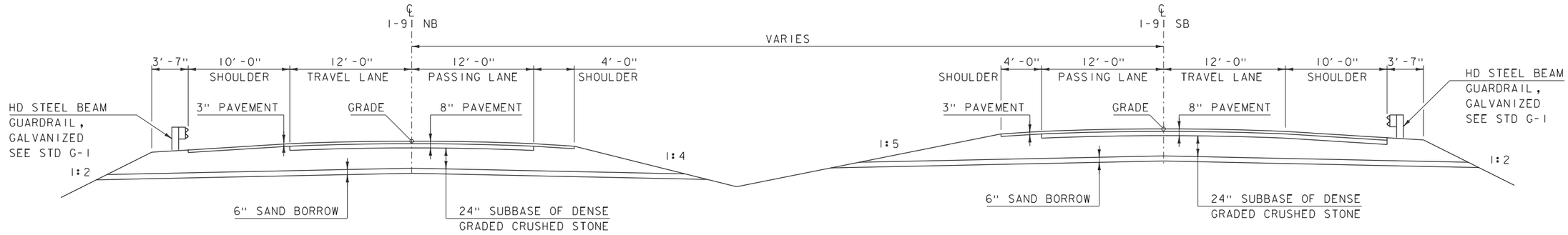
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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: IM 091-1(83)

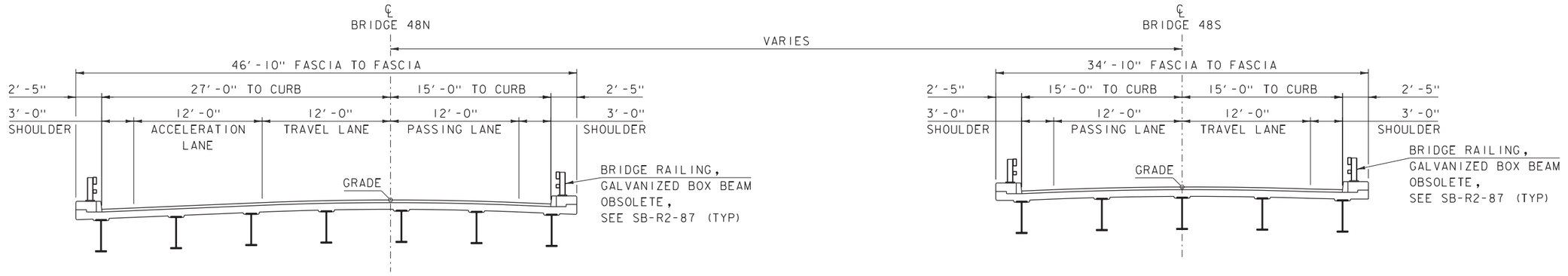
FILE NAME: I2a574/sI2a574profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
INTERSTATE 91 PROFILE SHEET 9

PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 20 OF 47



EXISTING I-91 TYPICAL SECTION

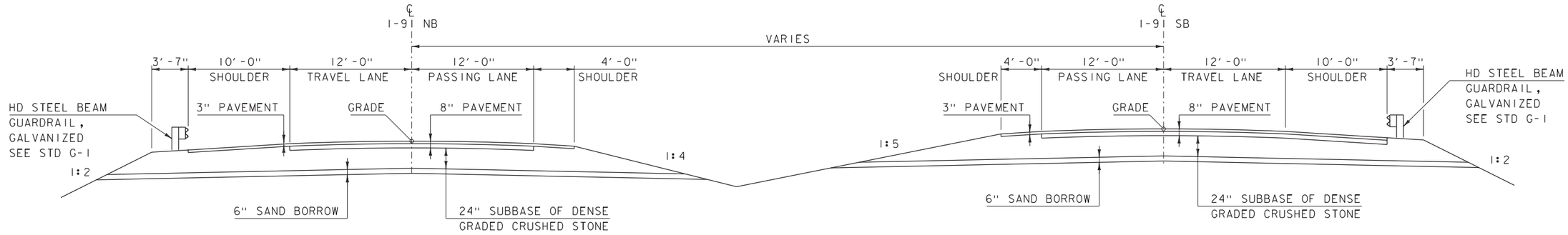
SCALE 3/16" = 1'-0"
ACCELERATION LANE NOT SHOWN



EXISTING BRIDGE 48 N/S TYPICAL SECTION

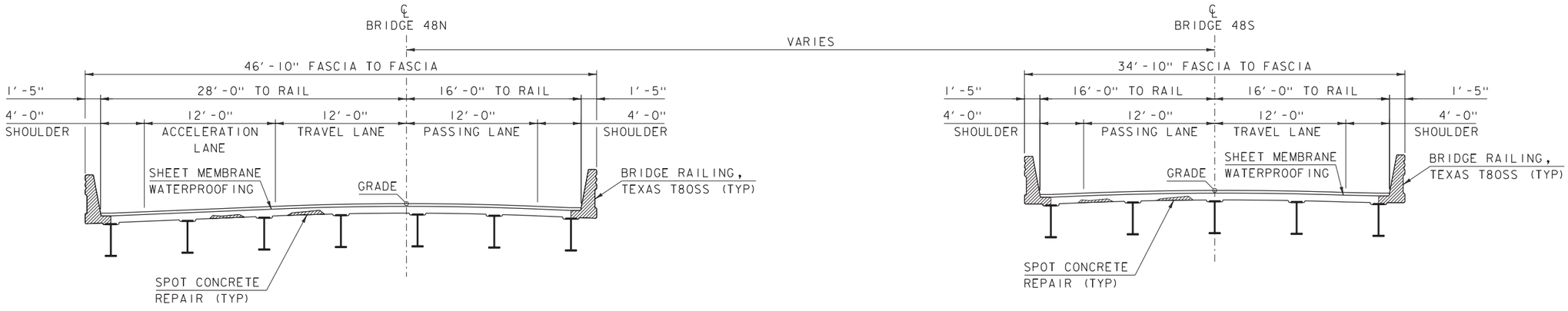
SCALE 3/16" = 1'-0"
ALL DIMENSIONS ARE RADIAL UNLESS OTHERWISE NOTED

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: l2a574/sl2a574typ.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING TYPICAL SECTIONS	SHEET 21 OF 47



EXISTING I-91 TYPICAL SECTION

SCALE 3/16" = 1'-0"
ACCELERATION LANE NOT SHOWN



BRIDGE 48 N/S REHABILITATION TYPICAL SECTION

SCALE 3/16" = 1'-0"
ALL DIMENSIONS ARE RADIAL UNLESS OTHERWISE NOTED

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: I2a574/sI2a574typ.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
REHABILITATION TYPICAL SECTIONS	SHEET 22 OF 47

US ROUTE 5
TO ROCKINGHAM

I-91 SB
TO ROCKINGHAM

2199+00
2200+00
2201+00
2202+00
2203+00

2199+00
2200+00
2201+00
2202+00
2203+00

I-91 NB
TO WEATHERSFIELD

MATCH LINE
STA 2198+00.00 NB

PI
STA 2198+85.15

I-91 SOUTHBOUND CURVE 1
DELTA = 43°35'17"
D = 3°00'00"
R = 1909.86'
T = 763.66'
L = 1452.93'
E = 147.02'

US ROUTE 5
TO WEATHERSFIELD

MATCH LINE
STA 2204+00.00 NB

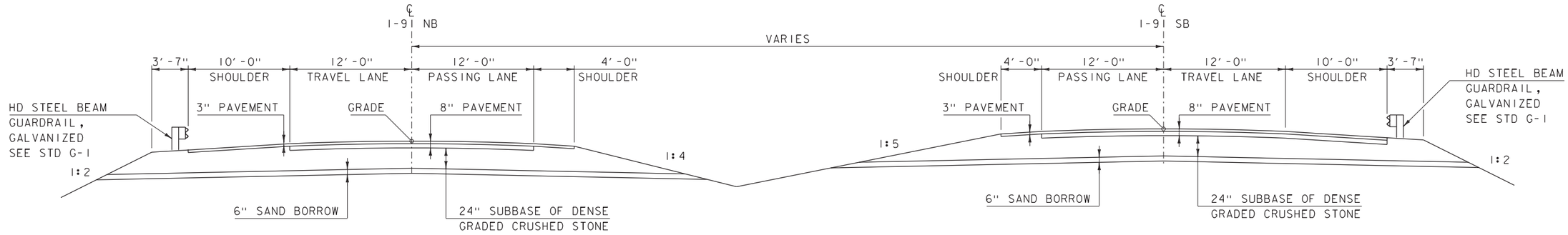
VT STATE PLANE GRID

N

REHABILITATION LAYOUT

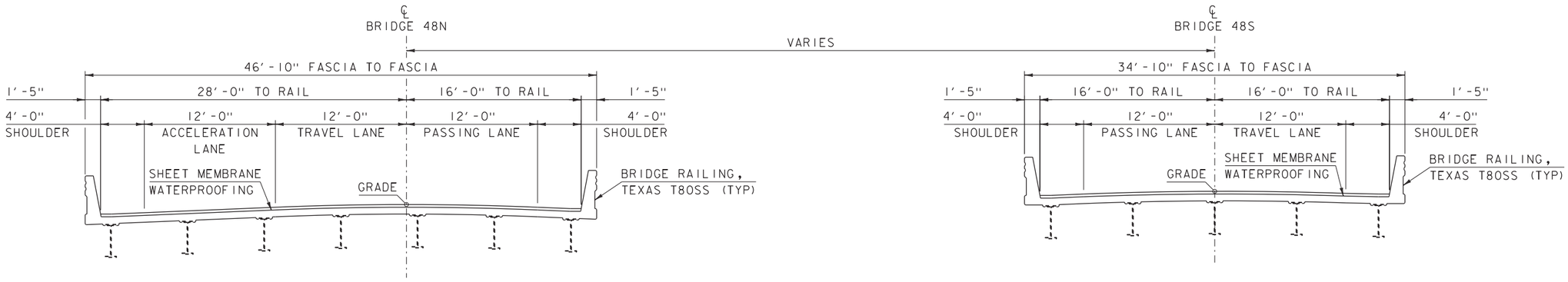
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: 12a574/sl2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
REHABILIATION LAYOUT SHEET	SHEET 23 OF 47



EXISTING I-91 TYPICAL SECTION

SCALE 3/16" = 1'-0"
ACCELERATION LANE NOT SHOWN



BRIDGE 48 N/S DECK REPLACEMENT TYPICAL SECTION

SCALE 3/16" = 1'-0"
ALL DIMENSIONS ARE RADIAL UNLESS OTHERWISE NOTED

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: l2a574/sl2a574typ.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
DECK REPLACEMENT TYPICAL SECTIONS	SHEET 24 OF 47

US ROUTE 5
TO ROCKINGHAM

I-91 SB
TO ROCKINGHAM

2199+00
2200+00
2201+00
2202+00
2203+00

2199+00
2200+00
2201+00
2202+00
2203+00

I-91 NB
TO WEATHERSFIELD

MATCH LINE
STA 2198+00.00 NB

PI
STA 2198+85.15

I-91 SOUTHBOUND CURVE 1
DELTA = 43°35'17"
D = 3°00'00"
R = 1909.86'
T = 763.66'
L = 1452.93'
E = 147.02'

US ROUTE 5
TO WEATHERSFIELD

MATCH LINE
STA 2204+00.00 NB

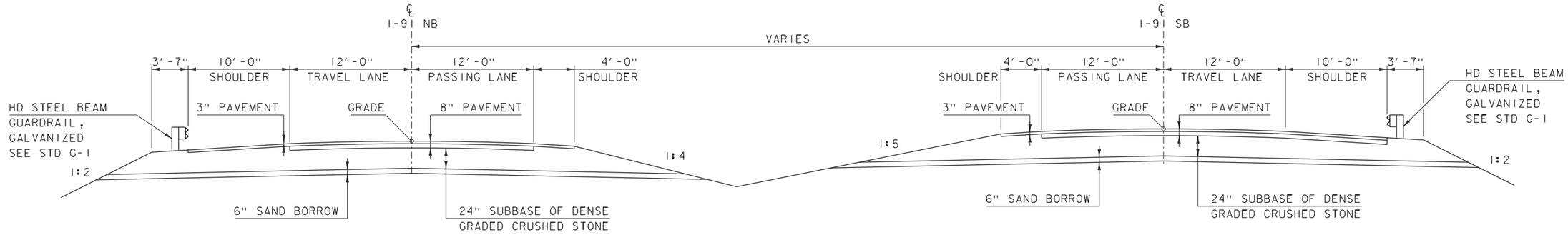
VT STATE PLANE GRID

N

DECK REPLACEMENT LAYOUT

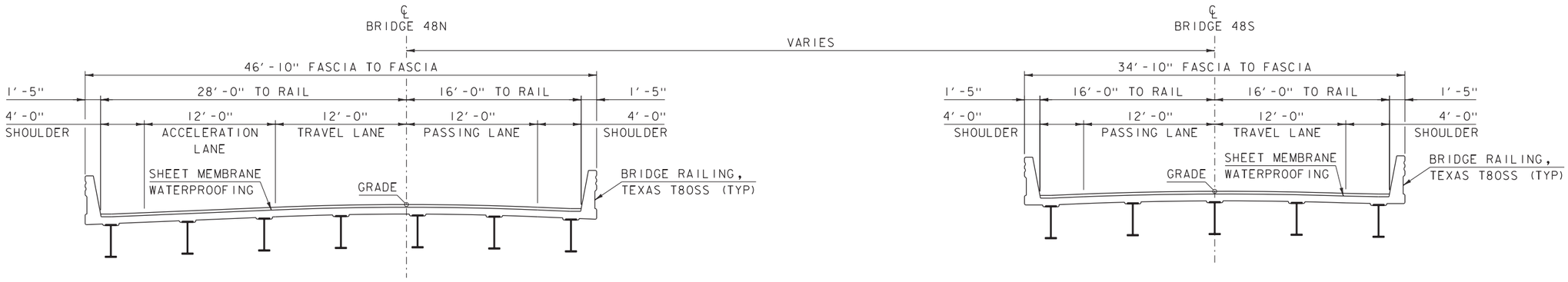
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: I2a574/sI2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
DECK REPLACEMENT LAYOUT SHEET	SHEET 25 OF 47



EXISTING I-91 TYPICAL SECTION

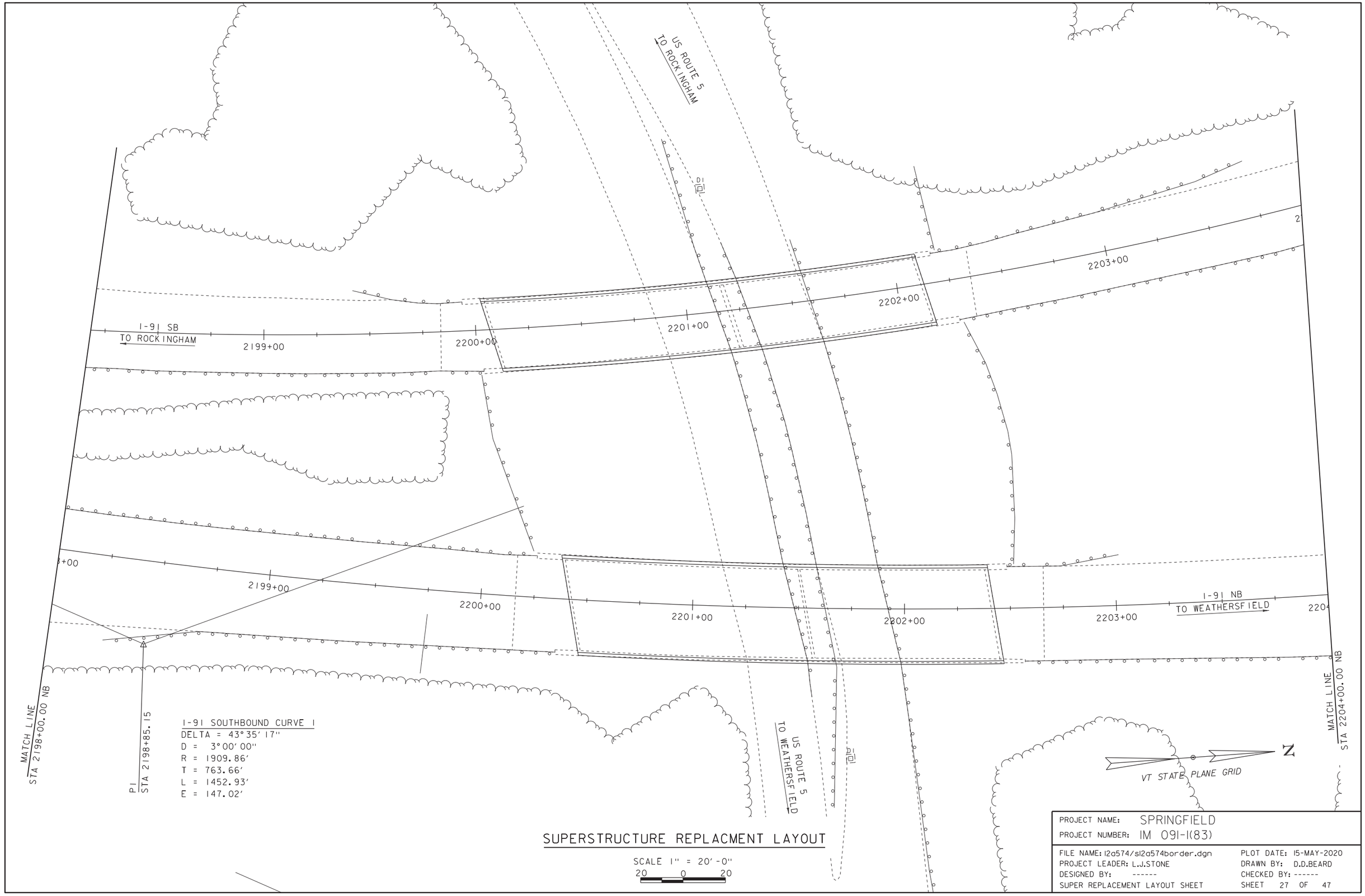
SCALE 3/16" = 1'-0"
ACCELERATION LANE NOT SHOWN



BRIDGE 48 N/S SUPERSTRUCTURE REPLACEMENT TYPICAL SECTION

SCALE 3/16" = 1'-0"
ALL DIMENSIONS ARE RADIAL UNLESS OTHERWISE NOTED

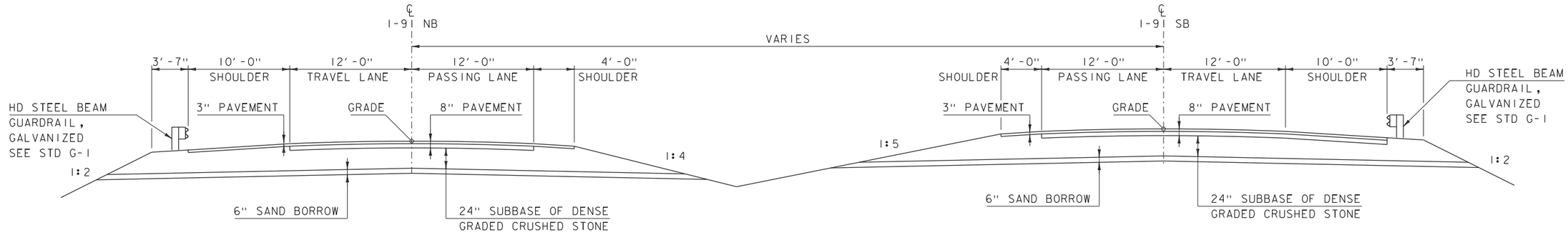
PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: I2a574/sI2a574typ.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SUPER REPLACEMENT TYPICAL SECTIONS	SHEET 26 OF 47



SUPERSTRUCTURE REPLACMENT LAYOUT

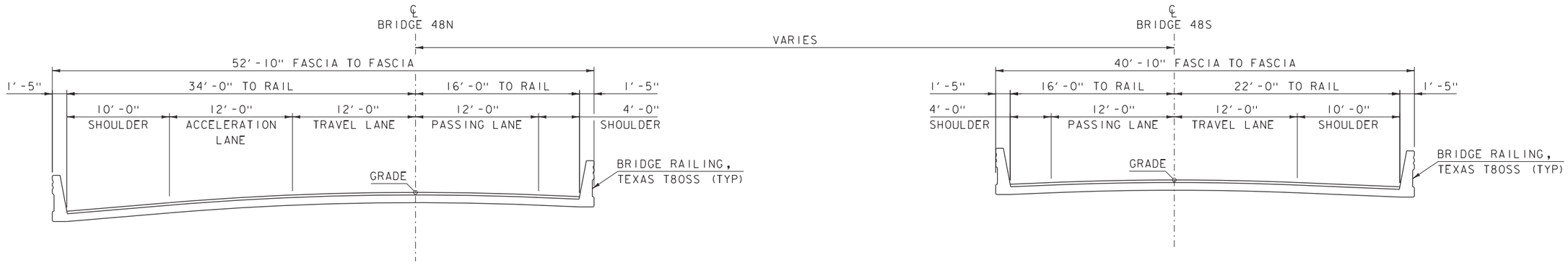
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: 12a574/sl2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SUPER REPLACEMENT LAYOUT SHEET	SHEET 27 OF 47



EXISTING I-91 TYPICAL SECTION

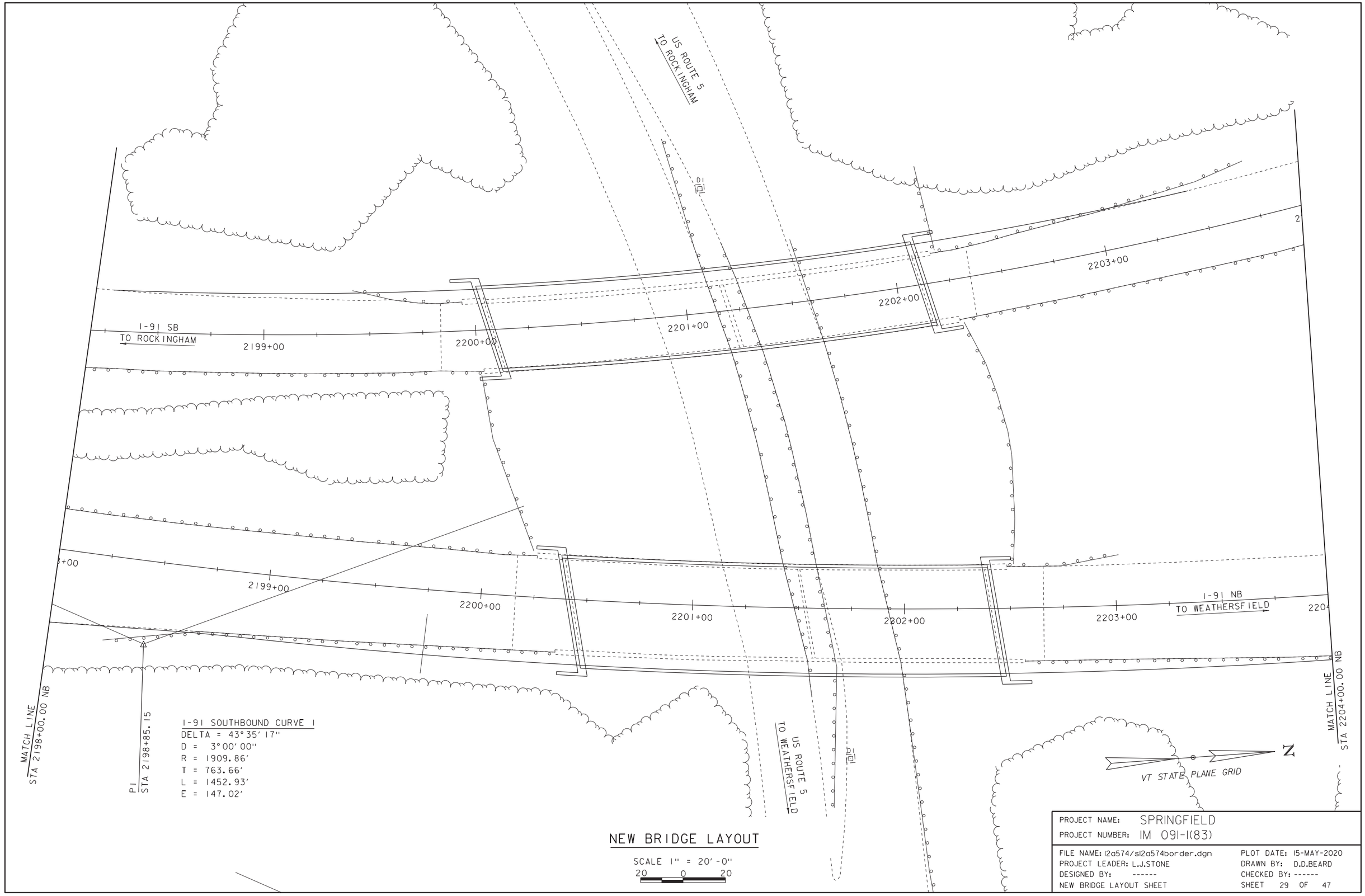
SCALE 3/16" = 1'-0"
ACCELERATION LANE NOT SHOWN



BRIDGE 48 N/S BRIDGE REPLACEMENT TYPICAL SECTION

SCALE 3/16" = 1'-0"
ALL DIMENSIONS ARE RADIAL UNLESS OTHERWISE NOTED

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: l2a574/sl2a574typ.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
BRIDGE REPLACEMENT TYPICAL SECTIONS	SHEET 28 OF 47



NEW BRIDGE LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: 12a574/sl2a574border.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NEW BRIDGE LAYOUT SHEET	SHEET 29 OF 47

ECT

ECT

ECT

ECT

I-91 EXIT 7
RAMP A

WOVEN WIRE
FENCE

SIGN
OM3-R

D1

I-91 SB
TO ROCKINGHAM

2193+00

2194+00

2195+00

2196+00

2197+00

2198+00

SIGN
OM3-L

BIKE
TRAIL

SIGN
OM3-L

D1

ECT

2193+00

2194+00

2195+00

2196+00

2197+00

I-91 NB
TO WEATHERSFIELD

SIGN
OM3-R

ECT

I-91 EXIT 7
RAMP D

N

VT STATE PLANE GRID

NORTHBOUND TEMPORARY BRIDGE LAYOUT

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)

FILE NAME: l2a574/sl2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NORTHBOUND TEMP BRIDGE LAYOUT 1	SHEET 30 OF 47

US ROUTE 5
TO ROCKINGHAM

I-91 SB
TO ROCKINGHAM

2199+00
2200+00
2201+00
2202+00
2203+00

I-91 NB
TO WEATHERSFIELD

US ROUTE 5
TO WEATHERSFIELD

I-91 SOUTHBOUND CURVE 1
DELTA = 43°35'17"
D = 3°00'00"
R = 1909.86'
T = 763.66'
L = 1452.93'
E = 147.02'

VT STATE PLANE GRID

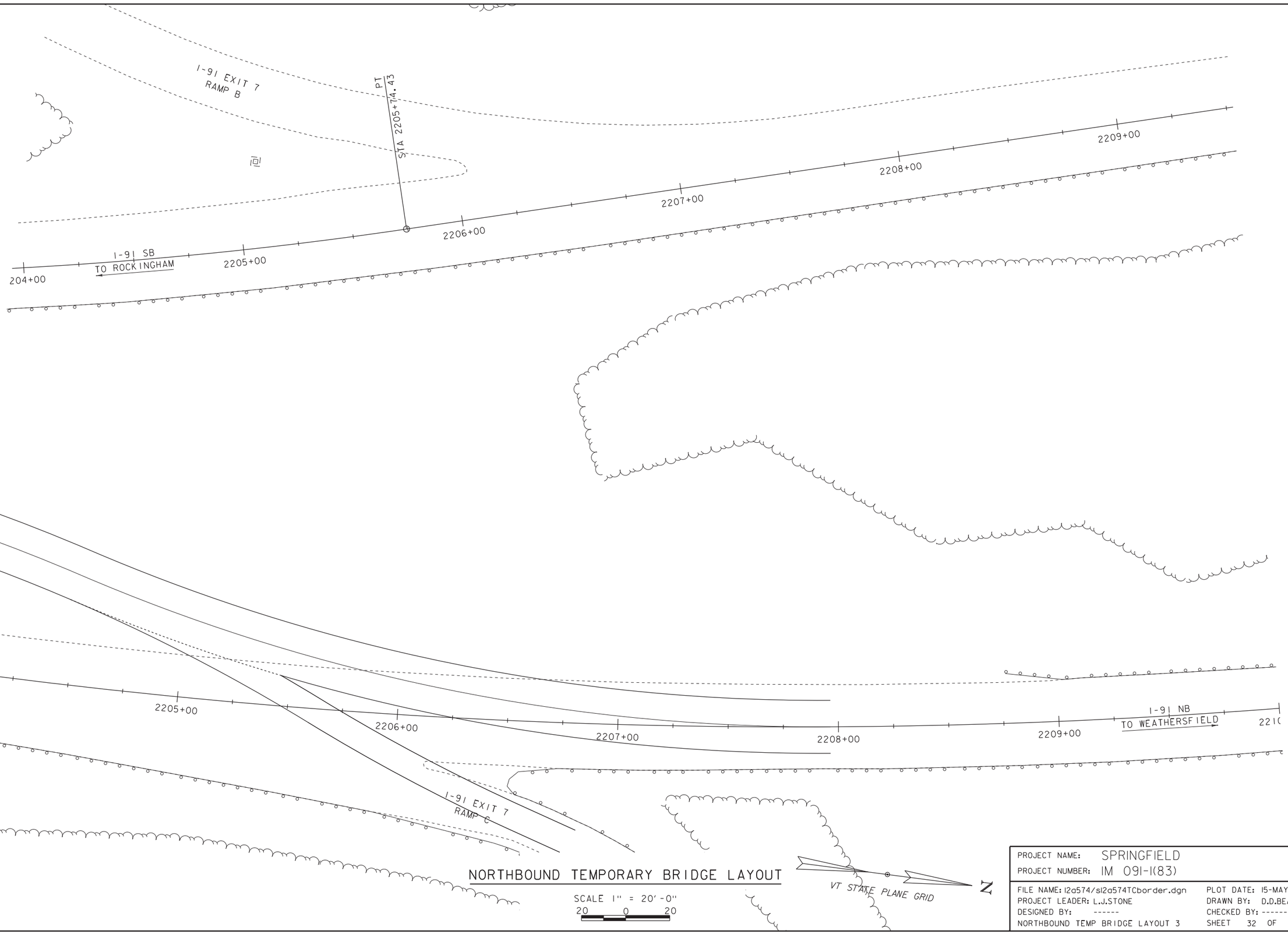
NORTHBOUND TEMPORARY BRIDGE LAYOUT

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

PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: IM 091-1(83)

FILE NAME: l2a574/sl2a574TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
NORTHBOUND TEMP BRIDGE LAYOUT 2

PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 31 OF 47



NORTHBOUND TEMPORARY BRIDGE LAYOUT

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: I2a574/sI2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NORTHBOUND TEMP BRIDGE LAYOUT 3	SHEET 32 OF 47

ECT

ECT

ECT

ECT

I-91 EXIT 7
RAMP A

WOVEN WIRE
FENCE

SIGN
OM3-R

D1

I-91 SB
TO ROCKINGHAM

2193+00

2194+00

2195+00

2196+00

2197+00

2198+00

SIGN
OM3-L

BIKE
TRAIL

SIGN
OM3-L

D1

2193+00

2194+00

2195+00

2196+00

2197+00

I-91 NB
TO WEATHERSFIELD

SIGN
OM3-R

ECT

I-91 EXIT 7
RAMP D

N

VT STATE PLANE GRID

SOUTHBOUND TEMPORARY BRIDGE LAYOUT

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)

FILE NAME: l2a574/sl2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SOUTHBOUND TEMP BRIDGE LAYOUT 1	SHEET 33 OF 47

US ROUTE 5
TO ROCKINGHAM

I-91 SB
TO ROCKINGHAM

2199+00
2200+00
2201+00
2202+00
2203+00

I-91 NB
TO WEATHERSFIELD

US ROUTE 5
TO WEATHERSFIELD

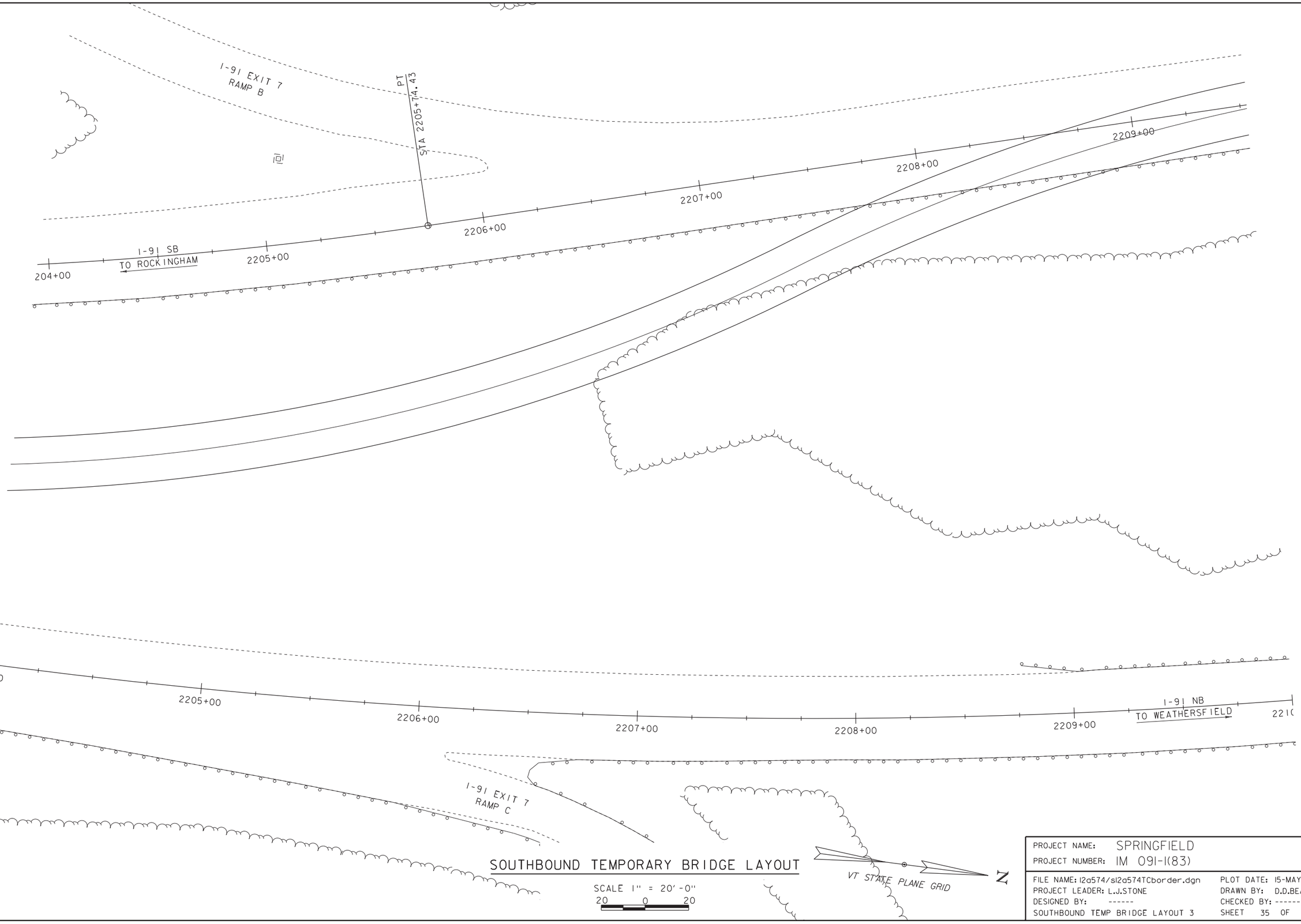
I-91 SOUTHBOUND CURVE 1
DELTA = 43°35'17"
D = 3°00'00"
R = 1909.86'
T = 763.66'
L = 1452.93'
E = 147.02'

VT STATE PLANE GRID

SOUTHBOUND TEMPORARY BRIDGE LAYOUT

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

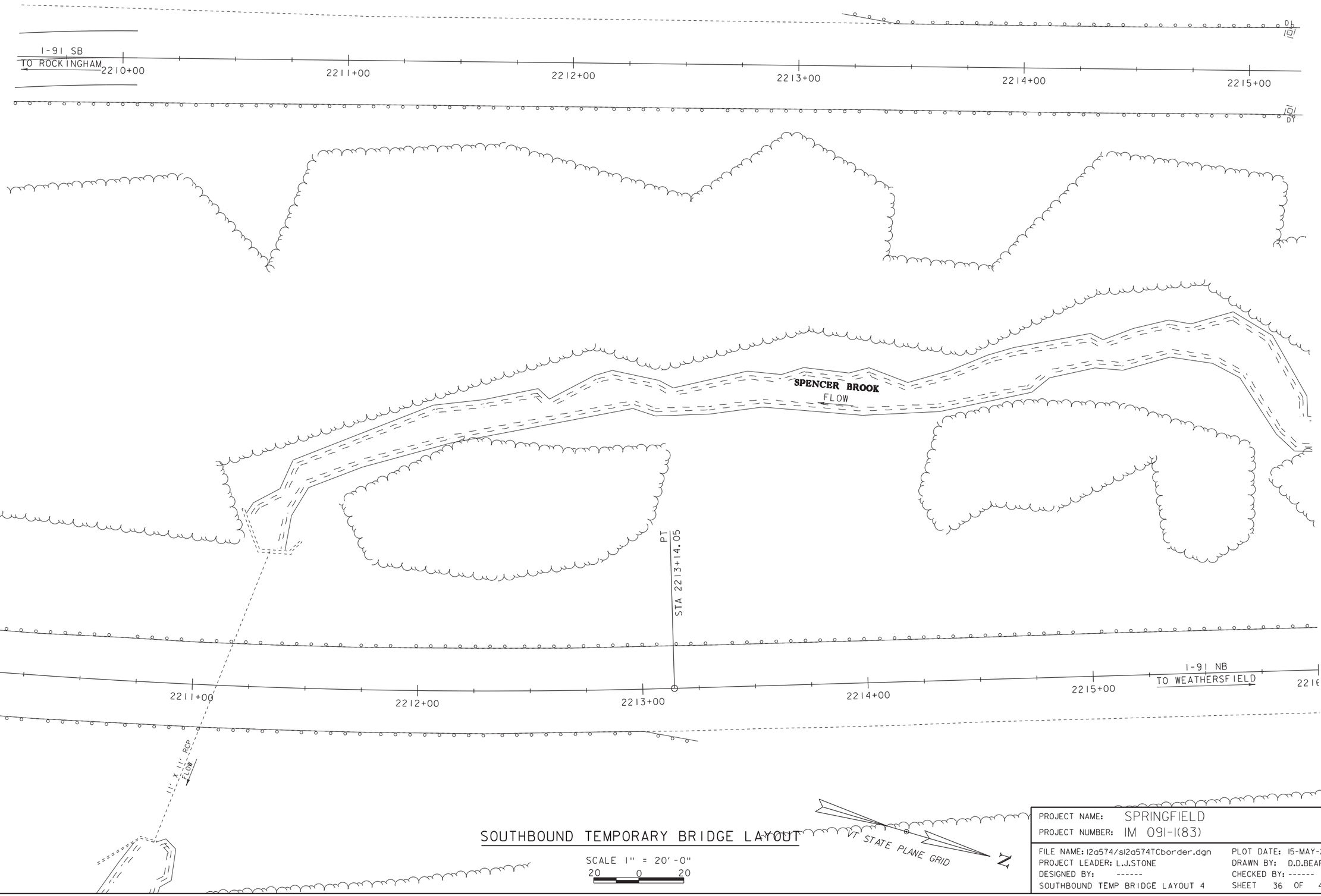
PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: I2a574/sI2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SOUTHBOUND TEMP BRIDGE LAYOUT 2	SHEET 34 OF 47



SOUTHBOUND TEMPORARY BRIDGE LAYOUT

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

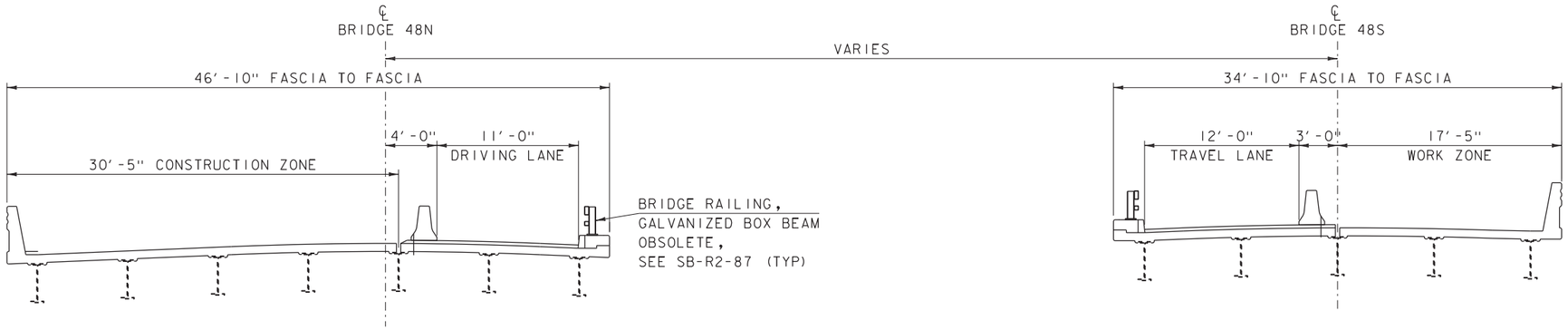
PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: I2a574/sI2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SOUTHBOUND TEMP BRIDGE LAYOUT 3	SHEET 35 OF 47



SOUTHBOUND TEMPORARY BRIDGE LAYOUT

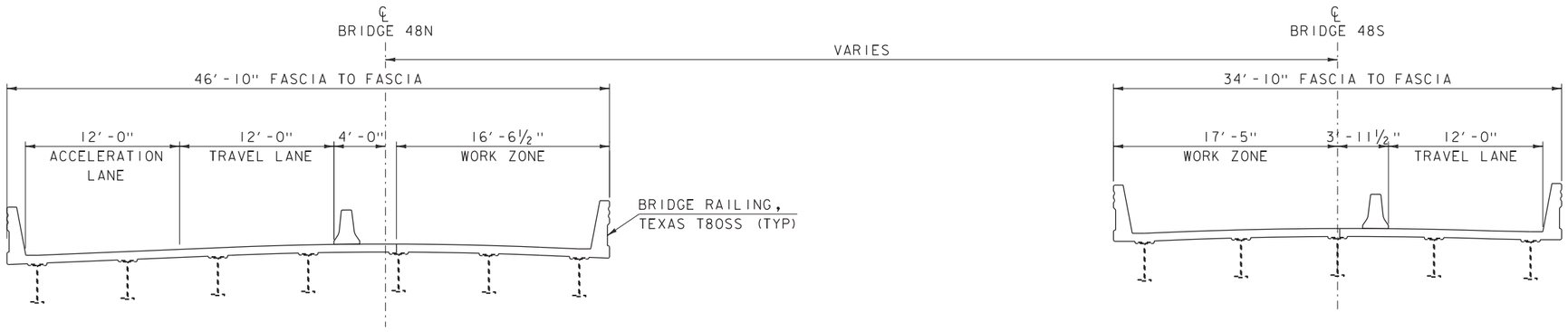
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME:	12a574/sl2a574TCborder.dgn
PROJECT LEADER:	L.J.STONE
DESIGNED BY:	------
SOUTHBOUND TEMP BRIDGE LAYOUT 4	
PLOT DATE:	15-MAY-2020
DRAWN BY:	D.D.BEARD
CHECKED BY:	------
SHEET	36 OF 47



BRIDGE 48 N/S PHASE 1 TYPICAL SECTION

SCALE 3/16" = 1′-0"
ALL DIMENSIONS ARE RADIAL UNLESS OTHERWISE NOTED



BRIDGE 48 N/S PHASE 2 TYPICAL SECTION

SCALE 3/16" = 1′-0"
ALL DIMENSIONS ARE RADIAL UNLESS OTHERWISE NOTED

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: 12a574/sl2a574traffic.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASING TYPICAL SECTIONS	SHEET 37 OF 47

US ROUTE 5
TO ROCKINGHAM

I-91 SB
TO ROCKINGHAM

2199+00

2200+00

2201+00

2202+00

2203+00

2199+00

2200+00

2201+00

2202+00

2203+00

I-91 NB
TO WEATHERSFIELD

US ROUTE 5
TO WEATHERSFIELD

I-91 SOUTHBOUND CURVE 1
DELTA = 43°35'17"
D = 3°00'00"
R = 1909.86'
T = 763.66'
L = 1452.93'
E = 147.02'

N

VT STATE PLANE GRID

PHASE 1 LAYOUT

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

PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: IM 091-1(83)

FILE NAME: 12a574/sl2a574TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PHASE 1 LAYOUT SHEET 2

PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 38 OF 47

US ROUTE 5
TO ROCKINGHAM

I-91 SB
TO ROCKINGHAM

2199+00

2200+00

2201+00

2202+00

2203+00

2199+00

2200+00

2201+00

2202+00

2203+00

I-91 NB
TO WEATHERSFIELD

US ROUTE 5
TO WEATHERSFIELD

I-91 SOUTHBOUND CURVE 1
DELTA = 43°35'17"
D = 3°00'00"
R = 1909.86'
T = 763.66'
L = 1452.93'
E = 147.02'

N

VT STATE PLANE GRID

PHASE 2 LAYOUT

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

PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: IM 091-1(83)

FILE NAME: 12a574/sl2a574TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PHASE 2 LAYOUT SHEET 2

PLOT DATE: 15-MAY-2020
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 39 OF 47

ECT

ECT

ECT

ECT

I-91 EXIT 7
RAMP A

WOVEN WIRE
FENCE

SIGN
OM3-R

D1

I-91 SB
TO ROCKINGHAM

2193+00

2194+00

2195+00

2196+00

2197+00

2198+00

SIGN
OM3-L

BIKE
TRAIL

SIGN
OM3-L

D1

I-91 NB
TO WEATHERSFIELD

2193+00

2194+00

2195+00

2196+00

2197+00

SIGN
OM3-R

I-91 EXIT 7
RAMP D

N

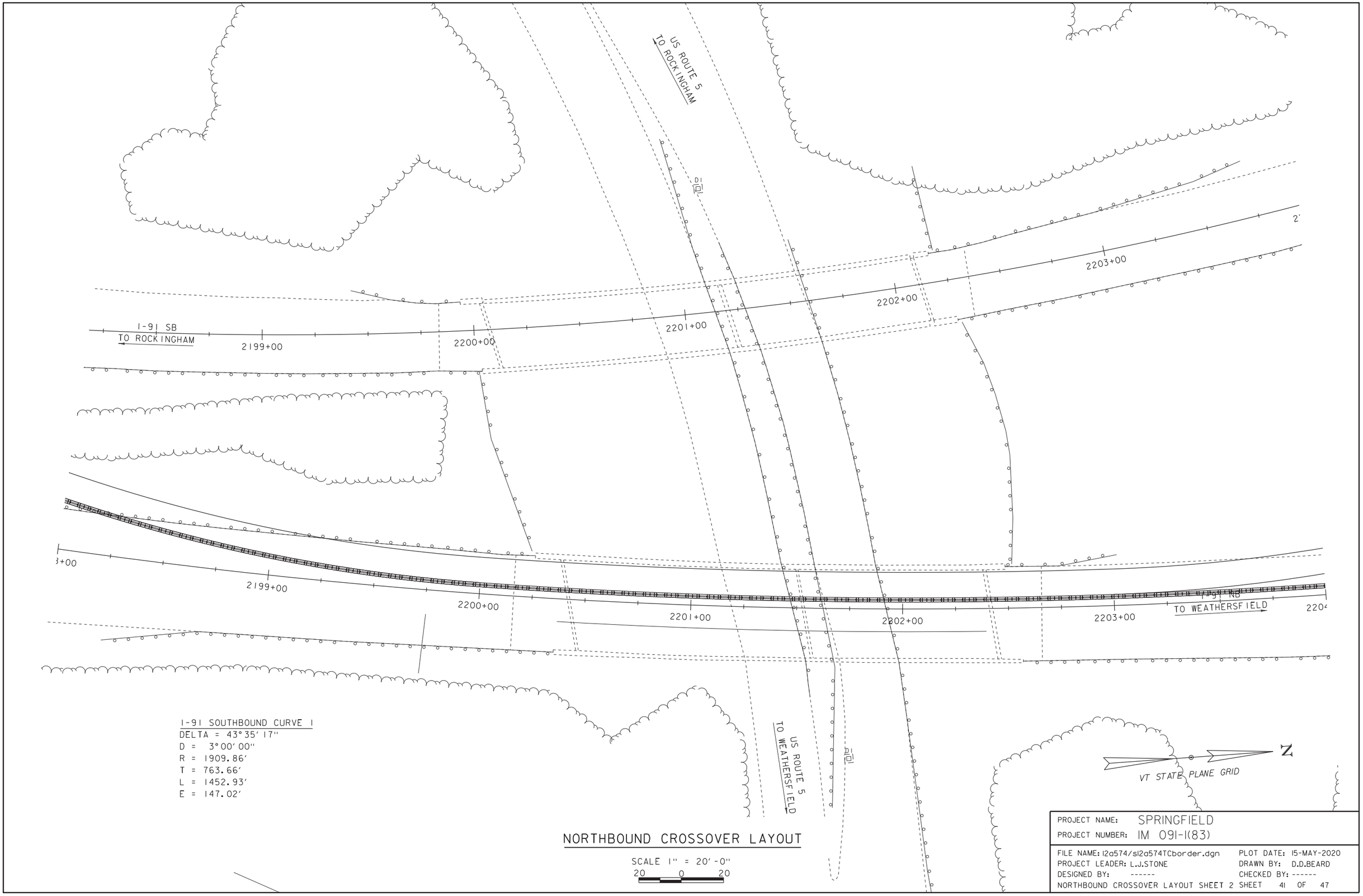
VT STATE PLANE GRID

NORTHBOUND CROSSOVER LAYOUT

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)

FILE NAME: I2a574/sI2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NORTHBOUND CROSSOVER LAYOUT SHEET 1	SHEET 40 OF 47

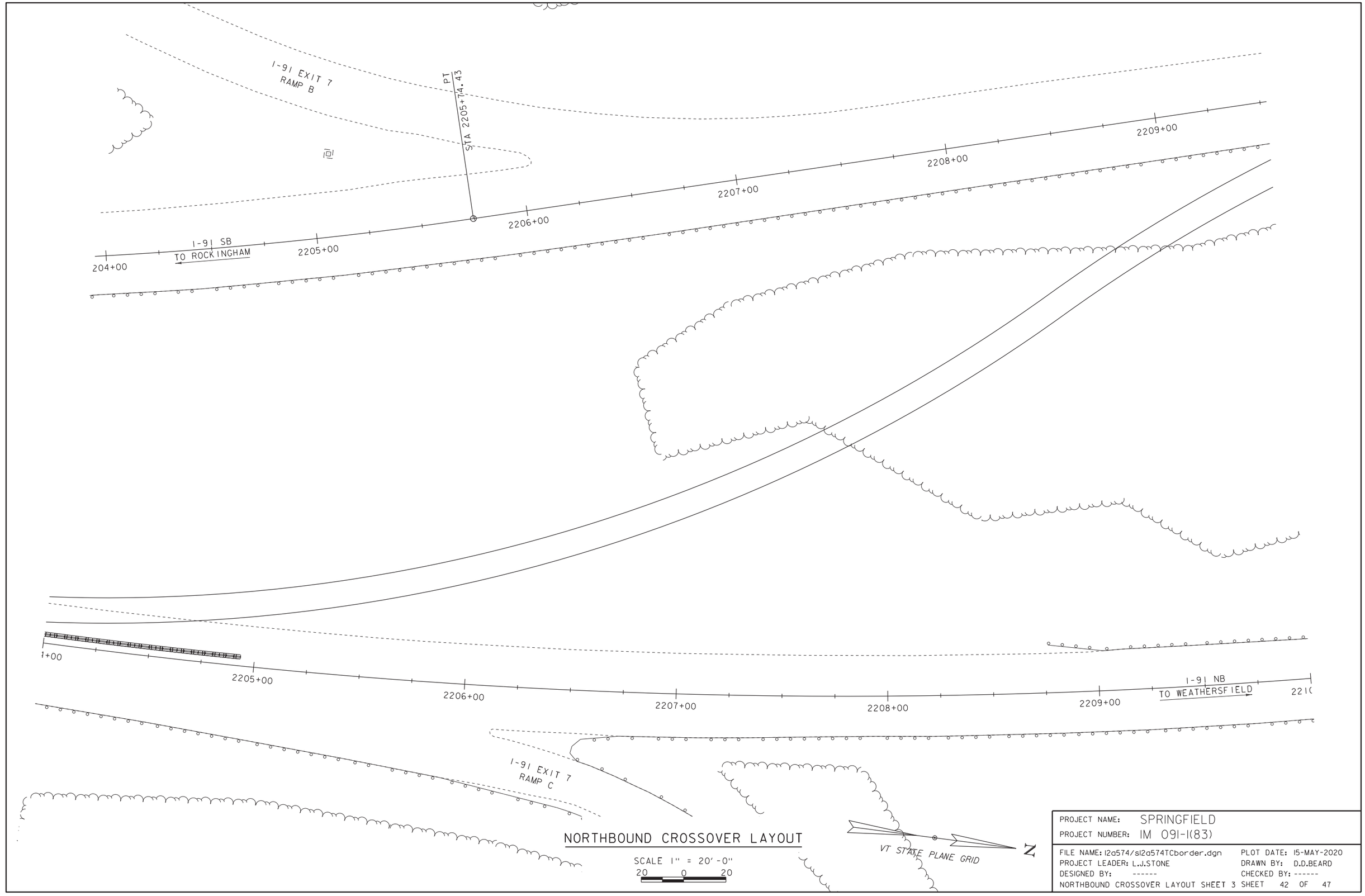


I-91 SOUTHBOUND CURVE 1
DELTA = 43°35'17"
D = 3°00'00"
R = 1909.86'
T = 763.66'
L = 1452.93'
E = 147.02'

NORTHBOUND CROSSOVER LAYOUT

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

PROJECT NAME: SPRINGFIELD	
PROJECT NUMBER: IM 091-1(83)	
FILE NAME: 12a574/sl2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NORTHBOUND CROSSOVER LAYOUT SHEET 2	SHEET 41 OF 47

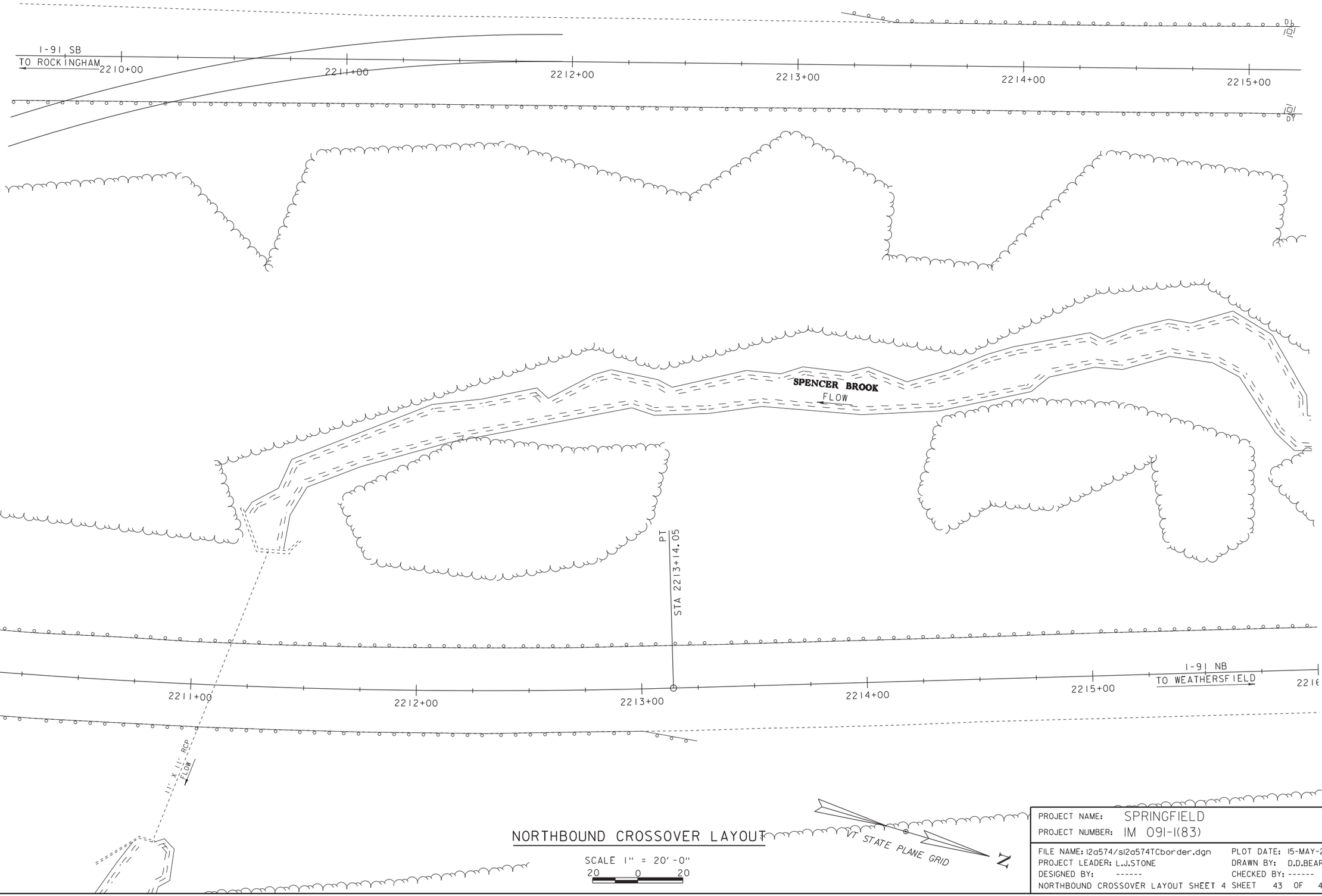


NORTHBOUND CROSSOVER LAYOUT

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)

FILE NAME: I2a574/sI2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NORTHBOUND CROSSOVER LAYOUT SHEET 3	SHEET 42 OF 47



NORTHBOUND CROSSOVER LAYOUT

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

PROJECT NAME: SPRINGFIELD
PROJECT NUMBER: IM 091-1(83)

FILE NAME: 12a574/sl2a574TCborder.dgn PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE DRAWN BY: D.D.BEARD
DESIGNED BY: ------ CHECKED BY: ------
NORTHBOUND CROSSOVER LAYOUT SHEET 4 SHEET 43 OF 47

ECT

ECT

ECT

ECT

I-91 EXIT 7
RAMP A

WOVEN WIRE
FENCE

SIGN
OM3-R

D1

I-91 SB
TO ROCKINGHAM

2193+00

2194+00

2195+00

2196+00

2197+00

2198+00

SIGN
OM3-L

BIKE
TRAIL

SIGN
OM3-L

D1

2193+00

2194+00

2195+00

2196+00

2197+00

I-91 NB
TO WEATHERSFIELD

SIGN
OM3-R

I-91 EXIT 7
RAMP D

VT STATE PLANE GRID

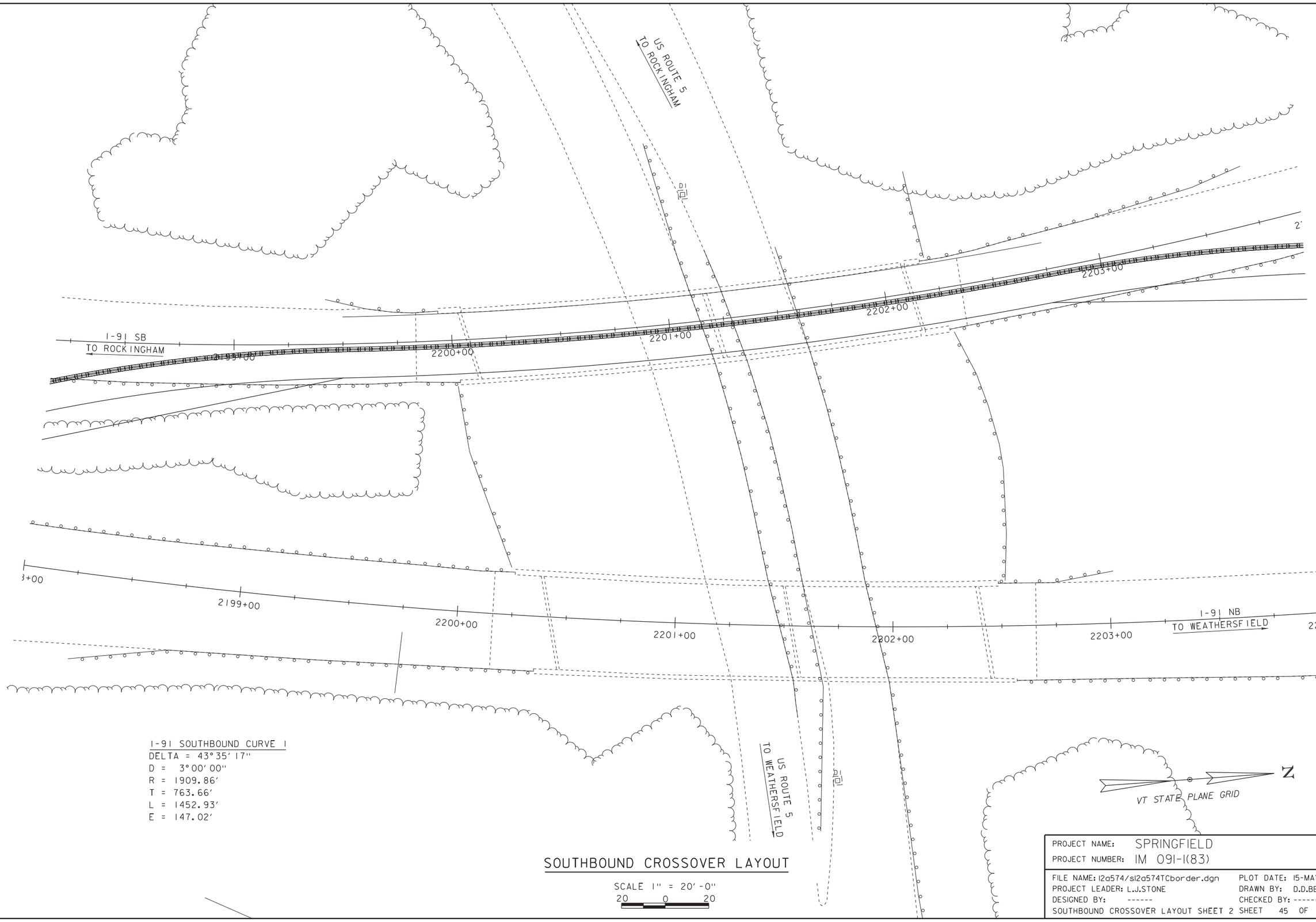
N

SOUTHBOUND CROSSOVER LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: l2a574/sl2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SOUTHBOUND CROSSOVER LAYOUT SHEET 1	SHEET 44 OF 47



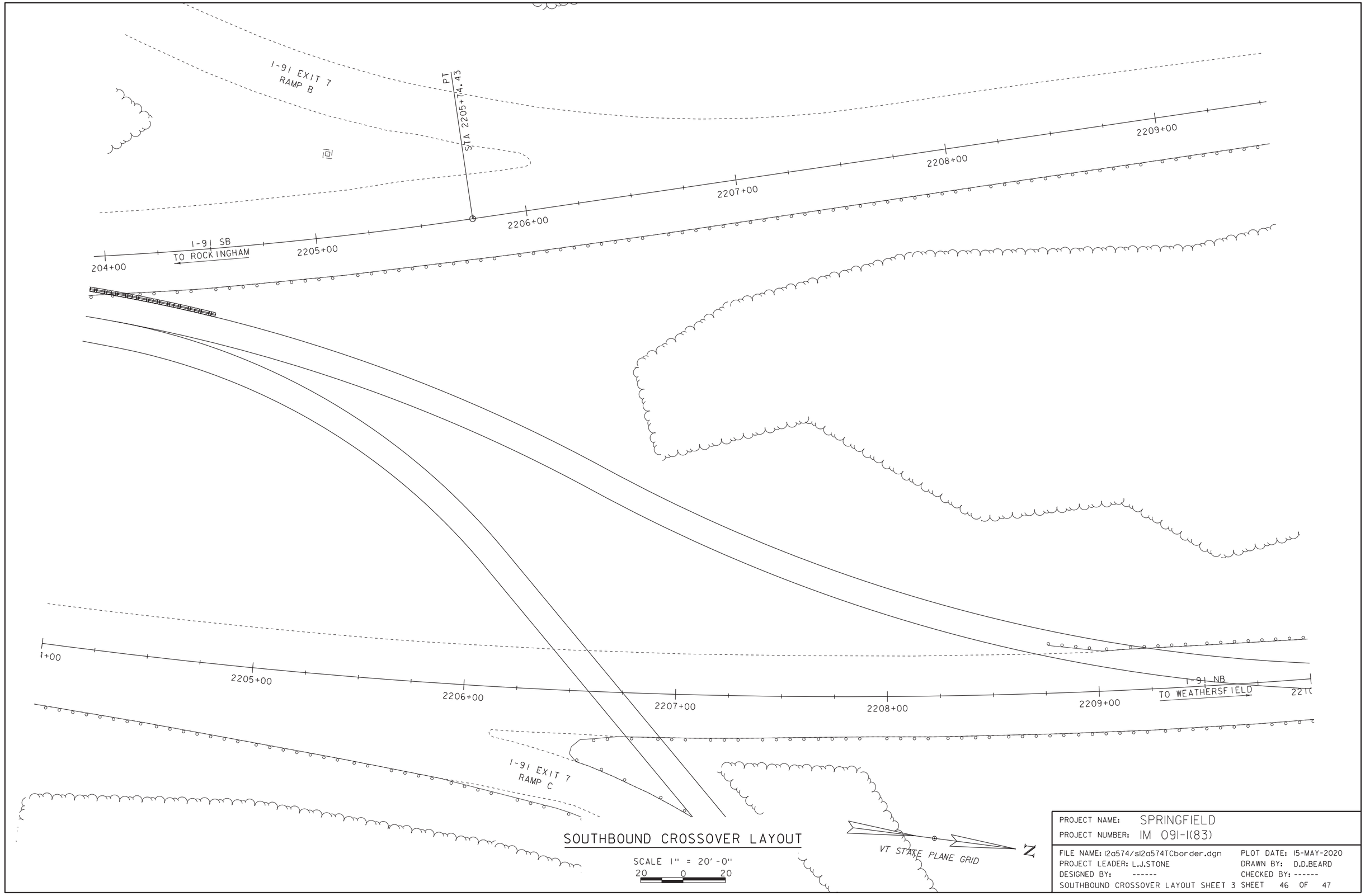
I-91 SOUTHBOUND CURVE 1
DELTA = 43°35'17"
D = 3°00'00"
R = 1909.86'
T = 763.66'
L = 1452.93'
E = 147.02'

SOUTHBOUND CROSSOVER LAYOUT

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME:	I2a574/sI2a574TCborder.dgn
PROJECT LEADER:	L.J.STONE
DESIGNED BY:	------
PLOT DATE:	15-MAY-2020
DRAWN BY:	D.D.BEARD
CHECKED BY:	------

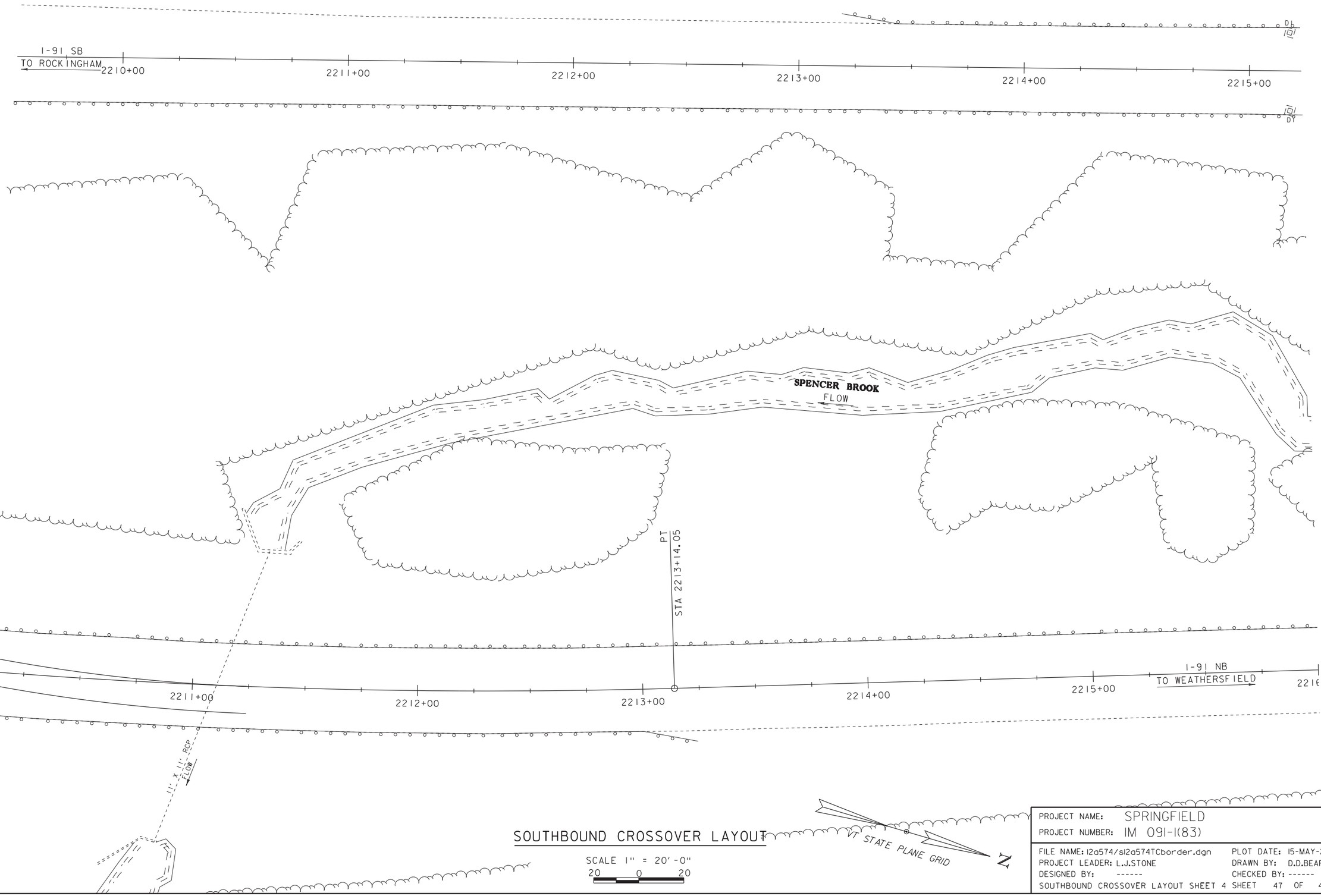
SOUTHBOUND CROSSOVER LAYOUT SHEET 2 SHEET 45 OF 47



SOUTHBOUND CROSSOVER LAYOUT

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

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: I2a574/sI2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SOUTHBOUND CROSSOVER LAYOUT SHEET 3	SHEET 46 OF 47



SOUTHBOUND CROSSOVER LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	SPRINGFIELD
PROJECT NUMBER:	IM 091-1(83)
FILE NAME: I2a574/sI2a574TCborder.dgn	PLOT DATE: 15-MAY-2020
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SOUTHBOUND CROSSOVER LAYOUT SHEET 4	SHEET 47 OF 47