Stantec

Memo

To:	Jason Charest	From:	Justin LaPerle
	Chittenden County RPC		Stantec Consulting Services
File:	Assessment of Existing Conditions	Date:	June 8, 2023

Reference: Existing Conditions Report

Executive Summary

In the interest of the CCRPC and the Town of Richmond this assessment investigates the 11 identified pinch points where a 5-foot shoulder cannot be met with the existing Richmond-Bolton paving project going through this section of US-2. This high-level feasibility report will assess the pinch points by identifying the cause of the pinch point and providing an order of magnitude cost estimate. Information from the ongoing Richmond-Bolton paving project will be used and assumptions about ROW, Utilities, and permitting will be made on a site-to-site basis.

Locations will be identified using the stations from the existing Richmond-Bolton paving project and will be included in Appendix A.

Site Location:

The corridor of interest is approximately 1.5 miles along US Route 2 which runs East/West in the arial map below. US Route 2 generally parallels Interstate 89 around Richmond. Plans detailing the pinch points can be found in Appendix A.

Figure 1: Google Map Snip of US-2 & Town of Richmond

Reference: **Existing Conditions Report**

Location 1: STA 79+20 – 81+00, LT. Proposed Shoulder Width: LT – 3'6"

The existing retaining wall adjacent to the westbound lane is encroaching on the shoulder. Proposed solutions for the wall include relocating the wall within the state Right-of-Way (ROW), removing the wall, and adequately sloping the slope in a manner that it remains stable, or removing the vegetation that you can see in Figure 2 between the Edge of Pavement (EOP) and the start of the wall.

Assumptions:

- Limits of construction activity will remain within the existing ROW.
- Assume Categorical Exclusion (NEPA) is applicable for all work.
- No Utility, or Historical/Archeological Impacts.
- Roadway impacts will be negligible.

Figure 2 (Location 1):Retaining Wall facing East.

Order of Magnitude Cost Estimate:

Location 1	Relocate Wall	Remove & Regrade
Parametric Solution	$90,000	$50,000
Utility Coordination	$25,000	$25,000
Geotechnical Analysis	$25,000	$5,000
Preliminary Engineering	$75,000	$50,000
Contingency (50%)	$107,500	$65,000
Approximate Total	$322,500	$195,000

Reference: **Existing Conditions Report**

Location 2 & 3: Covered in STP CULV (58) Richmond. Figure 3 (below) shows the projected timeline showed on VTrans website.

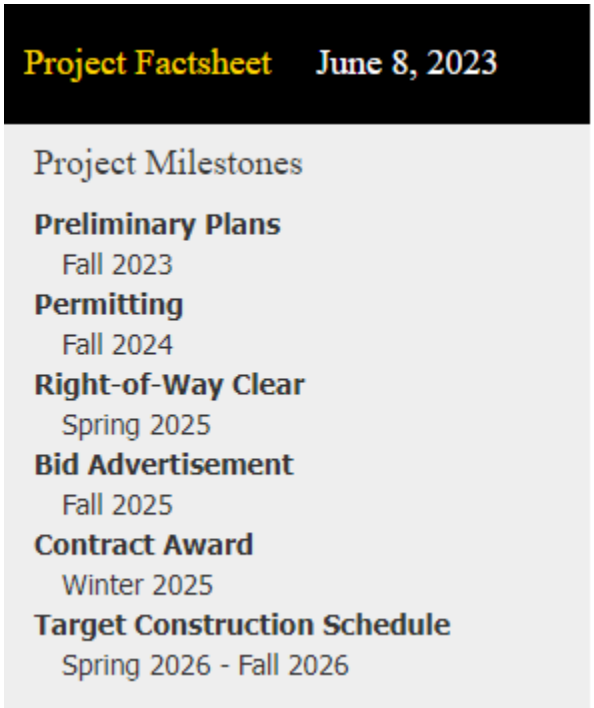


Figure 3: Schedule for STP CULV (58) Richmond

Locations 4 & 5: STA 100+33 – 102+58, LT STA 101+46 – 102+03, RT

Proposed Shoulder Widths: LT – 4' RT – 1'10"

The existing Bridge (#28) is showing signs of deterioration with the eastbound shoulder the narrowest of the whole stretch. Proposed solutions would include a full replacement or extending the Outlet (Eastbound) side of the culvert. With the extension, realignment of US-2 could accommodate 5ft shoulders on both sides of the roadway.

Assumptions:

- Limits of construction activity will remain within the existing ROW.
- Assume Categorical Exclusion (NEPA) is applicable for all work.
- No Utility, or Historical/Archeological Impacts.

Reference: **Existing Conditions Report**

Figure 4 (Location 4/5): Eastbound (Outlet) side of Culvert

Order of Magnitude Cost Estimate:

Location 4/5	Full Replacement	Extension
Parametric Solution	$290,000	$100,000
Utility Coordination	$50,000	$25,000
Geotechnical Analysis	$50,000	$50,000
Preliminary Engineering	$150,000	$100,000
Contingency (50%)	$270,000	$137,500
Approximate Total	$810,000	$412,500

Locations 6 & 7: STA 106+18 – 107+08, LT. STA 105+95 – 107+05, RT.

Proposed Shoulder Widths: LT – 2’4” RT – 3’6”

The existing 2’ x 3’ Box Culvert (PID 64504) is too short to provide enough roadway width for the desired shoulders. Keeping VTrans Maintenance personnel in mind, the best solution for this location is to replace the existing box culvert with a Pipe. Hydraulic Analysis would provide a recommended pipe size.

Assumptions:

- Limits of construction activity will remain within the existing ROW.
- Assume Categorical Exclusion (NEPA) is applicable for all work.
- No Utility, or Historical/Archeological Impacts.

Reference: **Existing Conditions Report**

Figure 5: Inlet Side of Box Culvert

Order of Magnitude Cost Estimate:

Location 6 &7	Full Replacement
Parametric Solution	$325,000
Utility Coordination	$50,000
Geotechnical Analysis	$50,000
Preliminary Engineering	$150,000
Contingency (50%)	$287,500
Approximate Total	$862,500

Location 8: STA 115+25 – 117+50, RT.

Proposed Shoulder Widths: RT – 3’6”

With the steep fill slope behind the existing guardrail, the most appropriate and most cost-effective solution would be sheet piling. Being only 1’6” short of 5’ removing the offset blocks from the existing guardrail would allow for an additional 6”. In addition to the results of the paving project going through the corridor, if lane widths change at all the results could be very close to 5’ on the Eastbound Lane after remove of offset blocks.

Assumptions:

- Limits of construction activity will remain within the existing ROW.
- Assume Categorical Exclusion (NEPA) is applicable for all work.

Reference: **Existing Conditions Report**

- No Utility, or Historical/Archeological Impacts.
- Roadway impacts will be negligible.
- Required embedment for sheet pile would be met.

Figure 6: Embankment on US-2 facing West.

Order of Magnitude Cost Estimate:

Location 8	Sheet Piling	Offset Blocks
Parametric Solution	$675,000	$2,250
Utility Coordination	$75,000	$5,000
Geotechnical Analysis	$50,000	$0
Preliminary Engineering	$100,000	$5,000
Contingency (50%)	$450,000	$6,125
Approximate Total	$1,350,000	$18,375

Reference: **Existing Conditions Report**

Location 9: STA 120+00 – 121+03, RT.

Proposed Shoulder Widths: RT – 3’7”

A combination of steep slope and proximity to the railroad limit the options to increase the shoulder along US-2. Sheet Piling is the solution that would work best in this instance. The small footprint of the sheet piles could potentially stay out of the Railroad clear zone while providing extra width to the shoulder.

Assumptions:

- Limits of construction activity will remain within the existing ROW.
- Assume Categorical Exclusion (NEPA) is applicable for all work.
- No Utility, or Historical/Archeological Impacts.
- Roadway impacts will be negligible.
- Required embedment for sheet pile would be met.

Figure 7: Embankment facing Eastbound along US-2

Order of Magnitude Cost Estimate:

Location 9	Sheet Piling
Parametric Solution	$309,000
Utility Coordination	$50,000
Geotechnical Analysis	$50,000
Preliminary Engineering	$100,000
Contingency (50%)	$204,500
Approximate Total	$613,500

Reference: **Existing Conditions Report**

Locations 10 & 11: STA 130+94 – 133+75, LT. STA 129+99 – 133+75, RT.

Proposed Shoulder Widths: LT – 1'5"-3'7" RT – 3'0"-4'2"

The roadway cut is narrow leaving tight shoulders on either side of US-2 coming up into the Village of Richmond. As you crest the hill heading Eastbound you are welcomed with infrastructure on both sides, including sidewalk on both sides when you reach the top of the hill. Retaining walls or sheet piling would provide adequate width to accommodate 5ft shoulders on either side. There's a cross culvert located at STA 130+30 that will need an appropriate headwall to facilitate the wider shoulder as well.

Assumptions:

- Limits of construction activity will remain within the existing ROW.
- Assume Categorical Exclusion (NEPA) is applicable for all work.
- No Utility, or Historical/Archeological Impacts.
- Roadway impacts will be negligible.
- Required embedment for sheet pile would be met.

Figure 8: Embankments along US-2 heading into Richmond Village

Order of Magnitude Cost Estimate

Location 10 & 11	Sheet Piling	Retaining Wall
Parametric Solution	$1,968,000	$656,000
Utility Coordination	$75,000	$75,000
Geotechnical Analysis	$100,000	$100,000
Preliminary Engineering	$200,000	$200,000
Contingency (50%)	$1,171,500	$515,500
Approximate Total	$3,514,500	$1,546,500

Reference: **Existing Conditions Report**

Appendix A:

Pinch Points PDF (12 Pages)

Stantec Consulting Services Inc.

Justin LaPerle, EIT
Civil Engineer

Phone: 802 497 6434
Fax: 802 864 0165
Justin.LaPerle@stantec.com

Attachment: Attachment

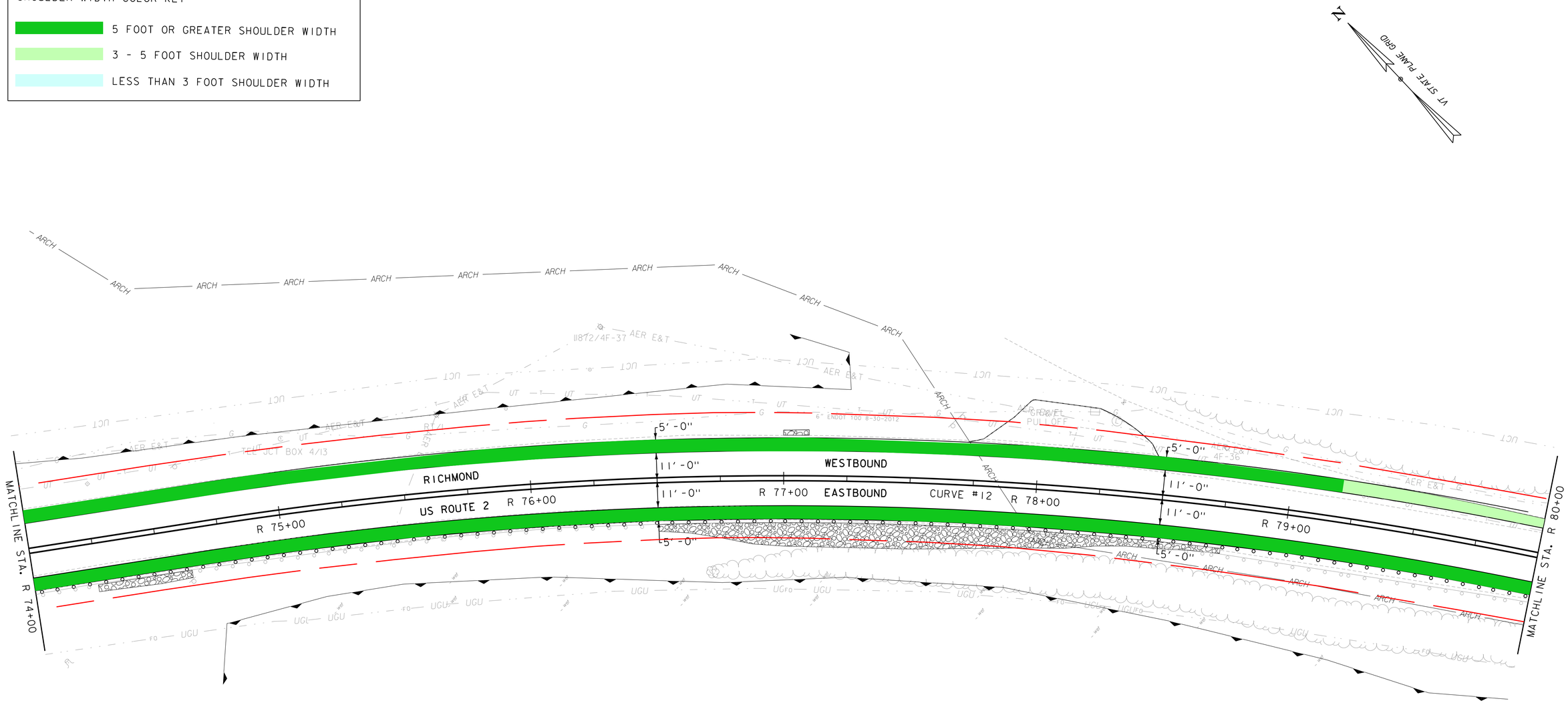
c. C.C.

Reference: **Existing Conditions Report**

Appendix A:

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



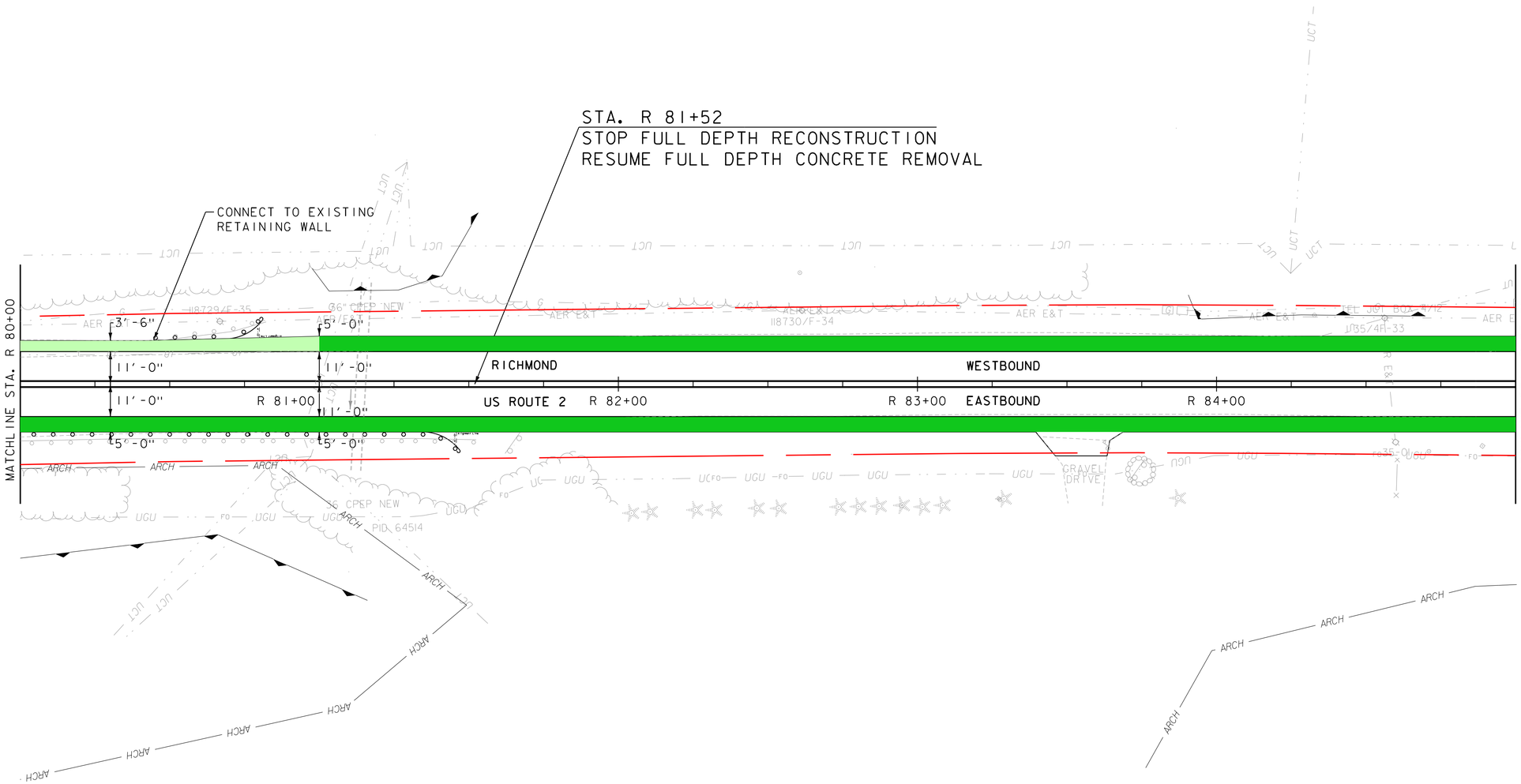
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 1	SHEET 1 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



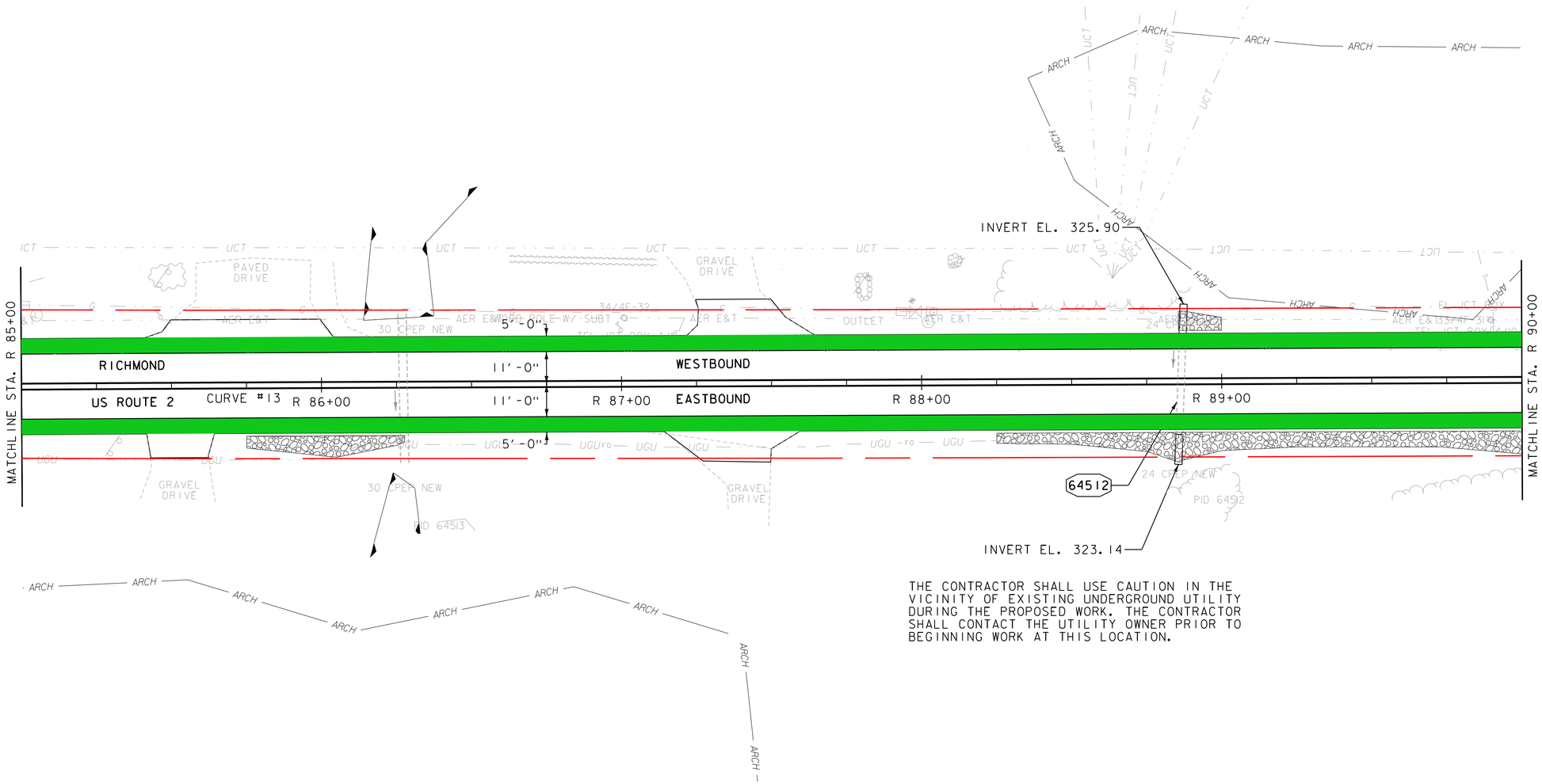
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 2	SHEET 2 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



THE CONTRACTOR SHALL USE CAUTION IN THE VICINITY OF EXISTING UNDERGROUND UTILITY DURING THE PROPOSED WORK. THE CONTRACTOR SHALL CONTACT THE UTILITY OWNER PRIOR TO BEGINNING WORK AT THIS LOCATION.

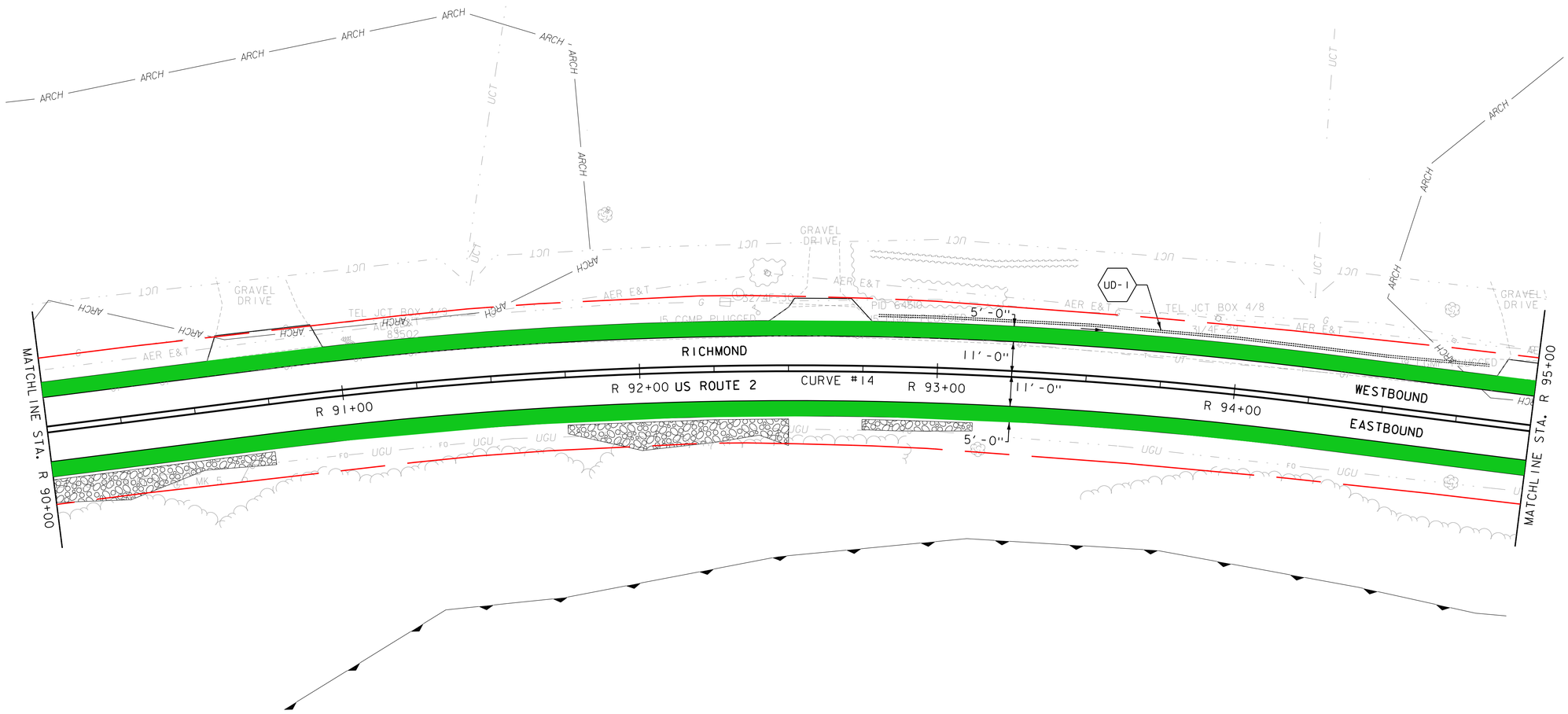
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 3	SHEET 3 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



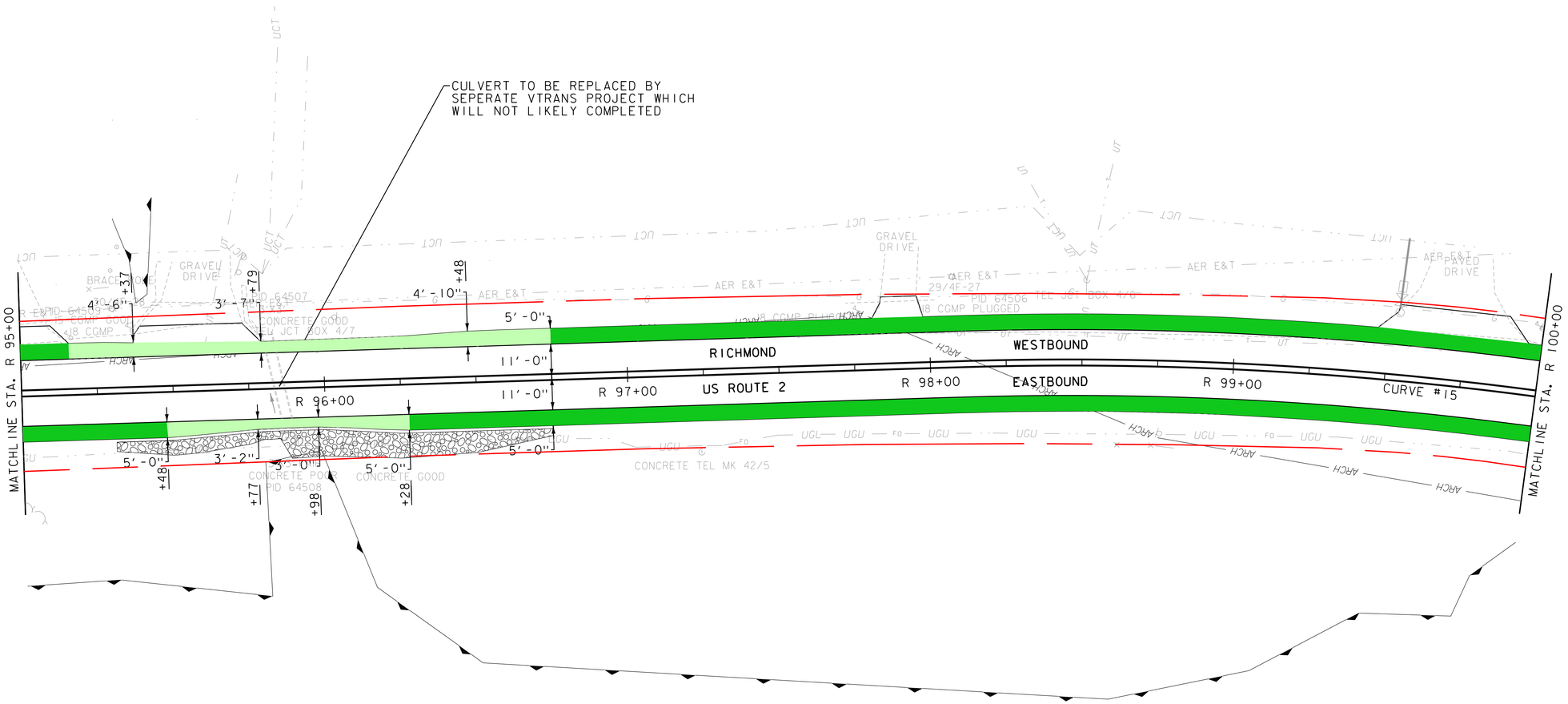
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 4	SHEET 4 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



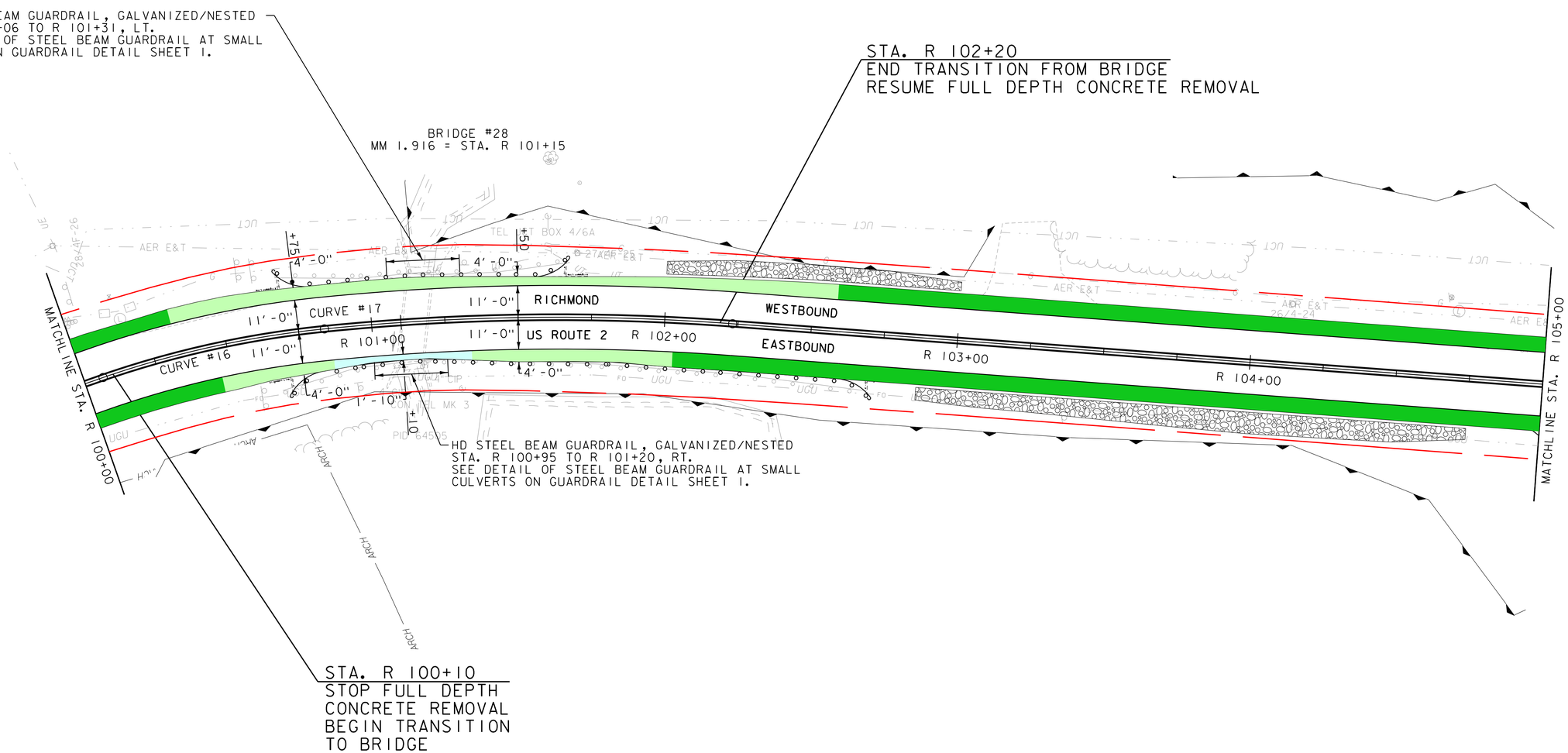
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 5	SHEET 5 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



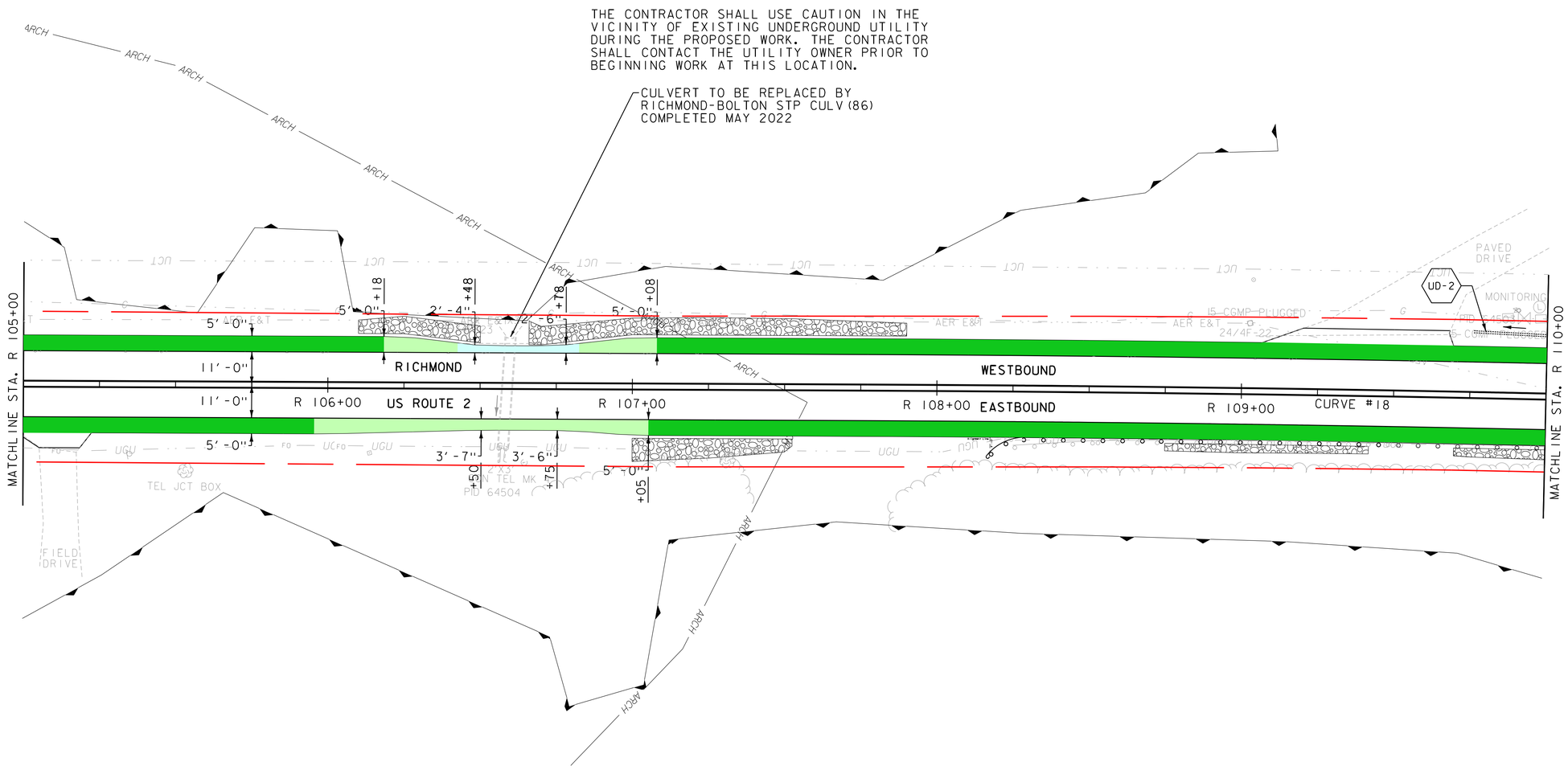
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 6	SHEET 6 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



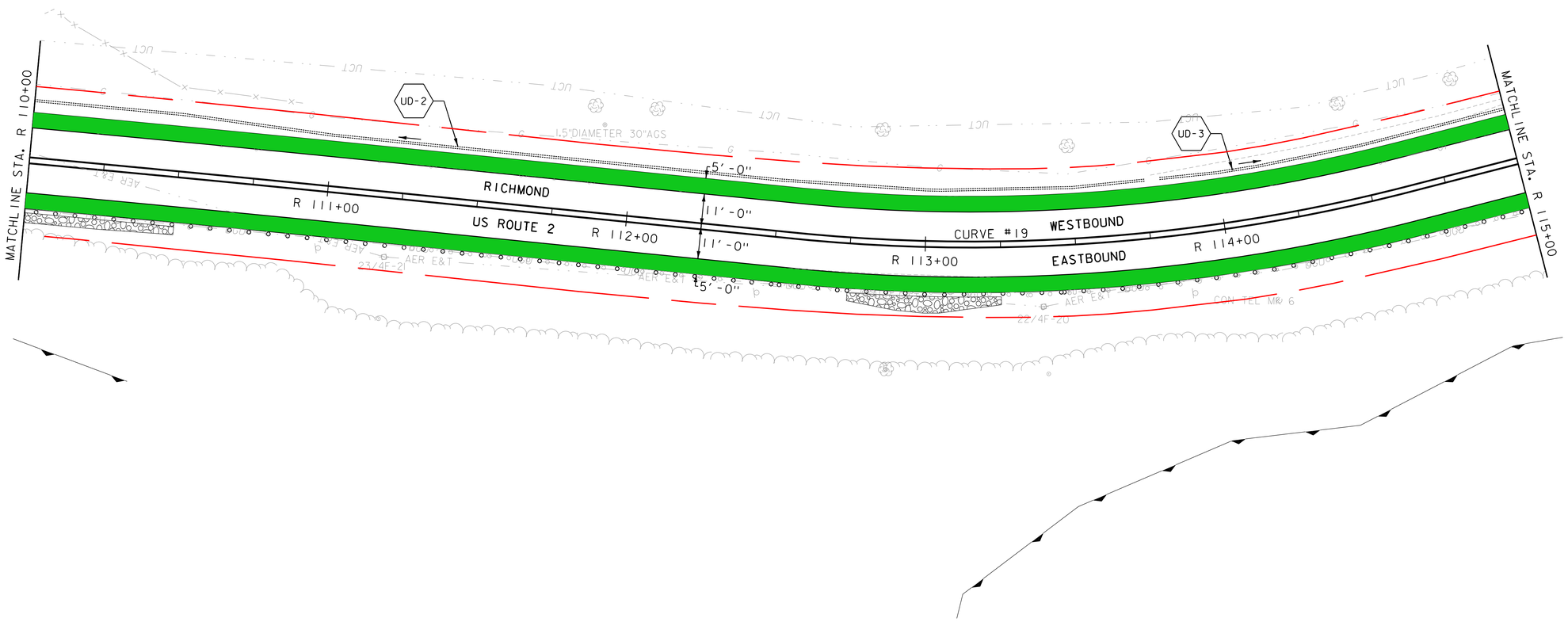
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 7	SHEET 7 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



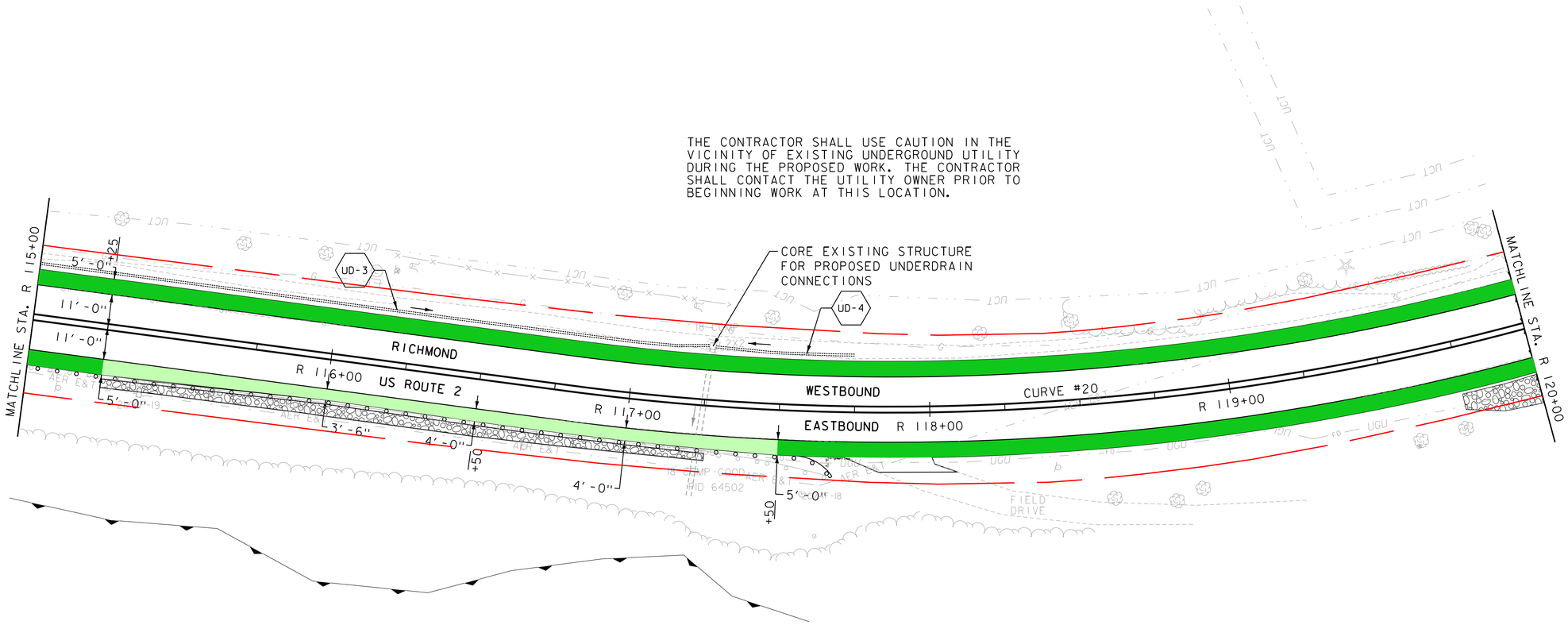
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 8	SHEET 8 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



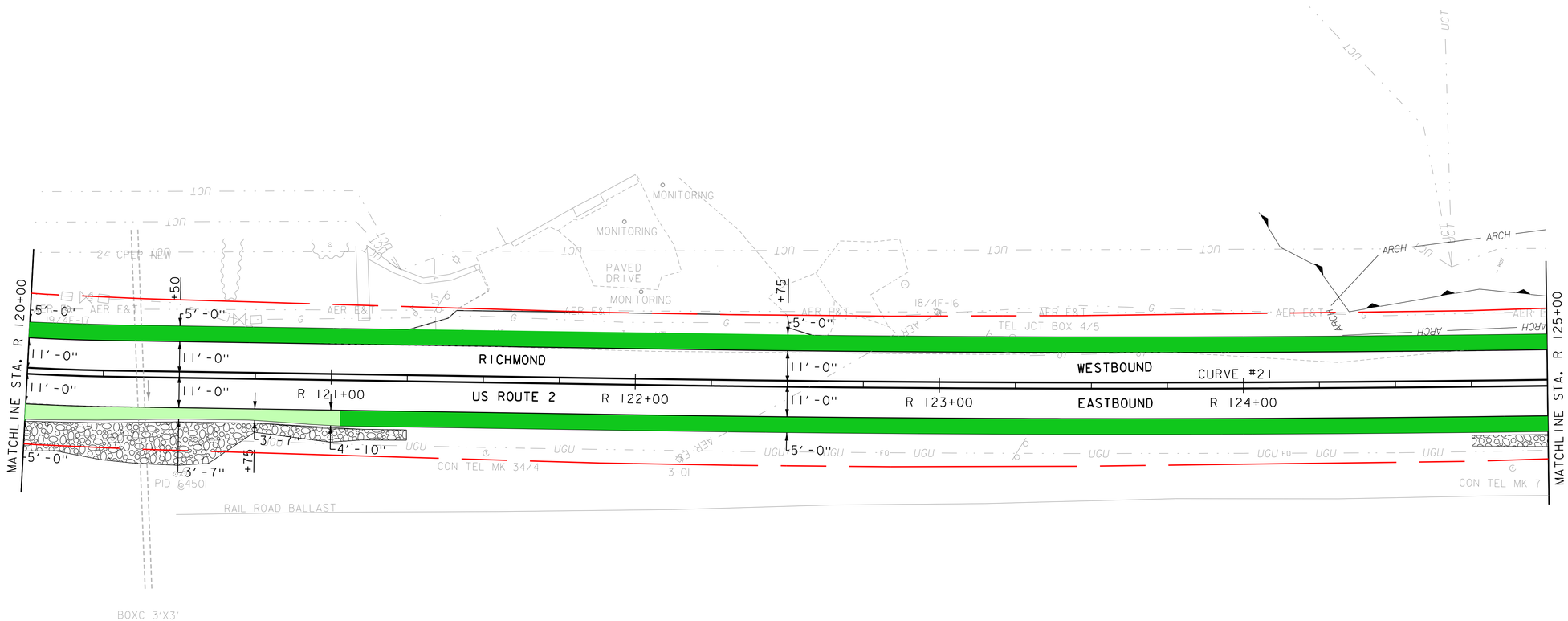
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 9	SHEET 9 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



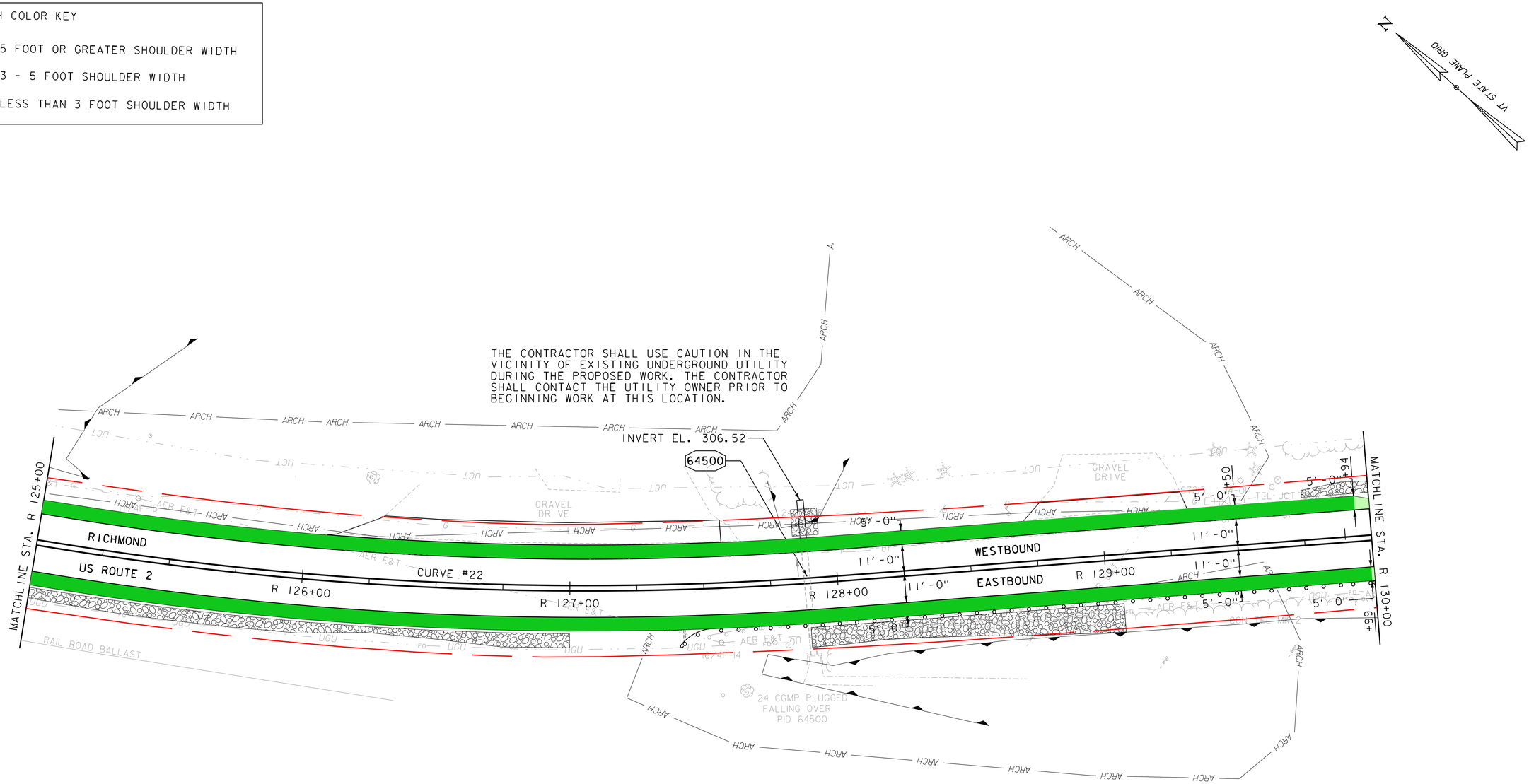
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 10	SHEET 10 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



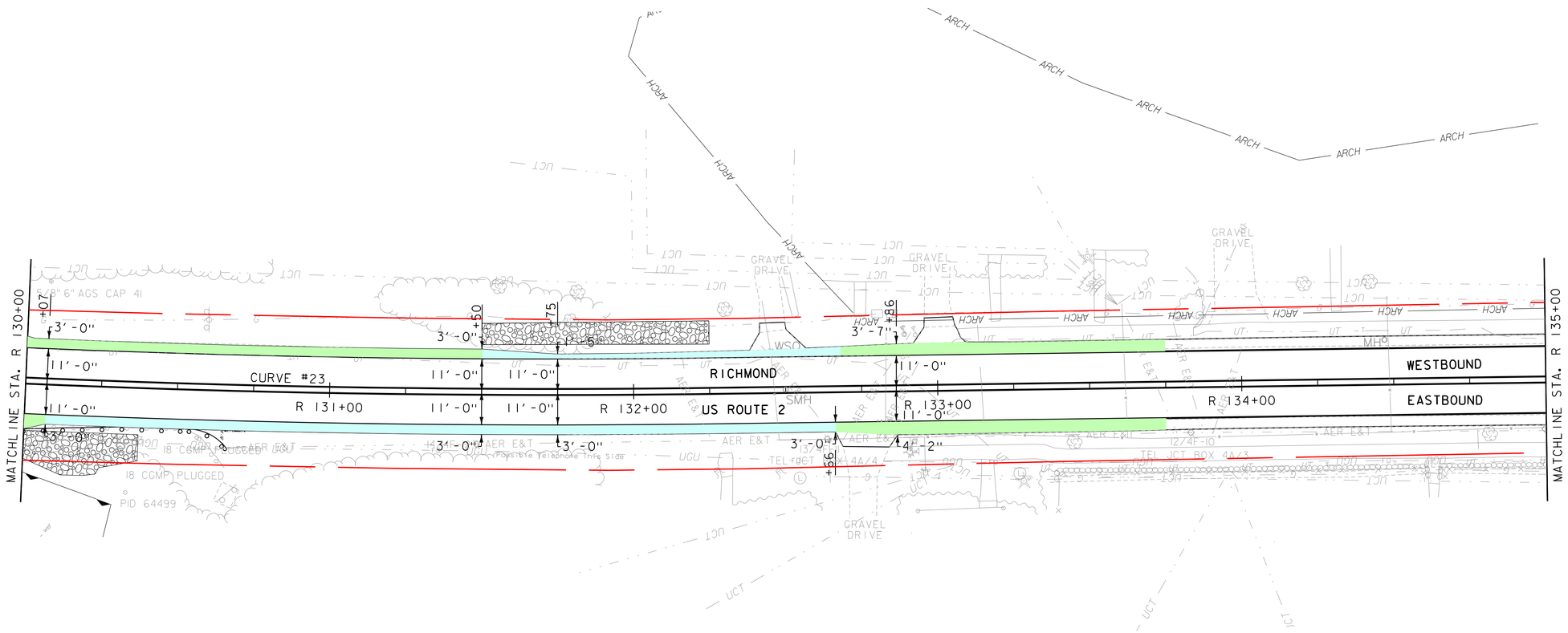
0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 11	SHEET 11 OF 12

SHOULDER WIDTH COLOR KEY

- 5 FOOT OR GREATER SHOULDER WIDTH
- 3 - 5 FOOT SHOULDER WIDTH
- LESS THAN 3 FOOT SHOULDER WIDTH



0 20 40
SCALE IN FEET

Stantec

PROJECT NAME: RICHMOND US-2 PINCH POINTS	
PROJECT NUMBER: 179450619	
FILE NAME: Richmond US-2 Pinch Points.dgn	PLOT DATE: 4/20/2023
PROJECT LEADER: M. FOWLER	DRAWN BY: J. LAPERLE
DESIGNED BY: J. LAPERLE	CHECKED BY: M. FOWLER
PLAN SHEET 12	SHEET 12 OF 12