

**APPENDIX A**

***2015 BRIDGE INSPECTION  
FIELD REPORT***

# STATE OF OHIO DEPARTMENT OF TRANSPORTATION

## BRIDGE INSPECTION FIELD REPORT

Structure File Number: 1800930

Inventory Bridge Number: CUY 00006 14.560 N

Bridge Type: 3 - STEEL/5 - ARCH/4 - THRU

Sufficiency Rating: 66.0

Date Built: 7/1/1917

District: 12 Place Code (FIPS): CLEVELAND

USR 6 over (1499)CUY. RIVER & RTA

Type of Service on: HIGHWAY-PEDESTRIAN

### APPROACH ITEMS

- c1. Approach Wearing Surface (EA)
- c2. Approach Slabs (SF)
- c3. Relief Joint (LF)
- c4. Embankment (EA) d
- c5. Guardrail (EA)

QTY.	condition state				TR
	1	2	3	4	
2	0	2			2.00
168	168				1.00
4	3	0	1		2.50
1	1	0			1.00

N36. Safety Features:  
Tr, Gr, Tm

36)B    N    36)C    1    36)D    0  
(9-0)    6

c6. Approach Summary

### DECK ITEMS

- c7.1 Floor/Slab (SF)
- c7.2 Edge of Floor/Slab (LF)
- c8. Wearing Surface (SF)
- c9. Curb/Sidewalk/Walkway (LF)
- c10. Median (LF)
- c11. Railing (LF)

QTY.	condition state				TR
	1	2	3	4	
226203.55	2177	7500	1000		1.12
	93.6				
5312	5312	0			1.00
191232	0	1912	0	0	2.00
		32			
5312.00	0	5312.			2.00
		00			
675	635	40		0	1.09
5312	5312		0		1.00

N36. Safety Features: Rail

36)A    1

c12. Drainage (EA) d

0.00	0	0.00	2		3.00
0.00	0	0.00	40		3.00

c13. Expansion Joint (LF) d

N58. Deck Summary

(9-0)    6

### SUPERSTRUCTURE ITEMS

- c14. Alignment (EA) d
- c15.1 Beams/Girders (LF)
- c15.2 Slab (SF)
- c16. Diaphragm/X-Frames (EA)
- c17. Stringers (LF)
- c18. Floorbeams (LF)
- c19. Truss Verticals (EA)
- c20. Truss Diagonals (EA)
- c21. Truss Upper Chord (EA)
- c22. Truss Lower Chord (EA)
- c23. Truss Gusset Plate (EA) d
- c24. Lateral Bracing (EA)
- c25. Sway Bracing (EA)
- c26. Bearing Devices (EA) d
- c27. Arch (LF)
- c28. Arch Column/Hanger (EA)
- c29. Arch Spandrel Walls (LF)
- c30. Prot. Coating System (LF) d
- c31. Pins/Hangers/Hinges (EA) d
- c32. Fatigue (LF) d

QTY.	condition state				TR
	1	2	3	4	
13	13				1.00
1200	1000	200			1.23
0.00	0				
10638	1063	0			1.00
	8				
37468	3626	1000	200	2	1.13
	6				
50	50	0			1.00
48	48	0			1.00
48	48				1.00
48	36	12			1.33
104	102	2	0		1.03
36	0	36			2.00
28	28	0.00			1.00
4	0	4			2.00
5558	5358	0.00	200		1.50
1118	1068	50.0			1.07
14469	1286	1200	400		1.49
	9				
30	30				1.00
0.00	0	0.00			

N59. Superstructure Summary

(9-0)    5

### SUBSTRUCTURE ITEMS

- c33. Abutment Walls (LF)
  - c34. Abutment Caps (LF)
  - c35. Abut. Columns/Bents (EA)
  - c36. Pier Walls (LF)
  - c37. Pier Caps (LF)
  - c38. Pier Columns/Bents (EA)
  - c39. Backwalls (LF)
  - c40. Wingwalls (EA)
  - c42. Scour (EA) d
  - c43. Slope Protection (EA) d
- N60. Substructure Summary

QTY.	condition state				TR
	1	2	3	4	
170.33	0	3289	170.		3.00
			33		
170.33	0				
0.00	0				
1022.00	0	1022.			2.00
		00			
1022.00	0	1022.			2.00
		00			
40.0	0	40.0	0		2.00
170.33	0	170.			2.00
		33			
0.00	0	0.00	60		3.00
14	0	14			2.00
0.00	0	0.00			

(9-0)    5

### CULVERT ITEMS

- c44. General (LF)
  - c45. Alignment (LF) d
  - c46. Shape (LF) d
  - c47. Seams (LF) d
  - c48. Headwall/Endwall (LF)
  - c49. Scour (LF) d
  - c50. Abutments (LF)
- N62. Culvert Summary

QTY.	condition state				TR
	1	2	3	4	

(9-0)    N

### CHANNEL ITEMS

- c51. Alignment (LF) d
  - c52. Protection (LF) d
  - c53. Hydraulic Opening (EA) d
  - c54. Navigation Lights (EA) d
- N61. Channel Summary

QTY.	condition state				TR
	1	2	3	4	
200.00	200	.0			2.00
200.00		200.			2.00
		00			
1	1				1.00
0.00	0	6			2.00

(9-0)    6

### SIGN/UTILITY ITEMS

- c55. Signs (EA) d
- c56. Sign Supports (EA) d
- c57. Utilities (LF) d

General Appraisal

N41. Operating Status

QTY.	condition state				TR
	1	2	3	4	
0.00	0	0.00	1		3.00
4	4	0.00			1.00
12000.00	0	1200	0.00		2.00
		0.00			

(9-0)    5

A

Inspector Name	Vermes, William
Inspection Date/Type	12/23/2015 Routine
PE Number	53391
Reviewer Name	Vermes, William
Review Date	02/15/2016
PE Number	53391

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Key: "Qty" = Quantity for Element Level inspection; "(LF)" = Linear Feet; "(SF)" = Square Feet; "(EA)" = Each or count; "CR" = 1-4 Condition Rating or average of worst span unless Summary item 9-0, then the average of entire bridge influenced by the bold boxes; "TR" = Transition Rating or weighted average of condition states; "d" = dedicated or specific chart and guidance, all others use Material specific chart/guidance; "c" = condition prefix; "N" = NBIS rating

## Inspection Procedures

## Comments

### APPROACH

#### c1. Approach Wearing Surface

This bridge lacks conventional approach slabs so the asphalt area the width of the tunnels and extending 30' beyond the tunnel bulkhead was rated. Though the approach tunnels on the west end of the bridge diverge to the south, only the approach surfaces on the main route US 6 were considered in the rating of this item. These regions lie just west of the intersection with West 28th and east of the intersection with West Huron Road. Overall, these areas are in fair condition with some cracking and isolated patched areas.

#### c4. Embankment

The SE embankment has been shored at its interface with the parking lot below where some erosion has occurred. No settlement along the south wall of the East Station is present.

At the NE embankment, where the bridge shares the embankment with the old Superior Viaduct there are some sink holes possibly due to a faulty water or sewer line below. These sinkholes do not affect the performance of the embankment.

The NW embankment is the County bridge garage parking lot and in good condition.

The SW embankment adjacent to the abandoned Riverbed Road is experiencing slope movement and is being monitored. This failure has led to the movement and cracks of the south west approach wingwall between Tower A and Tower B.

#### c5. Guardrail

For approach guardrail, only the portion at the SE end of the bridge adjacent to the parking lot was considered. The guardrail is composed of a concrete parapet topped with an aluminum picket. The guardrail is in good condition with only very minor shrinkage cracks noted. (Note median impact attenuator is rated with the median)

## DECK

### c7.1 Floor/Slab

This item includes the floor slab of the Detroit Avenue Tunnel, the West 25th Street Tunnel, the West Station, Upper deck floor in Spans 1A, 1B and 1 through 13, and the East Station. The top of floor is covered by wearing surface, curb, walk, or railing, thus this rating is governed primarily by the underside inspection.

A structural floor slab was placed on top of the Detroit Avenue Tunnel during the 1995-97 rehabilitation, and is considered to be in CS 1.

West 25th Street Tunnel: One location of exposed bottom mat rebar, say CS 3, 100

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SF.

The West Station floor slab has areas of CS 2 and CS 3 primarily beneath the south curb line and along deficient floor joints. CS 2 - 7342 SF, CS 3 - 832 SF. Top of West Station slab was extensively patch in Fall 1995. Waterproofing placed in 1995 is not effective. Slab is 16 inches thick in most areas.

Main Spans: No deficiencies noted except as follows:

Span 8, Center Bay: Water dripping during rain events.

Span 9: One full depth patch was performed in November 2015

many of the same deficiencies were observed. Many cracks had rows of stalactites. Active dripping in these areas also led to deposition mounds or corrosion in utilities below. In spall areas with rebar showing, sometimes up to about 50% of the bar circumference was exposed. An estimated 20% of the ceiling was saturated and stained.

East of the Detroit Station, the slab on the main concrete and steel spans was in good condition. Having been replaced in a recent rehabilitation, the slab in these areas was dry with only minimal hairline cracking. In Span 9, a full-depth The slab There were some very isolated areas with cracks, moisture, or efflorescence in the main steel span slab. The most notable deficiencies occurred in the stay in place forms adjacent to the locations where the main steel arch or hangers penetrate the deck. The east approach tunnel slab was also in very good condition with only some small isolated cracks with efflorescence noted.

#### c7.2 Edge of Floor/Slab

The edge of floor quantity applies only to the concrete bridge sections was rated. With 18 years of service, the slab edge is still in good condition with only minor cracks noted.

#### c8. Wearing Surface

The wearing surface quantity includes the four lanes of concrete wearing surface on the bridge as well as the asphalt overlay of the West Station and tunnels.

Overall, portions of the the concrete wearing surface were repaired in 2014 and 2015. condition with isolated spalls, patches, and plow damage. Local sounding of the concrete wearing surface revealed 2 to 5% of total WS area unsound. Open longitudinal cracks are also present in the concrete WS. On asphalt patch is present in Span 4, interior WB lane. Contractor also performed one additional large WS patch in Span 9 that revealed significant section loss of top mat rebar.

#### c9. Curb/Sidewalk/Walkway

The bridge has two walks that run its length. No walk quantities paralleling the tunnel sections were considered. The walk concrete has local spalls and delaminations, mostly on the north walk added in 2003.. This is primarily along the trench drain that runs for much of its length. Some of the drain cover panels are damaged and much of the drain is filled with sediment or vegetation. There is also plow debris accumulating on the walk at several points along the bridge.

#### c10. Median



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The bridge has a single median at the point where the southern eastbound lane diverges around the steel arch superstructure. The median received a poor rating due to the condition of the attenuator on the eastbound leading edge. As shown in the pictures below, several of the attenuator bays show evidence of collision damage. The visibility paint on the west end of the barrier is also nearly gone.

#### c11. Railing

The entire length of concrete railing on the bridge was considered in this item. There was also Type 5 railing on the north side of Span 4 protecting the bridge truss and hangers. All concrete railing was in good condition with minor cracking, staining, and isolated distress.

#### c12. Drainage

This item encompassed the entire drainage system of the bridge moving from the deck scuppers to the outlets at the bases of the piers. During rainfall the deck had little to no ponding. The majority of the deficiencies occurred at the drainage outlets. Some of the downspouts or the basins into which they drained were completely clogged. There was also one catchbasin with dislodged lid. The south drain outlet at pier 1 is clogged up to the downspout and is preventing drainage from the structure.

At the south side of Pier 3, the plastic downspout the lower 10 feet up is broken.

Most of the curb drains are partially clogged, but drainage is not impacted.

#### c13. Expansion Joint

The bridge has expansion joints within the tunnel sections, concrete spans, and main steel arch. Expansion joints are not present in the west approach tunnels, West Station or East Station. The concrete arches sections have expansion joints between spans. Most joints are in good condition. The Tower B expansion joint membrane is torn. The armor above is in good condition, but some surrounding concrete has occasional delaminations and spalls on both the leading and trailing edges. The joints are nearly full of debris. There are four joints within the steel arch section. On the deck these joints show similar concrete damage and debris accumulation with minimal staining at the interface with the concrete spans. There is some plow damage.

### SUPERSTRUCTURE

#### c15.1 Beams/Girders

This item is the concrete beams between the columns in the tunnel section. Overall these are in fair condition. Some were repaired during our inspection process.

#### c17. Stringers

This quantity only includes upper deck stringers. Normal vehicular and pedestrian traffic is not dependent on the lower deck stringers.

#### c18. Floorbeams

Rating of this item includes all concrete and steel floorbeams in both the upper and lower decks. Concrete floorbeams are supported by columns in the spans approaching the central steel arch. Floorbeams in the steel section are supported from hangers from the lower arch chord.

Most of the concrete floorbeams in the spans approaching the central steel span are

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in good condition. Hairline cracks are common and larger cracks have been previously repaired using epoxy injection. There are a few isolated spalls which are already marked for repair in the current rehabilitation.

The steel floorbeams in Span 4 are in poor condition. All show severe corrosion and section loss especially around the verticals connecting the decks. Pack rust is common between the plates that compose the members. Through holes in the web, flanges, and stiffeners were also noted.

c19. Truss Verticals

Minor corrosion on lacing bars

c20. Truss Diagonals

Minor section loss on lacing bars.

c21. Truss Upper Chord

Minor corrosion present at U12 hinge cover plate

c22. Truss Lower Chord

Minor section loss typical L0 to L3.

c23. Truss Gusset Plate

10% average section on both gusset plates, South L2.

c24. Lateral Bracing

Lateral bracing below upper deck has minor section loss.

c26. Bearing Devices

Steel Arch bearing has minor deterioration. Steel shot blast material not removed during the 1997 painting is present within the chambers of all bearings. The bearing pin covers have cracks, at all four bearing locations. Appear to be growing at the South West Bearing. Cracks do not affect the performance of the bearing.

c27. Arch

This item consists 5558 feet of concrete arch ribs. (See truss items for steel arch condition rating.) Overall the concrete arch ribs are in fair condition with about 5% areas with spalls.

Except Span 12, all arches have no shear reinforcement and top and bottom matt of reinforcement is discontinuous.

Span 3 NE, NI & SE arches, Span 5 NE and SE arches: Evidence present that the arches are cracked vertically through full section centered on the 1/4 point of the arches.

Evidence also present that concrete patches are cracked and spalling due to continued rebar corrosion. Removed portions of shotcrete patches shows signs of sufficient adhesion to original concrete.

See detailed report for additional information.

c28. Arch Column/Hanger

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See c31 Pins/Hangers/Hinges for steel hangers in Span 4..

Overall the Concrete Columns are in fair condition, with the once that were replaced with the 1994 rehab in fair condition. Most of the deteriorated columns from the 2013 bridge inspection are were being repaired under the current construction project. Current rehabilitation work patched only columns over public areas.

#### c30. Protective Coating System

Above Upper Deck: Minor paint PCS deficiencies are present, including the oxidized top coat, are present.

At upper and lower deck levels: PCS has been restored and is in good condition.

Below lower deck, L0 to L3 and lateral bracing connections: Local PCS failure on lower chord and lateral bracing connections.

#### c31. Pins/Hangers/Hinges

Quantity The bridge has a single pin on each side at the center of each lower steel arch chord. From PP 5 to PP 5', the steel hangers were replaced during the 1994 Rehab and are in good condition.

Original hanger at PP4 and PP4' were not removed in 1995 since these elements were contained steel, are redundant elements and not included in this condition rating.

One hanger set on South Truss exhibits unequal tension.

#### c32. Fatigue

No fatigue distress was noted at the eyebar heads. Lower pins with grease fitting were greased during the 2014 inspection.

### SUBSTRUCTURE

#### c33. Abutment Walls

The abutment wall include the tunnel walls. Abutment wall concrete shows signs of staining and minor cracking with some spalls. North East Approach Tunnel Wall was under construction during out initial inspections, with many areas of 360 degree rebar exposure during the repair process. These ares were repaired by the completion of the inspection and the rating is based on the repaired walls.

Overall the Pier Columns are in fair condition.

#### c38. Pier Columns/Bents

Piers 1-3 and 5-12. Minor cracking and some unsound areas where previously patched with shotcrete. (Note South Tower B is rated under wingwall)

Upper and lower deck pier shafts: The Pier 5 South Upper Deck Pier Shaft was replaced in 1995-96. The Pier 5 South Lower Deck Pier Shaft is deeply scaled with indications that it is deficient deep inside.

#### c36. Pier Walls

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Arch Span Abutments and Piers 3 and 4. Minor cracks with active rebar corrosion is present.

c39. Backwalls

Tunnel Ends. Minor Staining, Wet, and isolated cracking.

c40. Wingwalls

Soft concrete at southwest wingwall and cracking. Spalls at curtain walls typical with no significant change.

South Tower B settlement has continued. See crack monitor pictures in report.

c43. Slope Protection

Stone in some areas along West Side.

CHANNEL

c51. Alignment

Bridge has navigation lights, but SMS will not allow this item to be rated. All 6 navigation lights are not working at the time of this report.

c52. Protection

Sheet Pile walls at Pier 4. Small sink hole behind sheet pile wall.

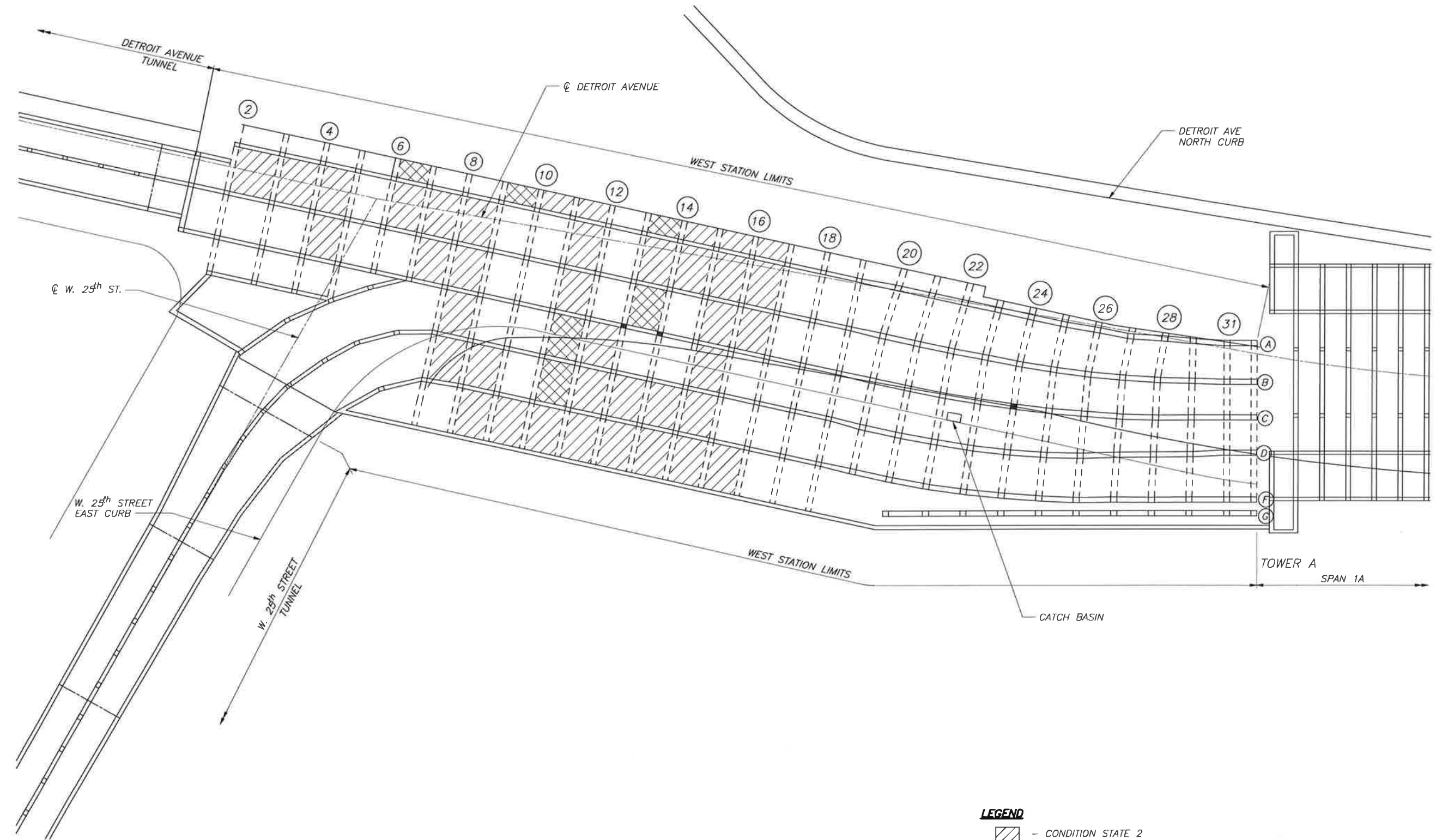
There is no collision protection present at Pier 3. Former sheet pile sea wall that defined the west dock line downstream Pier 3 is partially missing, remaining section is just visible above the water.

c53. Hydraulic Opening




Span 4 has 96-ft minimum navigation clearance.


# **APPENDIX B**

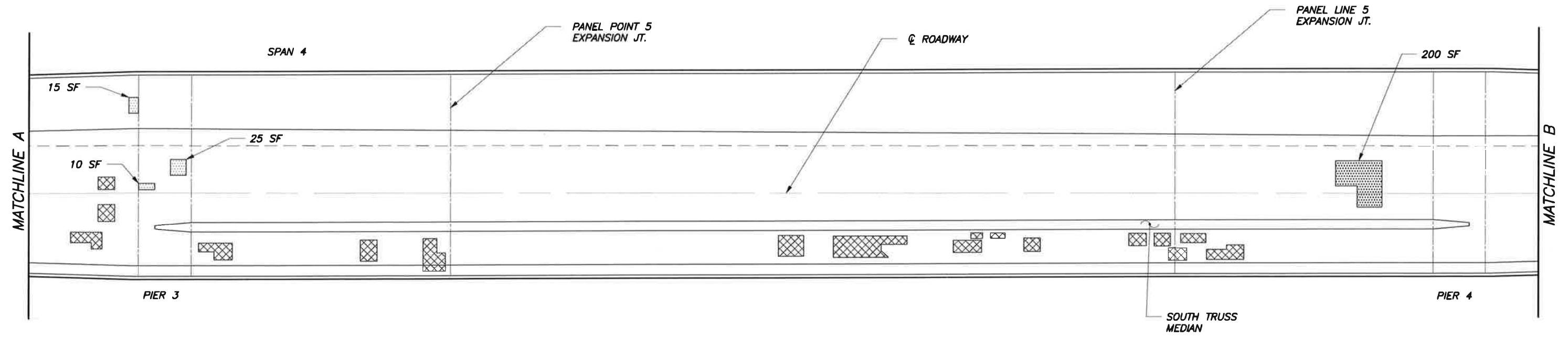
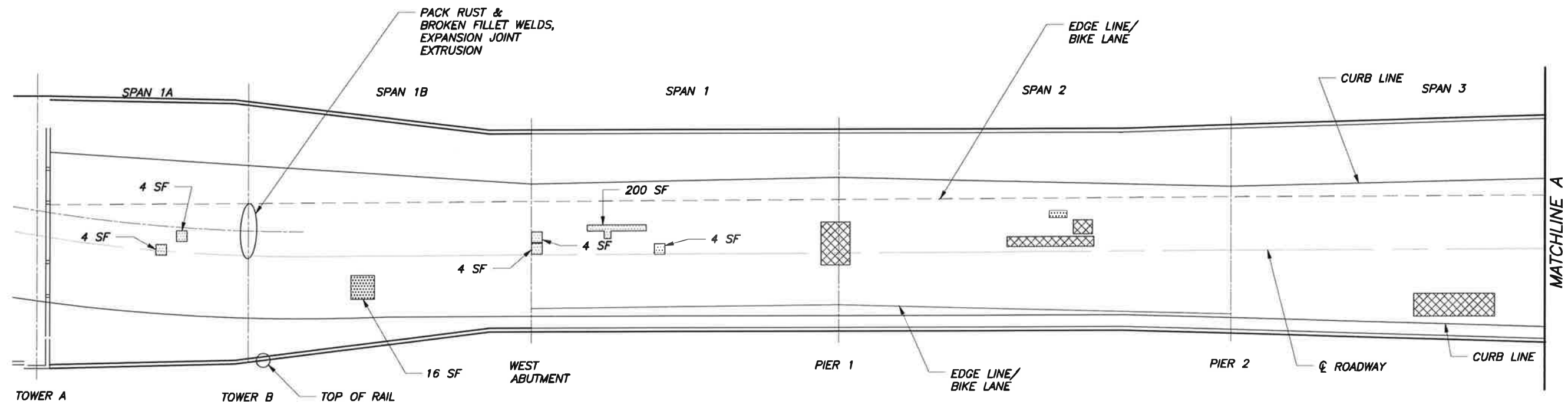
## ***2015 INSPECTION FINDINGS***



**WEST STATION PLAN**

- LEGEND**
-  - CONDITION STATE 2
  -  - CONDITION STATE 3
  -  - UPCOMING COLUMN REPLACEMENT

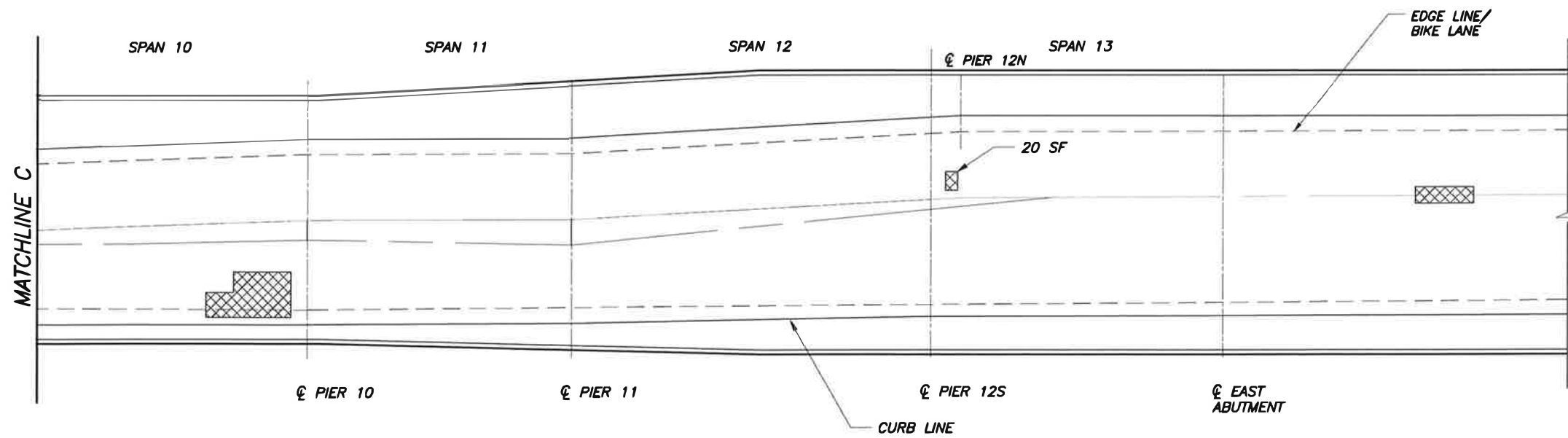
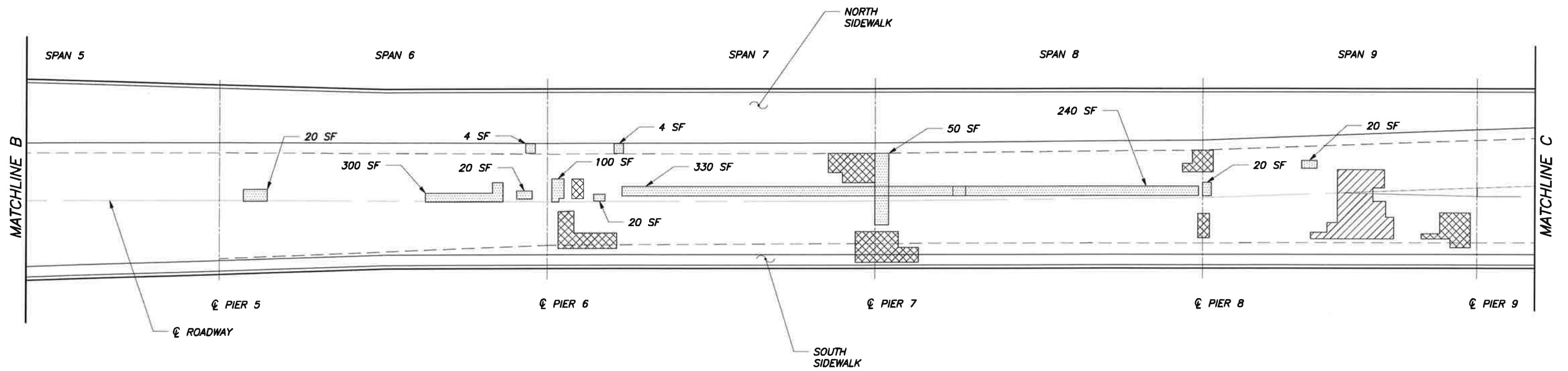
	SPANS 1 - 5
	WEST STATION ROOF SLAB
	B-1



**LEGEND**

-  DELAMINATED CONCRETE WEARING SURFACE WITH ESTIMATED AREA
-  PATCHED WEARING SURFACE NOVEMBER 2015
-  PREVIOUS WEARING SURFACE REPAIR

	UPPER DECK FINDINGS SPANS 1A- EAST STATION
	B-2

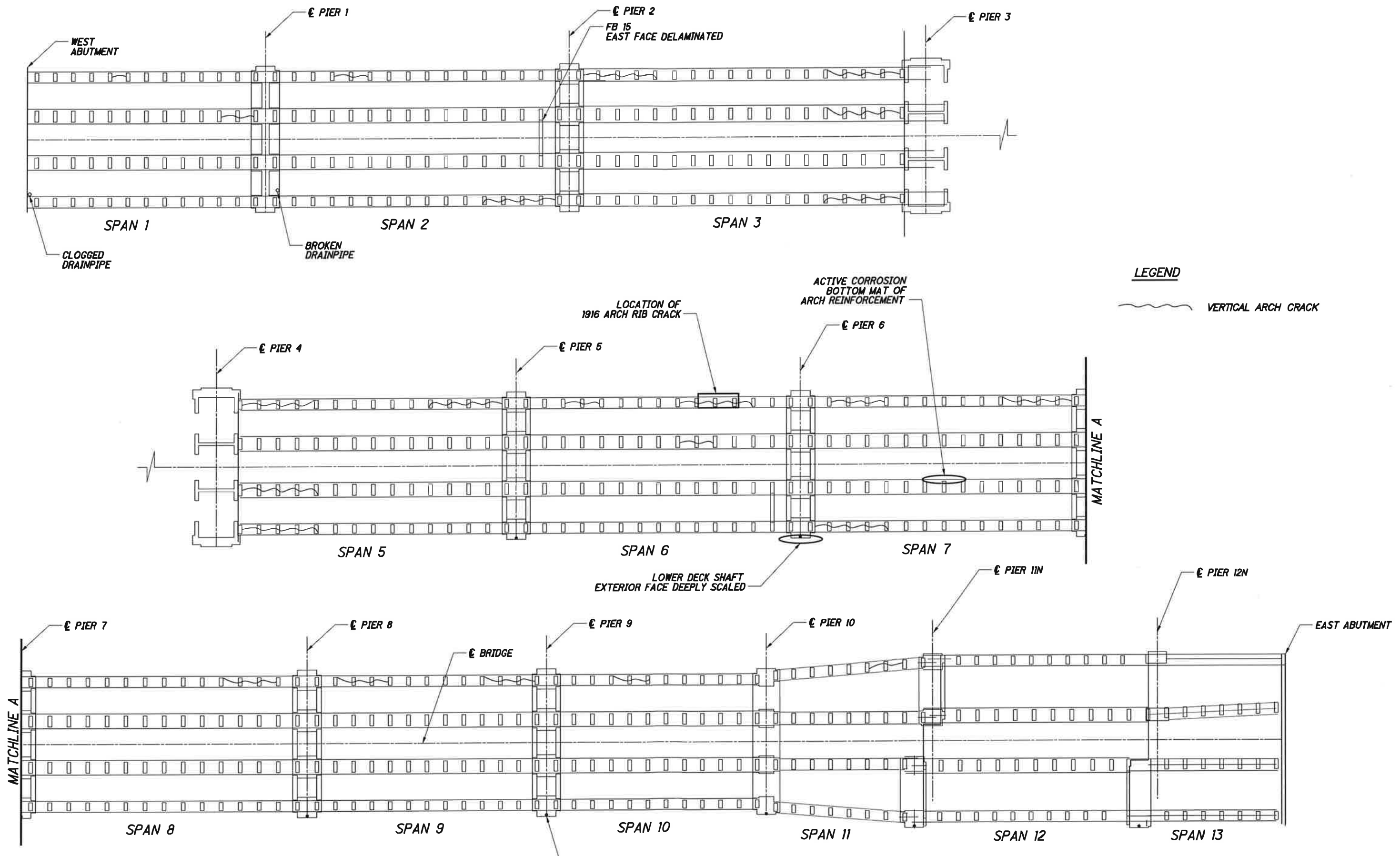


**LEGEND**

-  DELAMINATED CONCRETE WEARING SURFACE
-  WEARING SURFACE PATCH 2015
-  PREVIOUSLY PATCH WORN

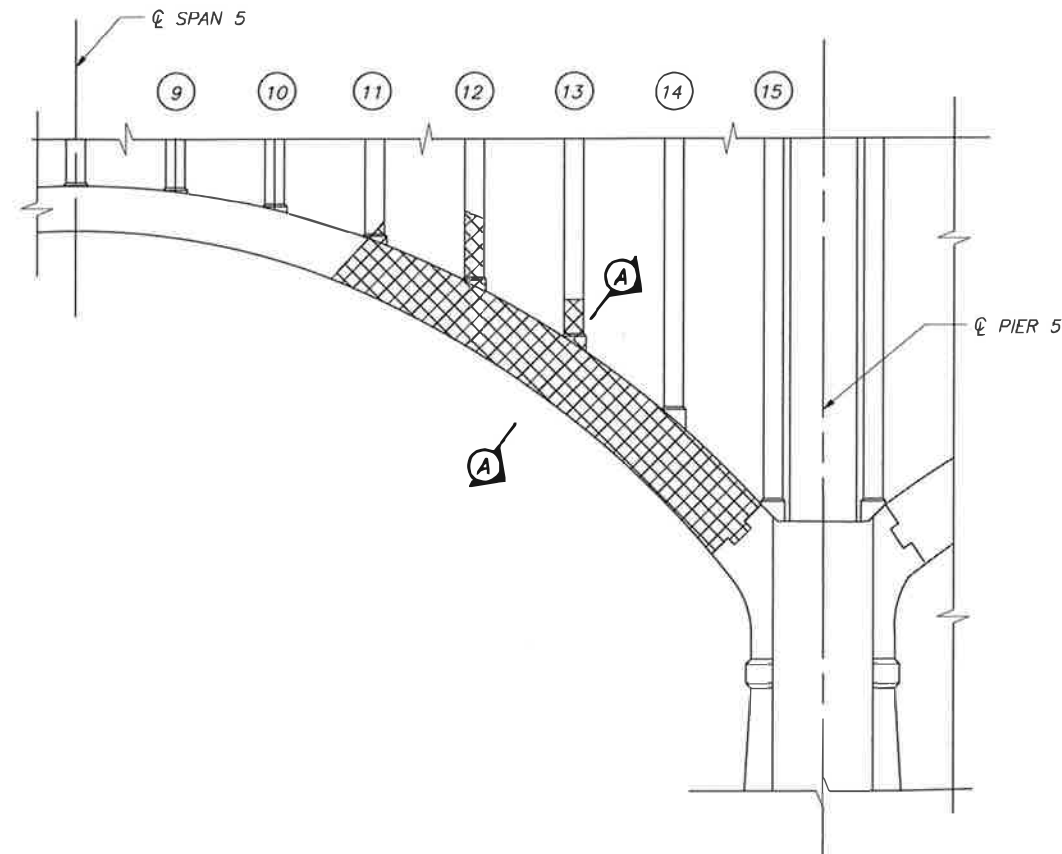


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**LEGEND**  
 VERTICAL ARCH CRACK

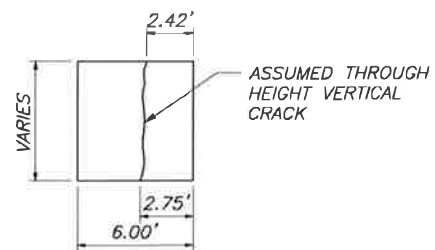
	LOWER CONCRETE SUPERSTRUCTURE COMMENTS
	SPANS 1-13
	B-4



**SPAN 5 NE ARCH PARTIAL ELEVATION**

LOOKING NORTH

CRACK MEASUREMENTS				
PANEL	INTRADOS		EXTRADOS	
	MEASURED CRACK WIDTH	DIST. FROM SOUTH FACE	MEASURED CRACK WIDTH	DIST. FROM SOUTH FACE
11-12	0.030"	3.50'	<0.030"	2.58' TO 3.75'
12-13	0.156"	2.75'	$\frac{3}{32}$ " & $\frac{5}{8}$ "	2.42'
13-14	0.035" & 0.020"	2.50' & 3.83'	0.040" TO 0.094"	2.75'
14-15	0.012"-0"	2.00'	0.010" TO 0.020"	2.75'



**SECTION A-A**

**LEGEND**

- VERTICAL CRACK LOCATION



Photo B1 – Panels 1-4.



Photo B2 – Panels 4-6.



Photo B3 – Panels 7 & 8.



Photo B4 - Panels 11 & 12.



Photo B5 – Panel 13 & 14.



Photo B6 – Panels 14 & 15.



Photo B7 – Panels 15 & 16.



Photo B8 – Panels 16-18.

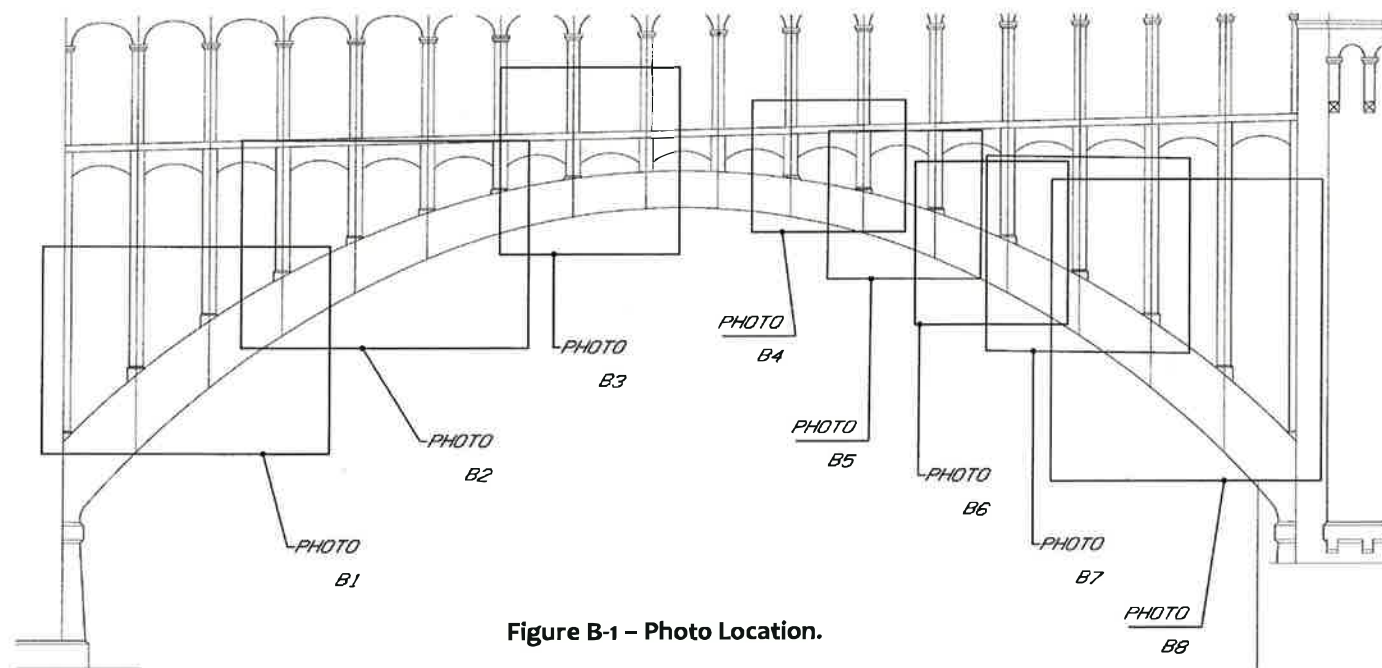


Figure B-1 – Photo Location.

Photos represent the narrow, horizontal crack observed on the south face of the Span 3 NE Arch Rib. In several locations, a similar crack is present on the north face also. Arch segments shown in photos are identified in Figure B-1.

-  VERTICAL CRACK LOCATION
-  HORIZONTAL CRACK LOCATION

# *APPENDIX C*

## *EXPANSION JOINT MEASUREMENTS*

Expansion Joint	2015	
	NORTH EDGE LINE	SOUTH EDGE LINE
TOWER A	1 <sup>7</sup> / <sub>8</sub> "	1 <sup>3</sup> / <sub>8</sub> "
TOWER B	1 <sup>7</sup> / <sub>8</sub> "	2 <sup>3</sup> / <sub>8</sub> "
WEST ABUT.	1 <sup>7</sup> / <sub>8</sub> "	2 <sup>5</sup> / <sub>16</sub> "
PIER 1	2"	2 <sup>1</sup> / <sub>4</sub> "
PIER 2	1 <sup>7</sup> / <sub>8</sub> "	2 <sup>3</sup> / <sub>8</sub> "
PIER 3W	2 <sup>1</sup> / <sub>8</sub> "	2 <sup>1</sup> / <sub>2</sub> "
PIER 3E	1 <sup>3</sup> / <sub>8</sub> "	1 <sup>3</sup> / <sub>4</sub> "
SPAN 5, LINE 5	1 <sup>1</sup> / <sub>2</sub> "	2"
SPAN 5, LINE 5'	2"	2 <sup>3</sup> / <sub>16</sub> "
PIER 4W	1 <sup>5</sup> / <sub>8</sub> "	1 <sup>7</sup> / <sub>8</sub> "
PIER 4E	2 <sup>1</sup> / <sub>8</sub> "	2 <sup>3</sup> / <sub>8</sub> "
PIER 5	1 <sup>3</sup> / <sub>4</sub> "	2"
PIER 6	1 <sup>7</sup> / <sub>8</sub> "	2 <sup>1</sup> / <sub>16</sub> "
PIER 7	2"	2"
PIER 8	2"	2 <sup>3</sup> / <sub>16</sub> "
PIER 9	1 <sup>7</sup> / <sub>8</sub> "	2"
PIER 10	1 <sup>7</sup> / <sub>8</sub> "	2 <sup>1</sup> / <sub>8</sub> "
PIER 11	2 <sup>1</sup> / <sub>4</sub> "	1 <sup>7</sup> / <sub>8</sub> "
PIER 12	2"	2 <sup>1</sup> / <sub>8</sub> "
EAST ABUT.	1 <sup>3</sup> / <sub>4</sub> "	1 <sup>13</sup> / <sub>16</sub> "

Measurements taken at 55° F.

# **APPENDIX D**

## ***SLOPE INCLINOMETER MEASUREMENTS***





B-004-0-13

B-004-1-13

Tower B North

B-003-0-13

B-002-0-13

B-003-1-13

B-001-0-13

Tower B South

B-002-1-12

B-002-2-12

B-001-1-13

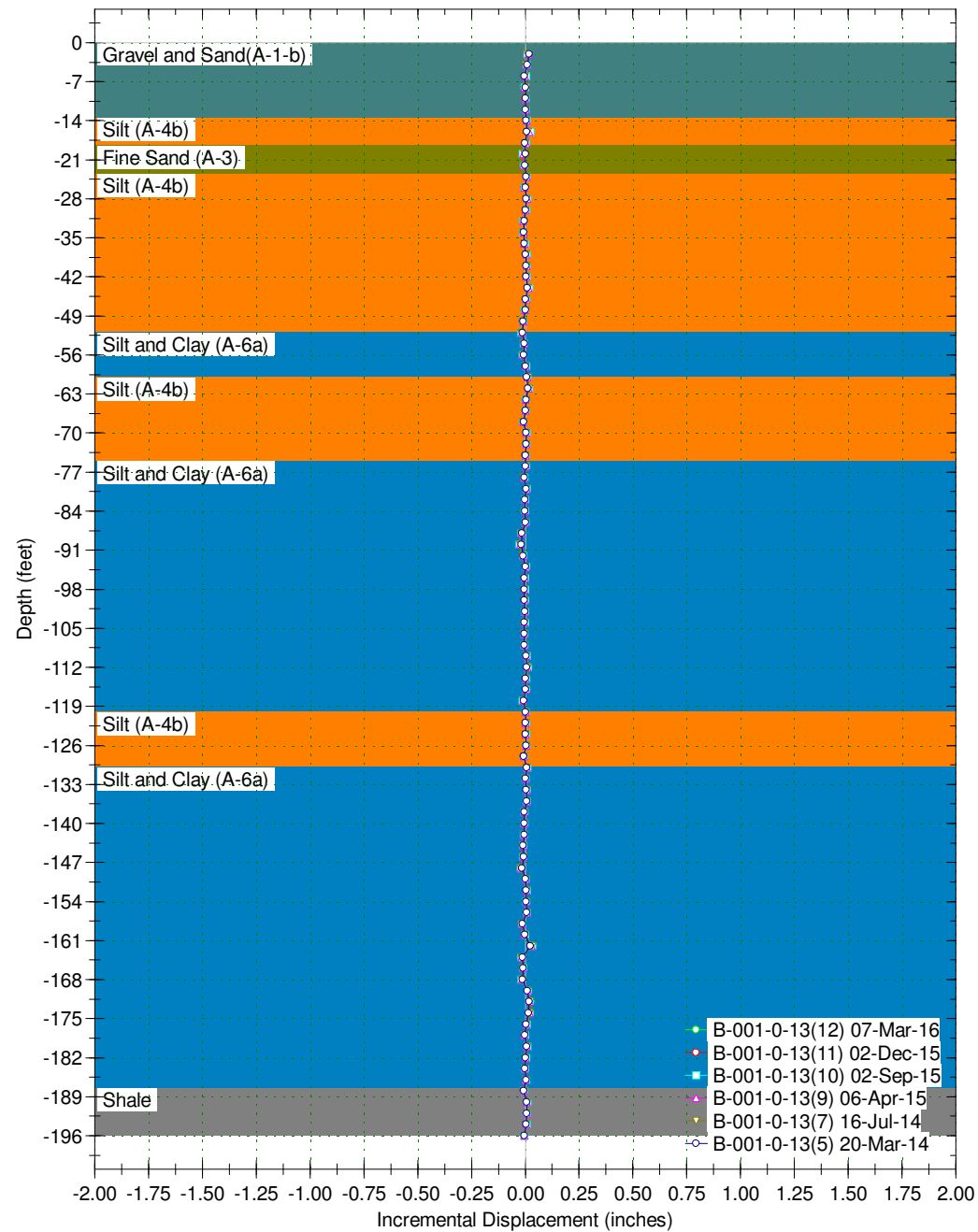
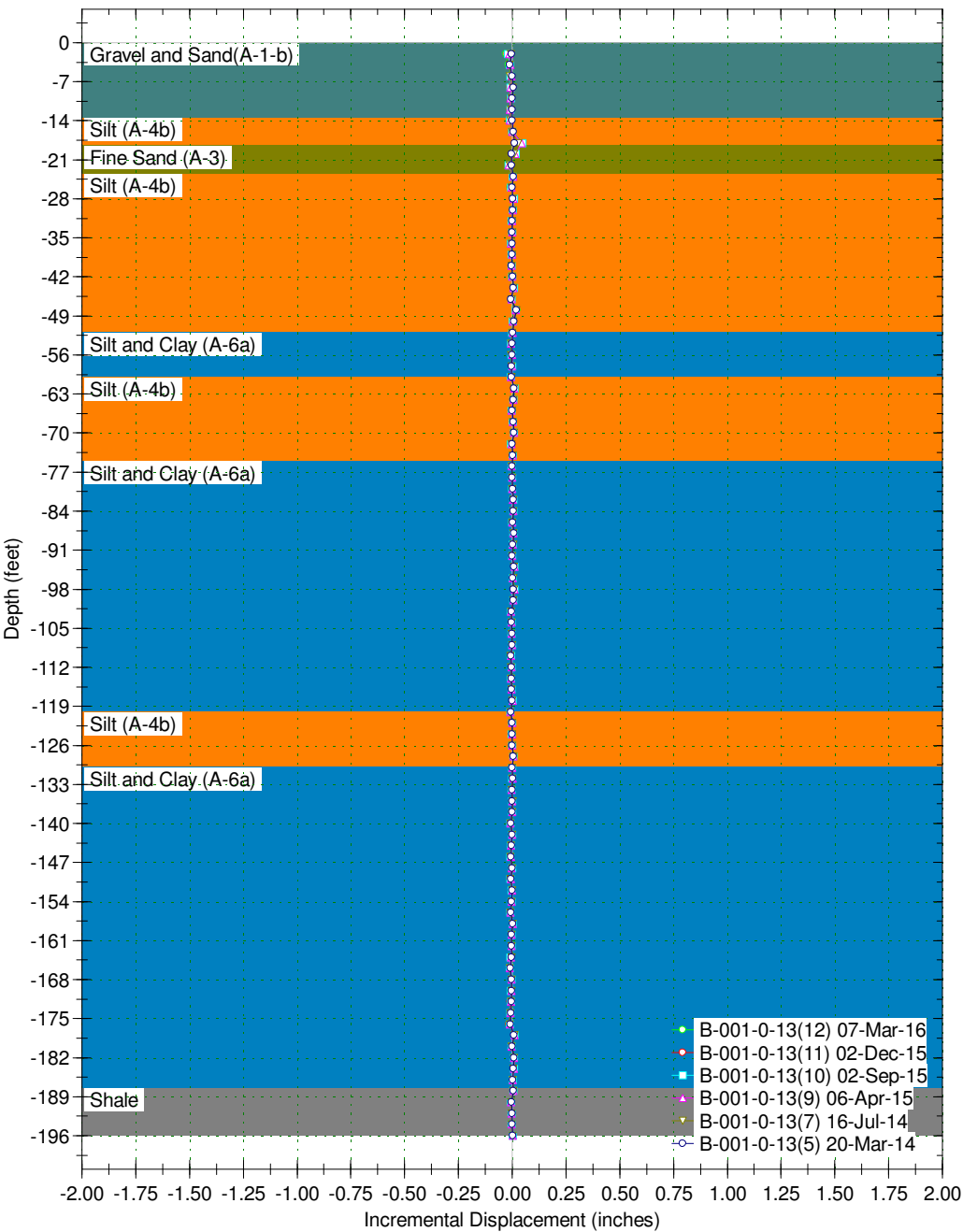
B-002-3-13

Borehole : B-001-0-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 196.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 21 15:19  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B



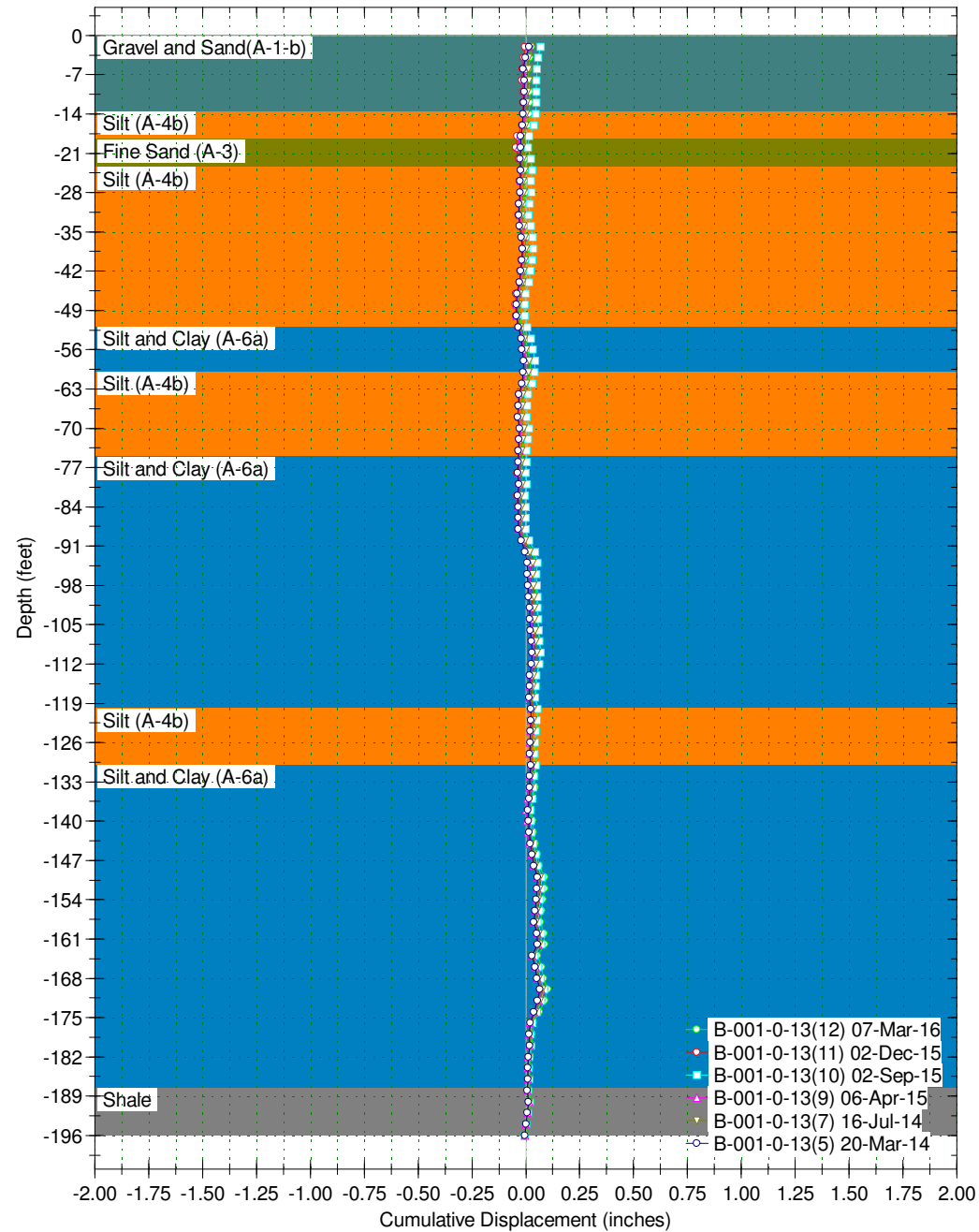
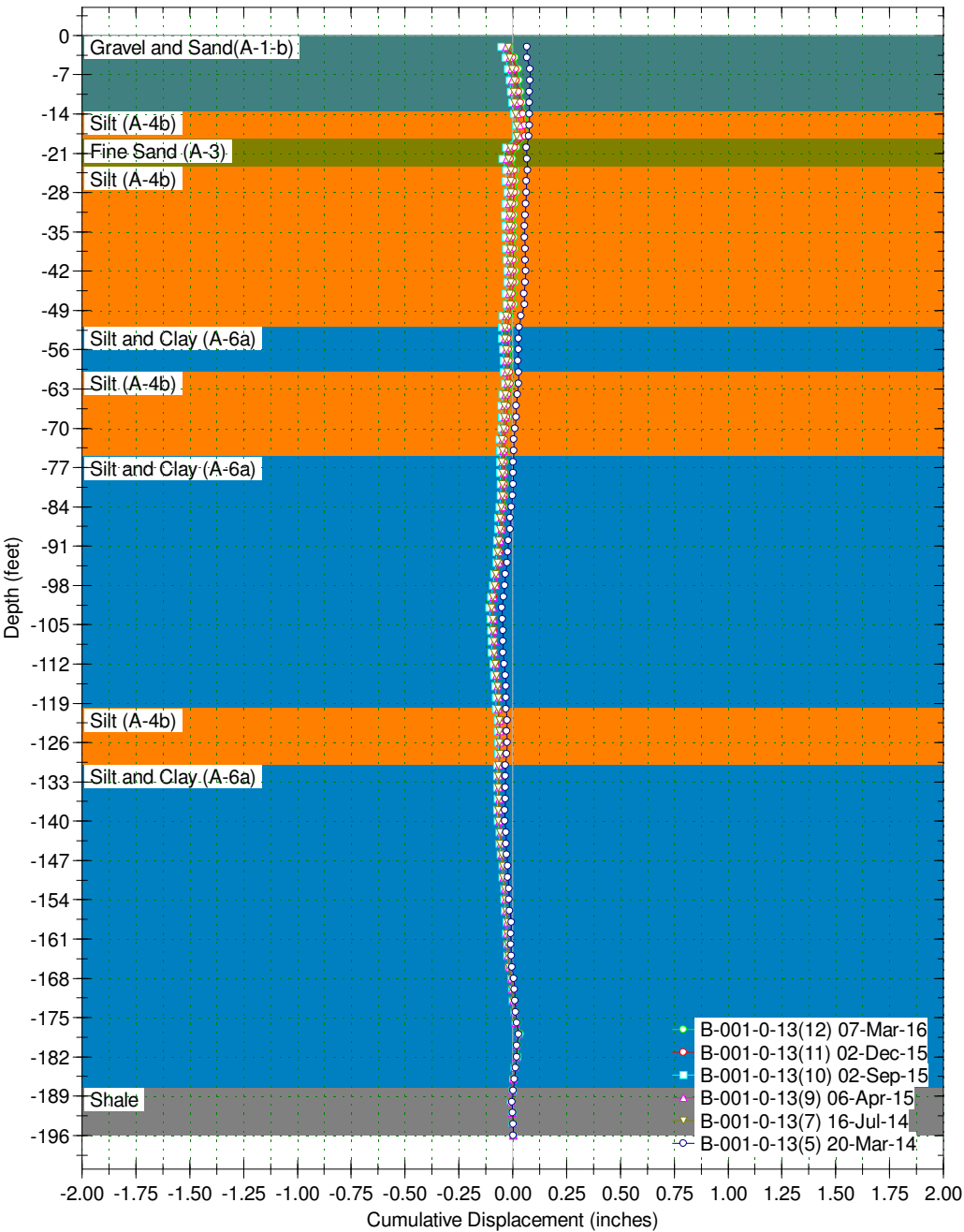


Borehole : B-001-0-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 196.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 21 15:19  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

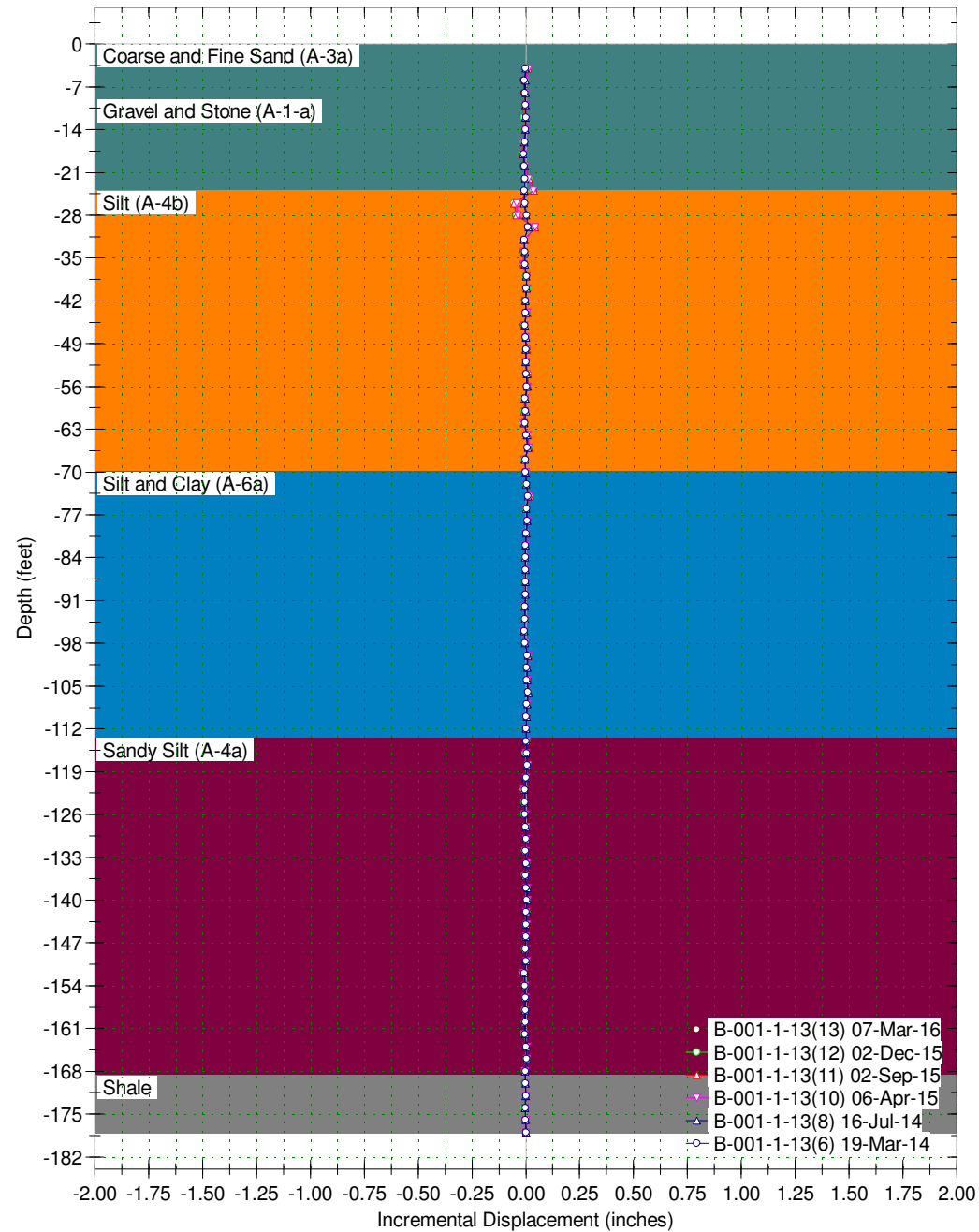
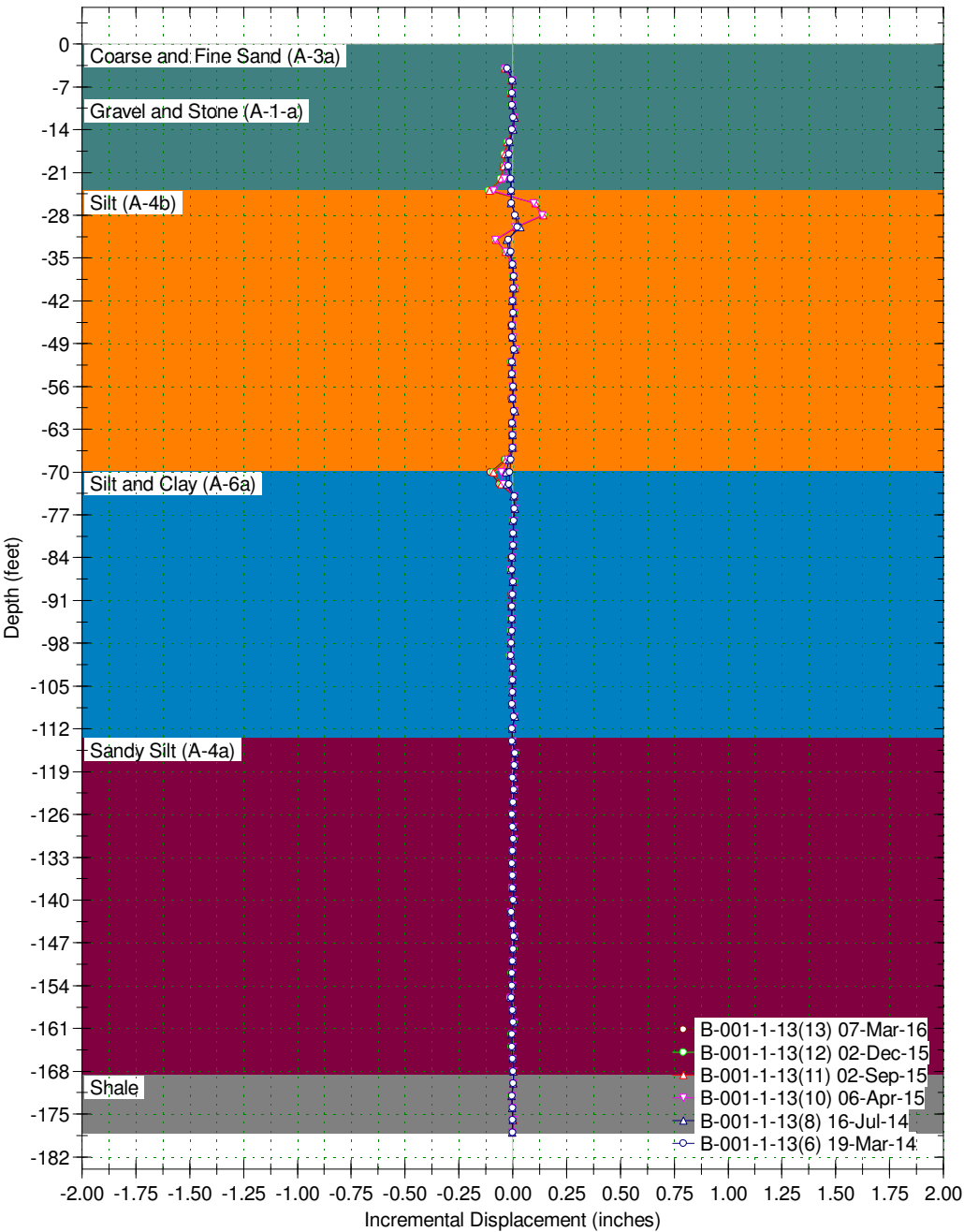


Borehole : B-001-1-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 178.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 21 13:15  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

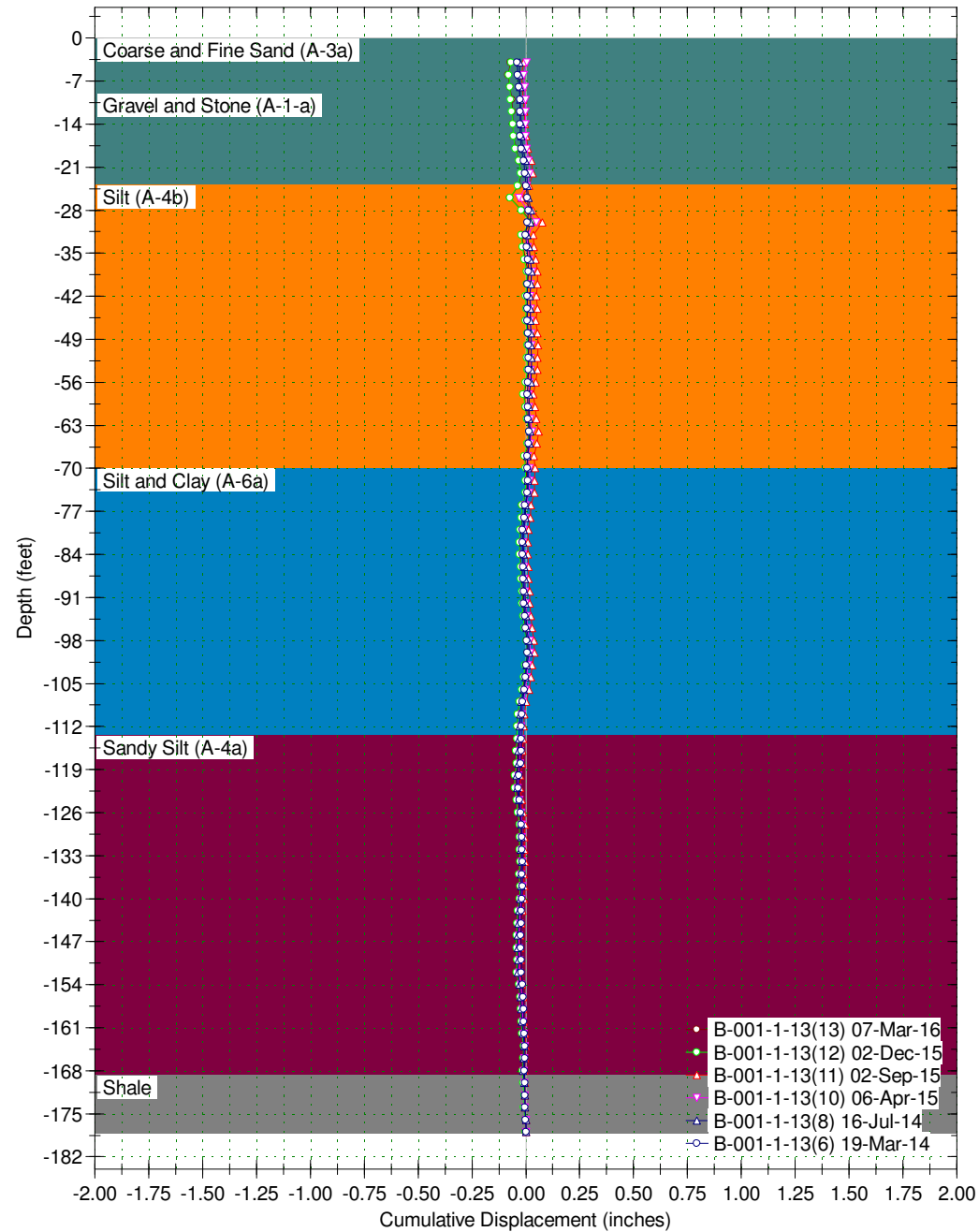
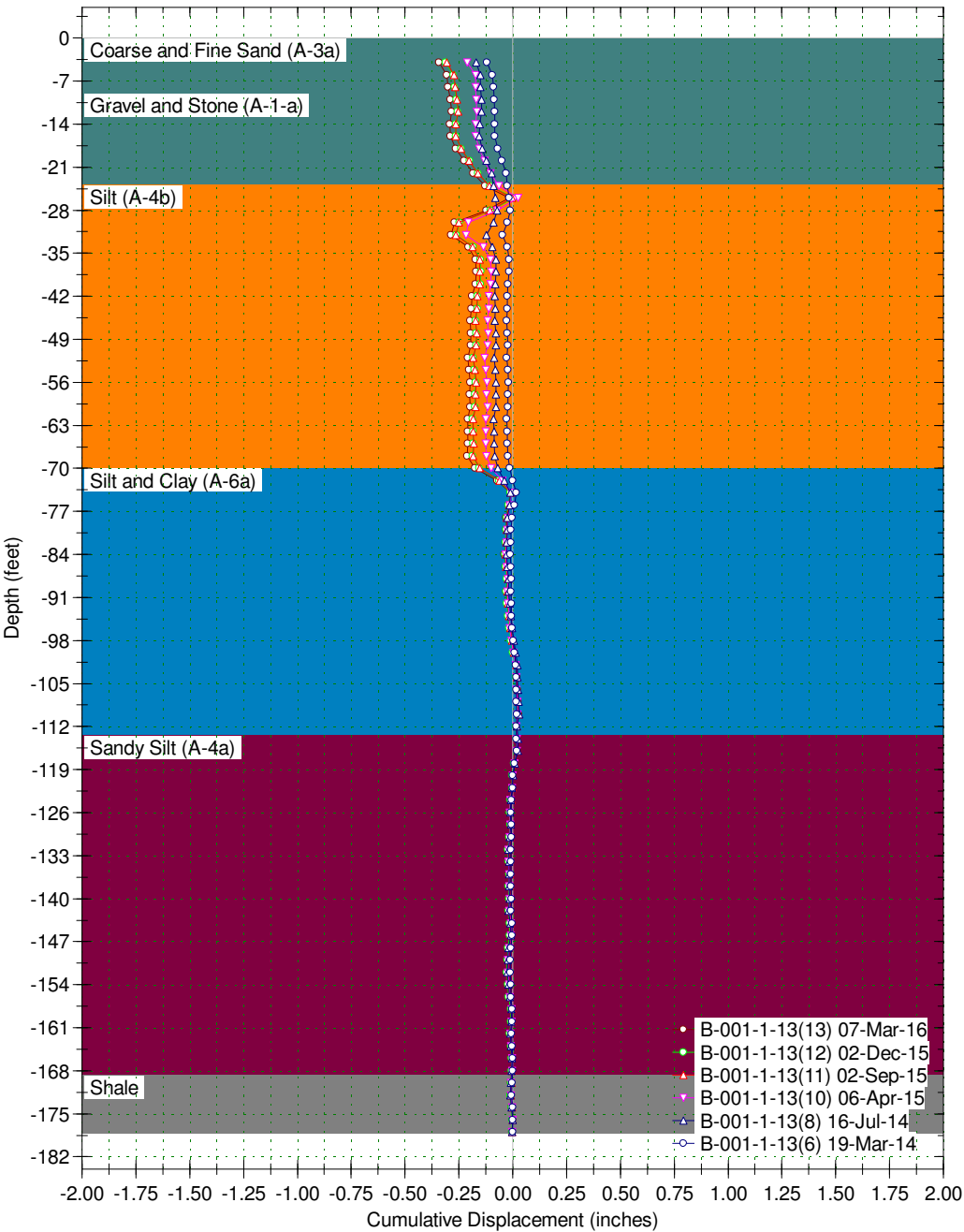


Borehole : B-001-1-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 178.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 21 13:15  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

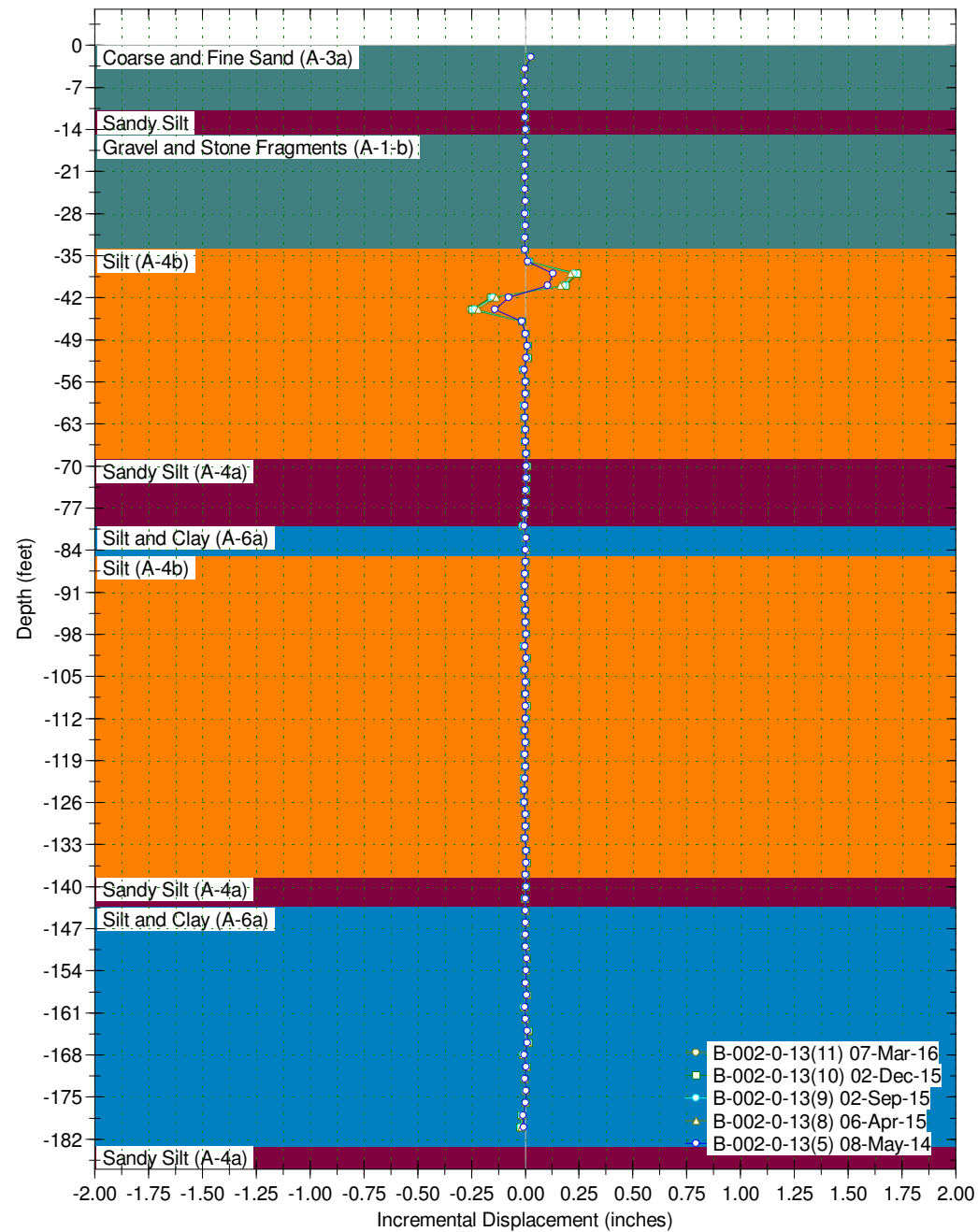
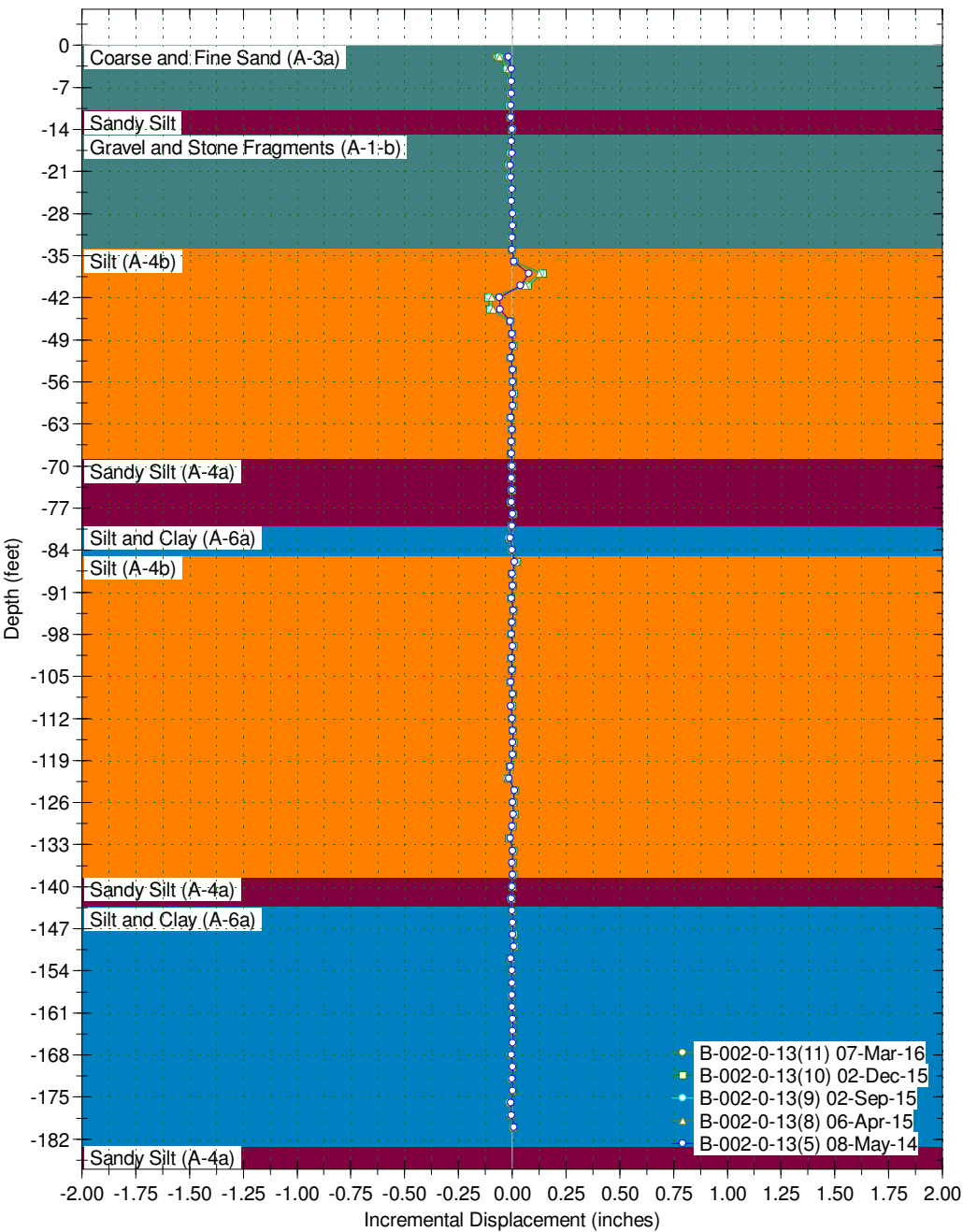


Borehole : B-002-0-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 180.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 21 14:51  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

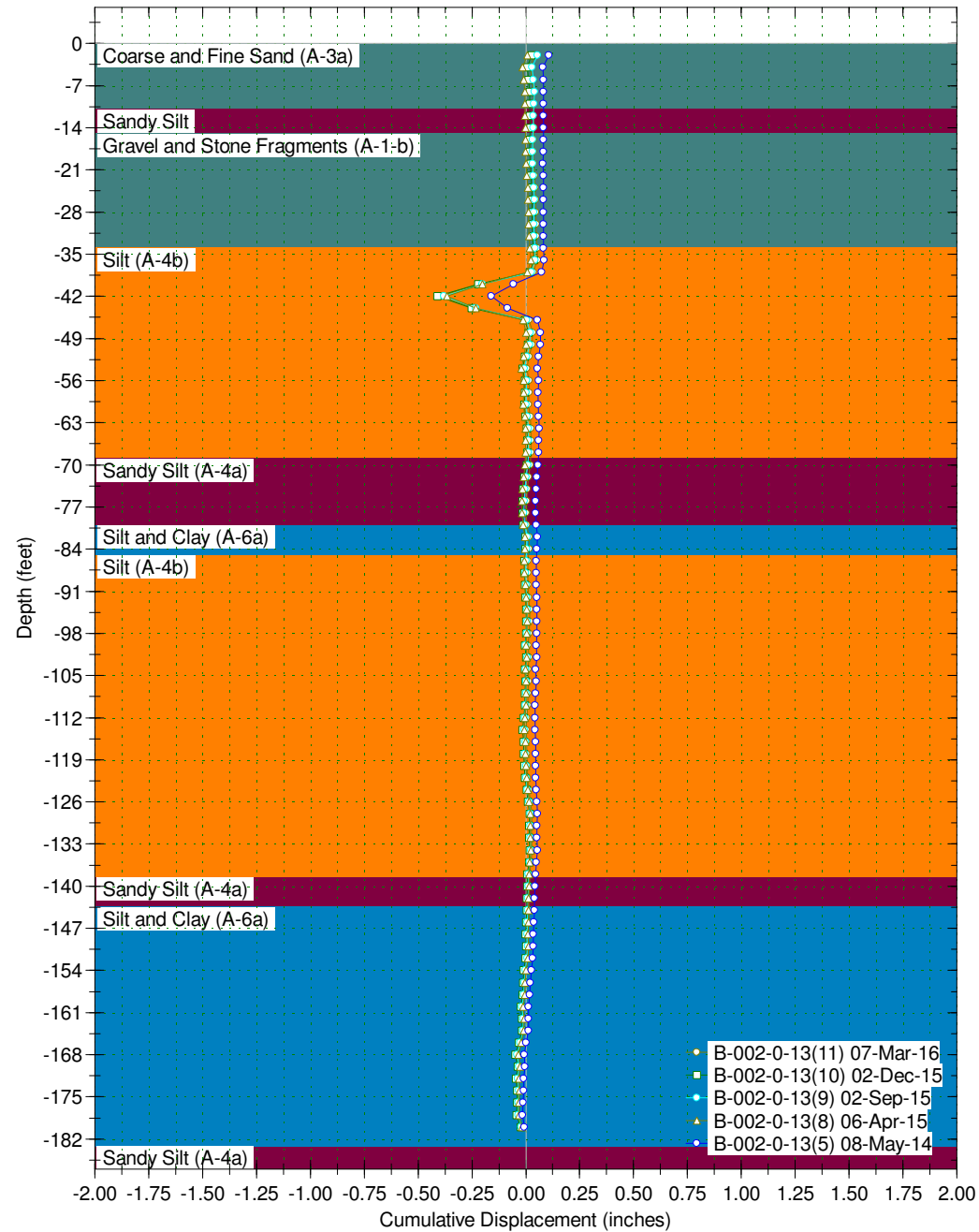
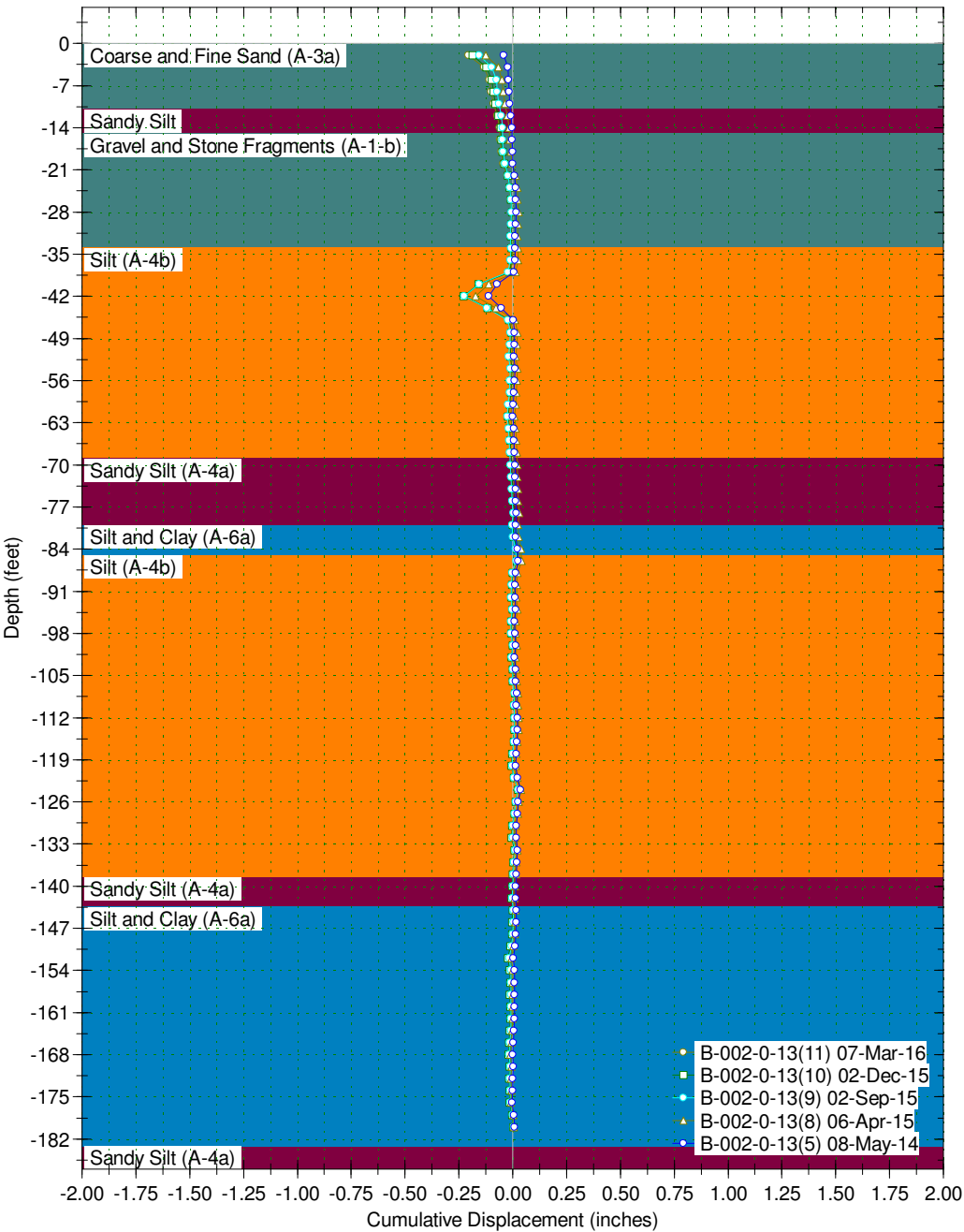


Borehole : B-002-0-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 180.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 21 14:51  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

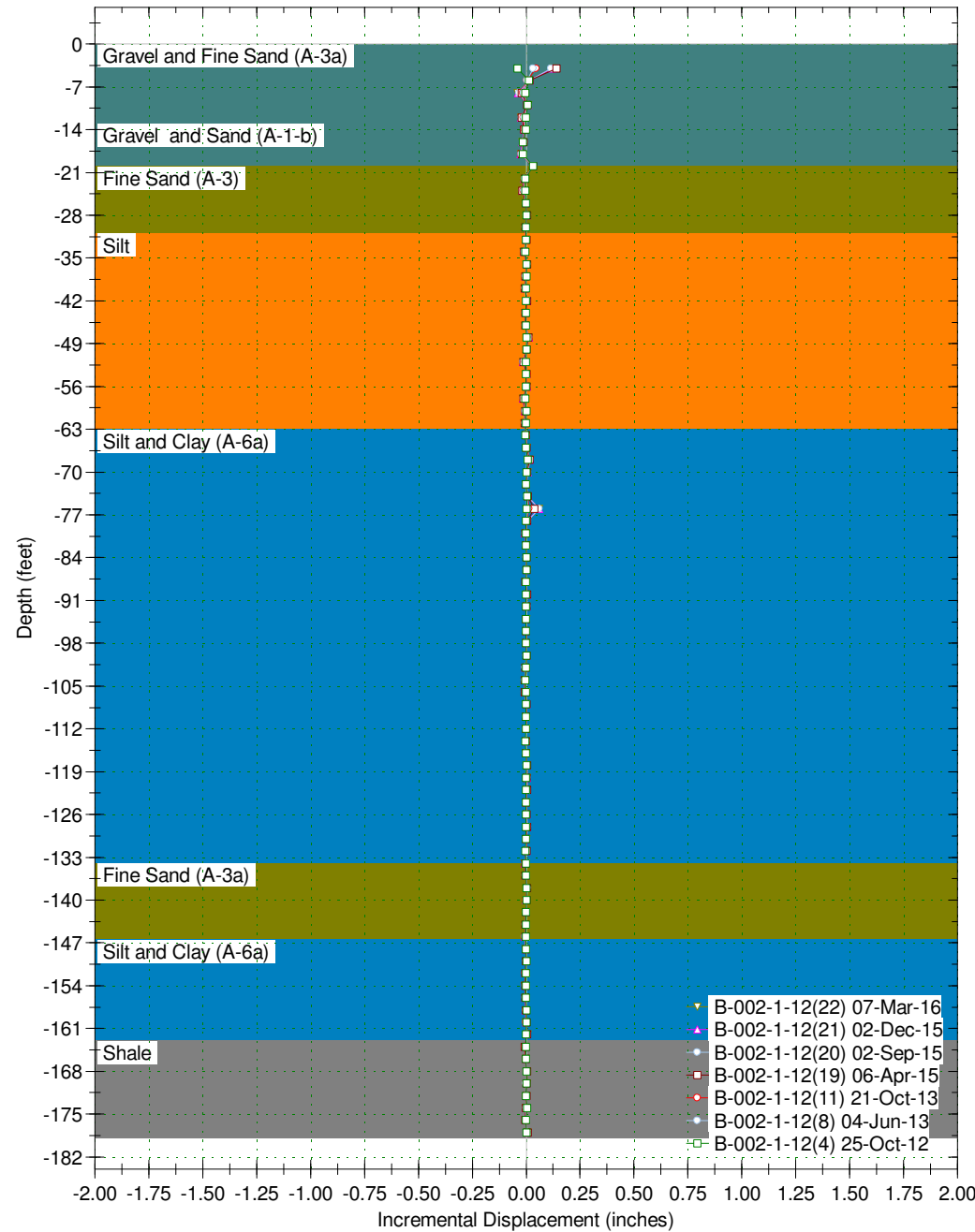
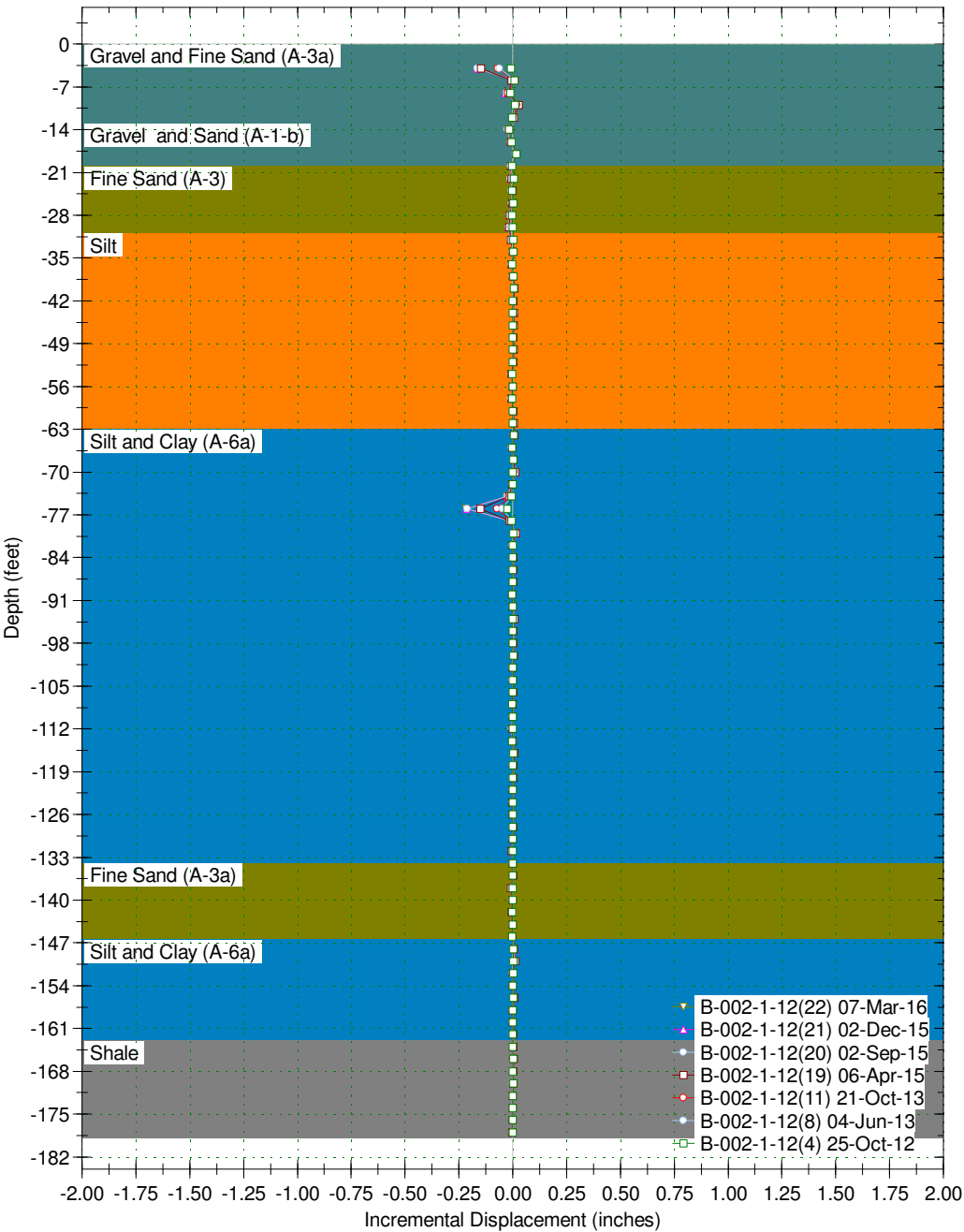


Borehole : B-002-1-12  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 178.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2012 Jun 25 10:24  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

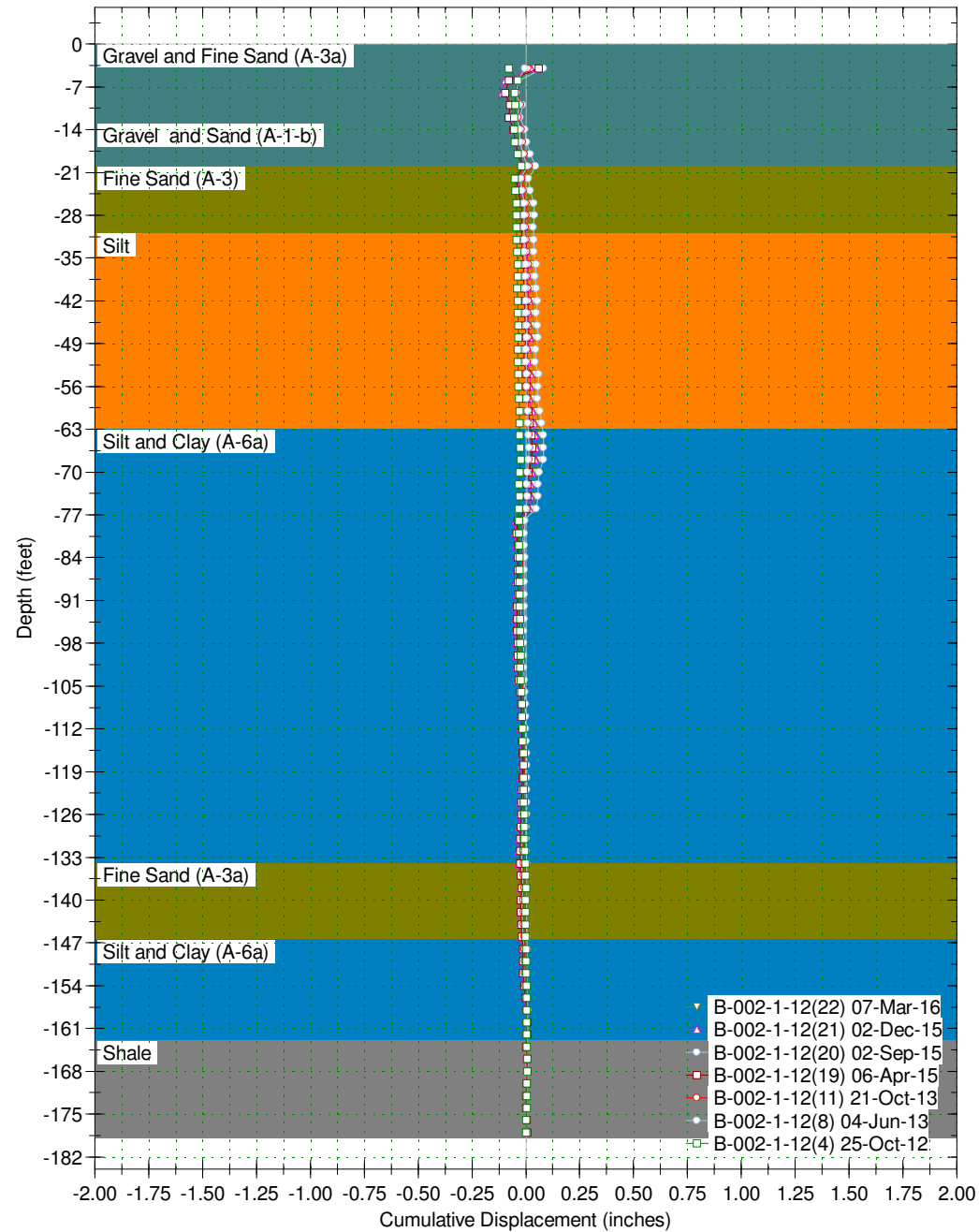
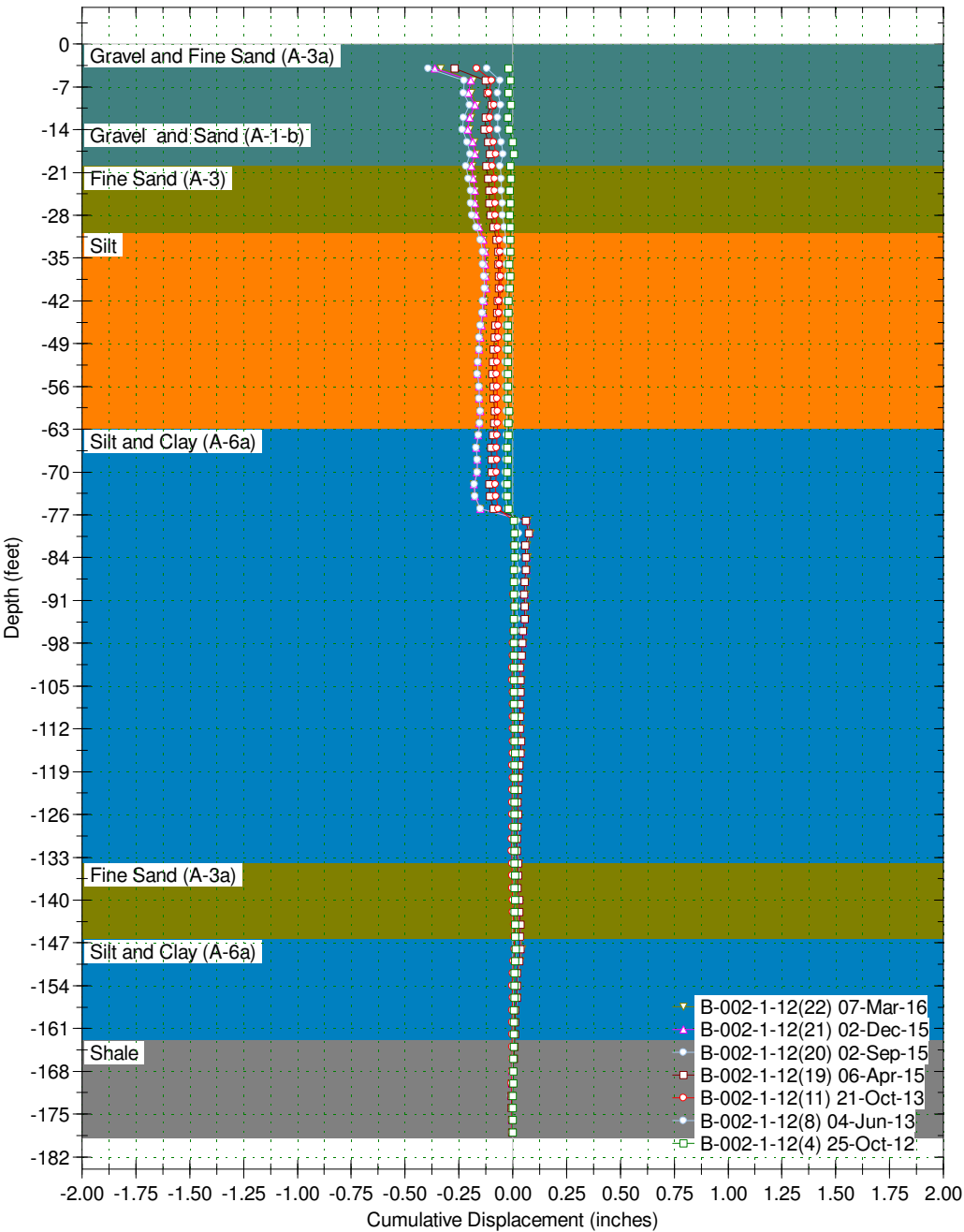


Borehole : B-002-1-12  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 178.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2012 Jun 25 10:24  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

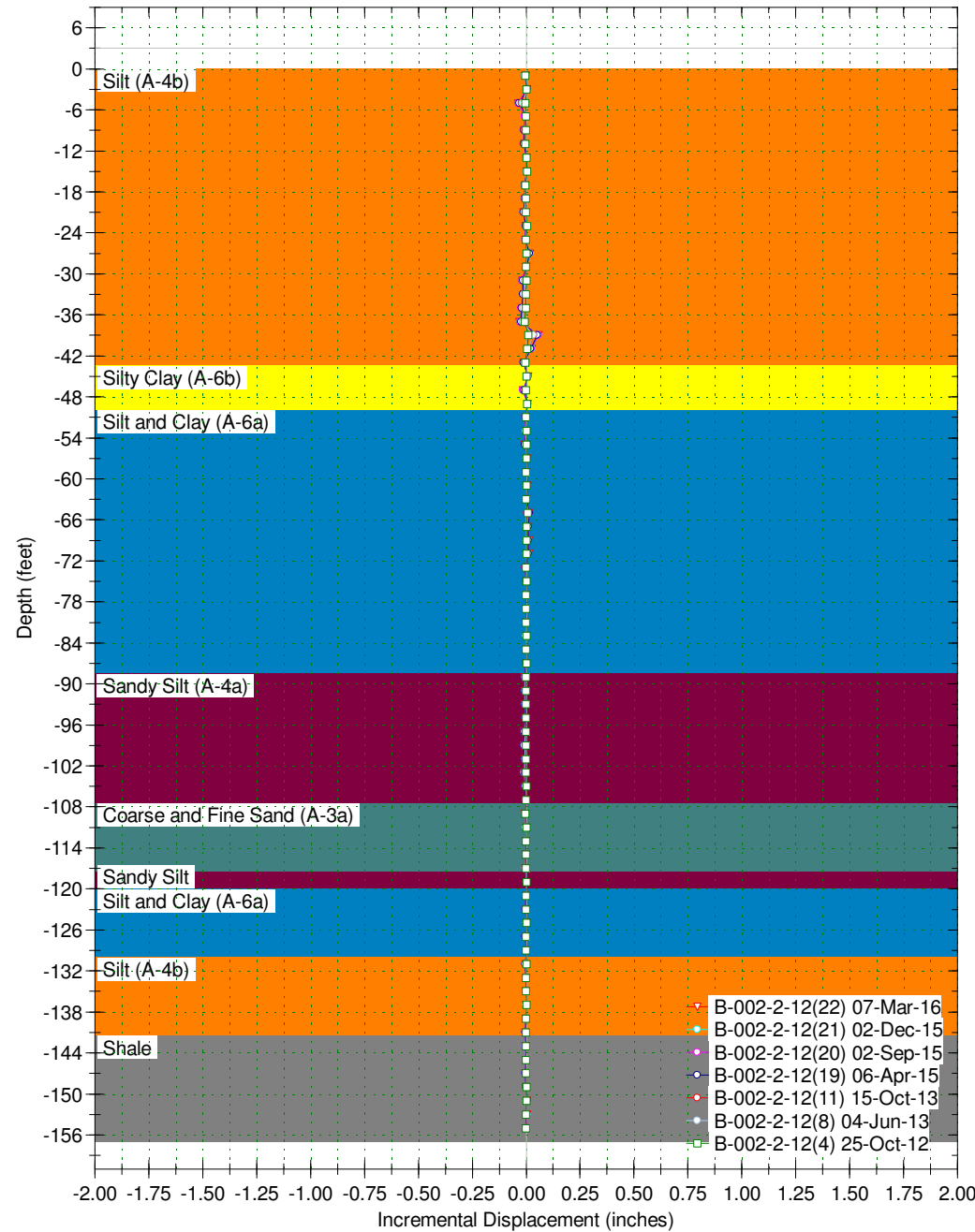
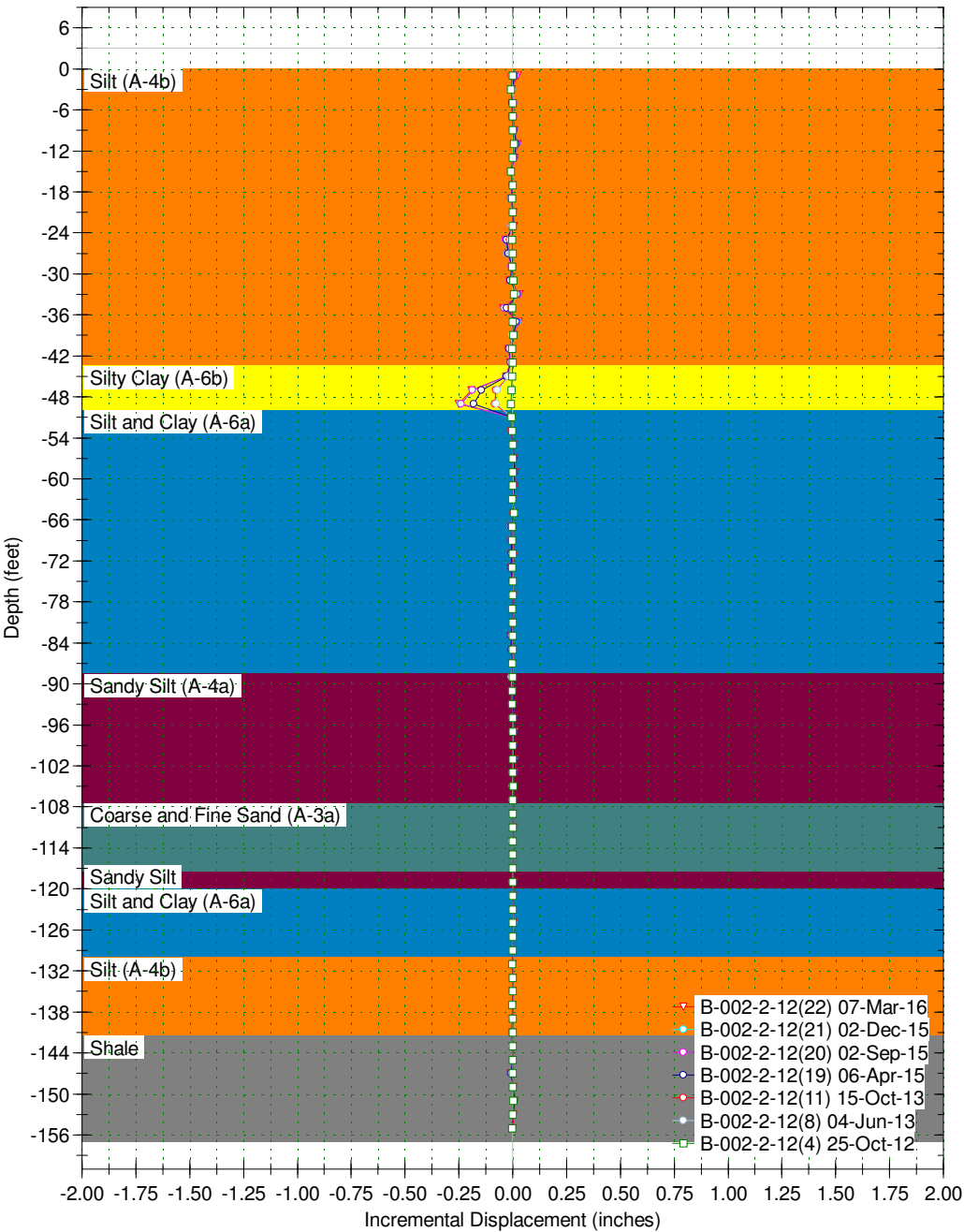


Borehole : B-002-2-12  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 3.0 feet  
 Borehole Total Depth : 158.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2012 Jun 25 10:59  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B



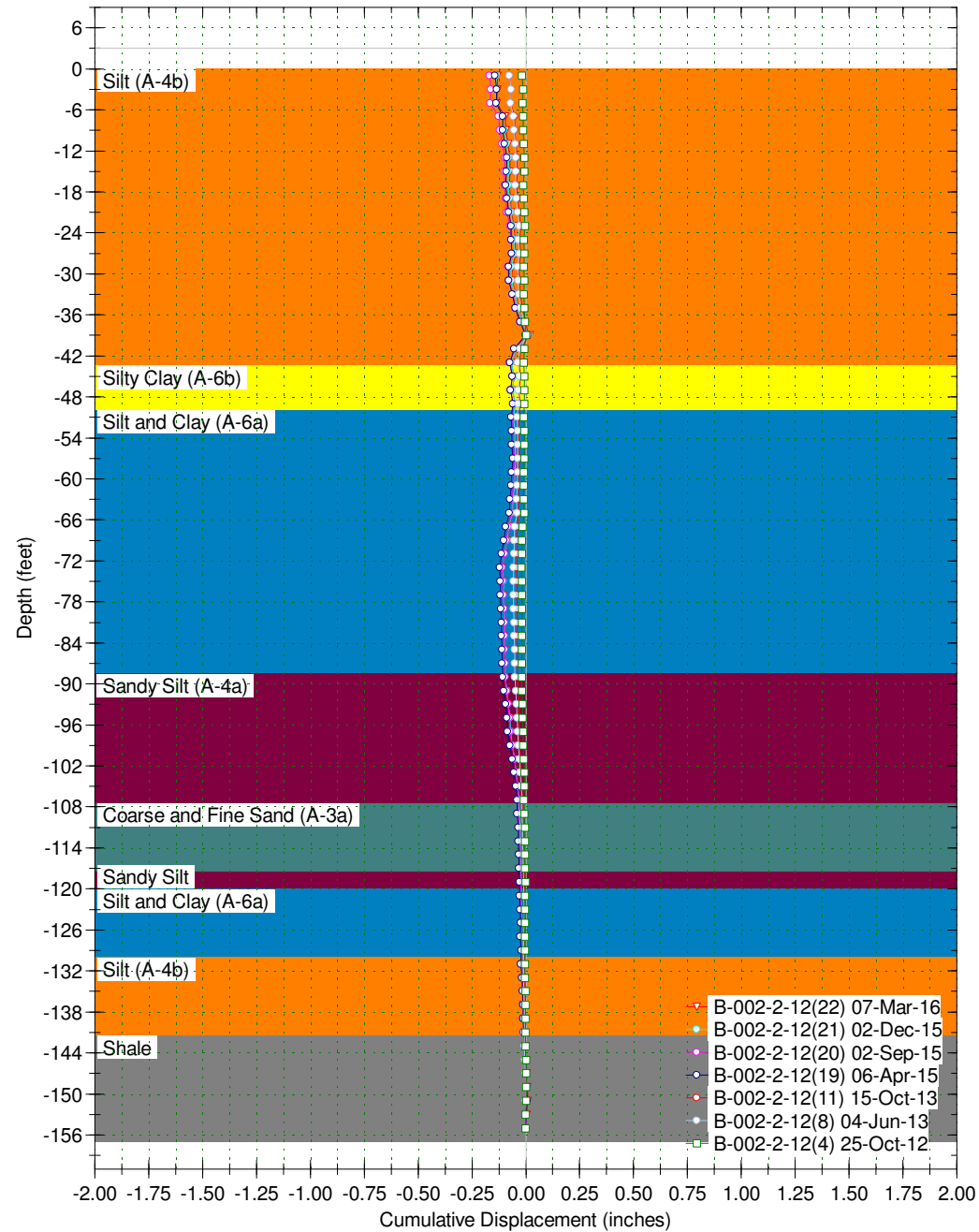
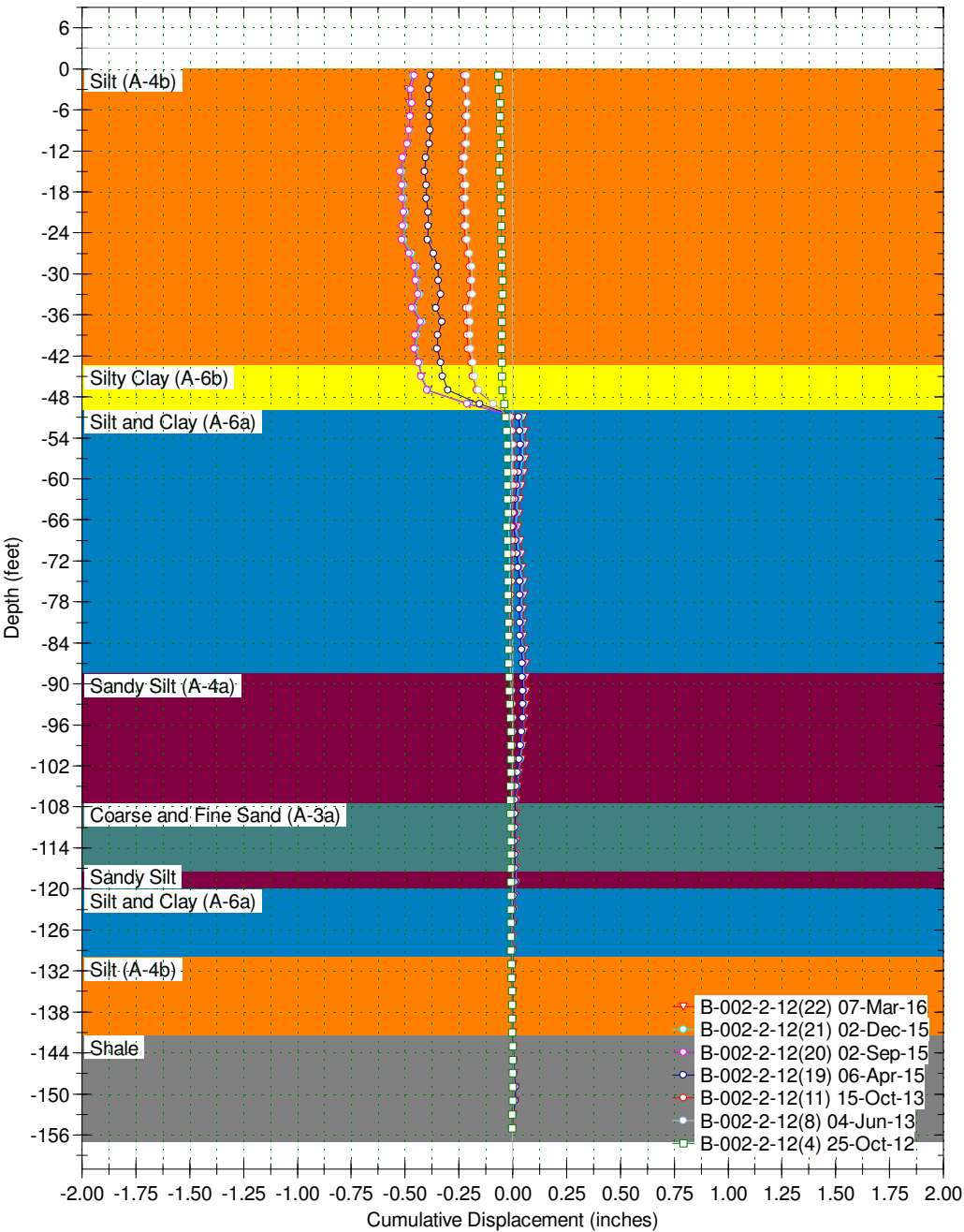


Borehole : B-002-2-12  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 3.0 feet  
 Borehole Total Depth : 158.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2012 Jun 25 10:59  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

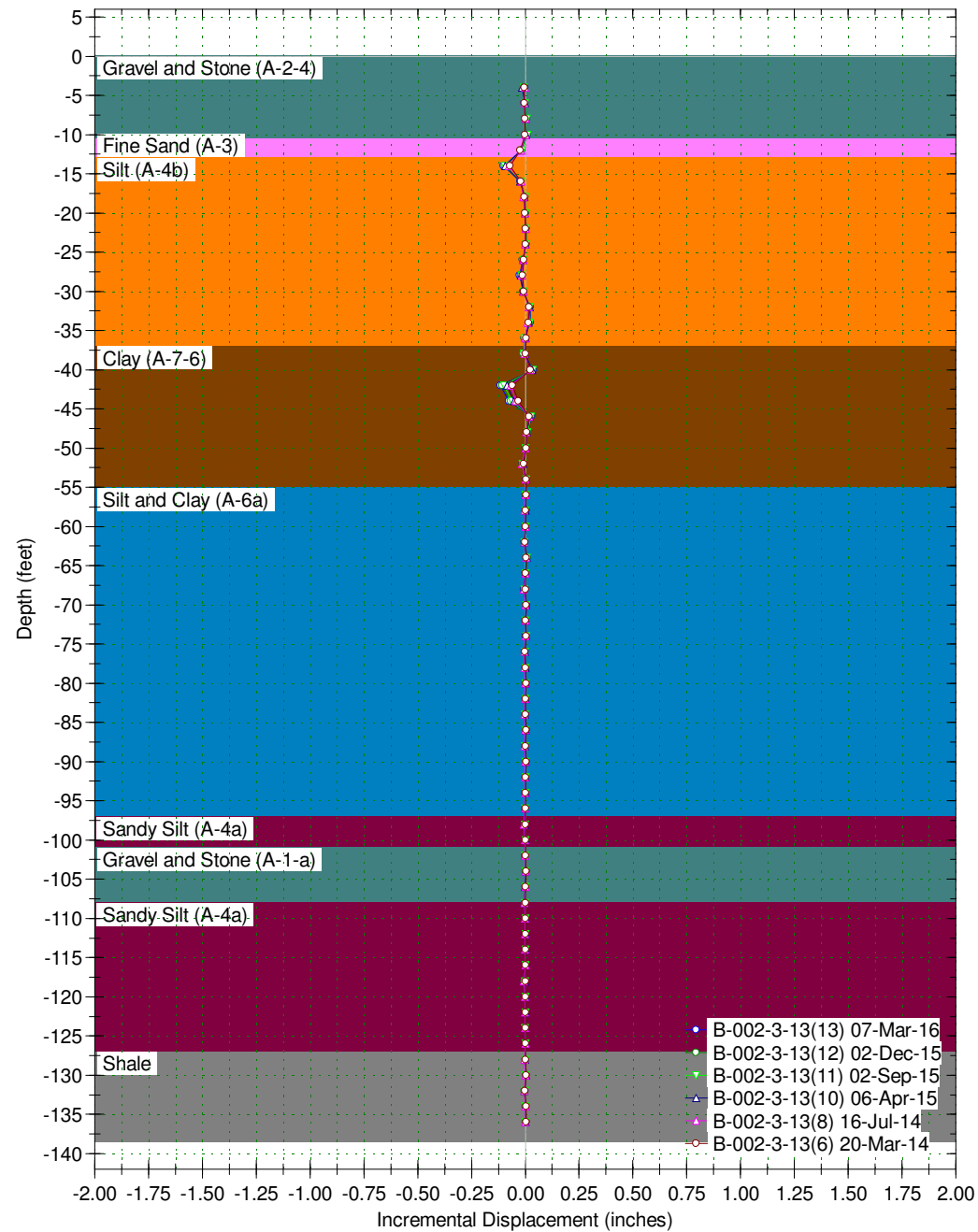
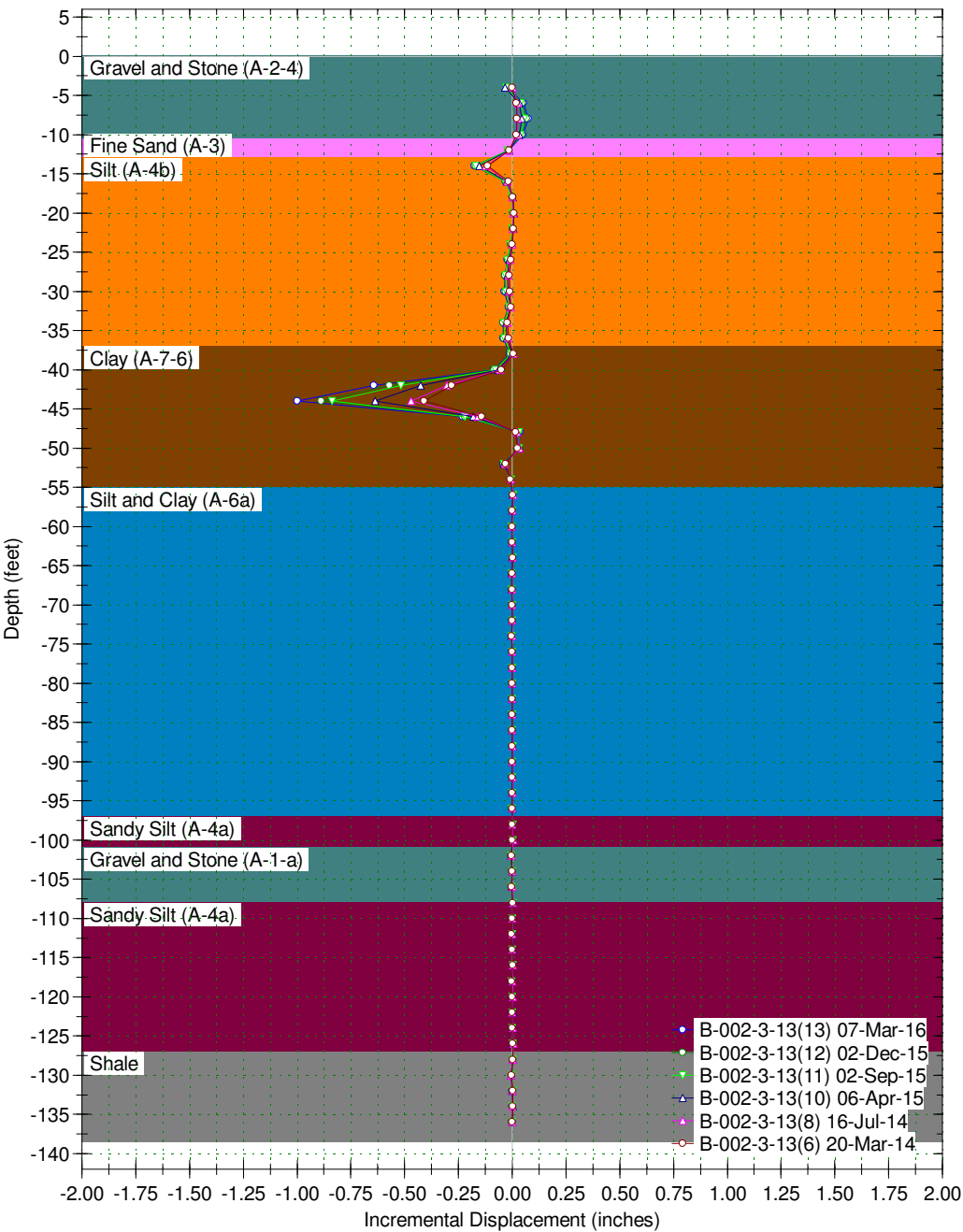


Borehole : B-002-3-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 136.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 15 14:34  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B



- B-002-3-13(13) 07-Mar-16
- B-002-3-13(12) 02-Dec-15
- B-002-3-13(11) 02-Sep-15
- B-002-3-13(10) 06-Apr-15
- B-002-3-13(8) 16-Jul-14
- B-002-3-13(6) 20-Mar-14

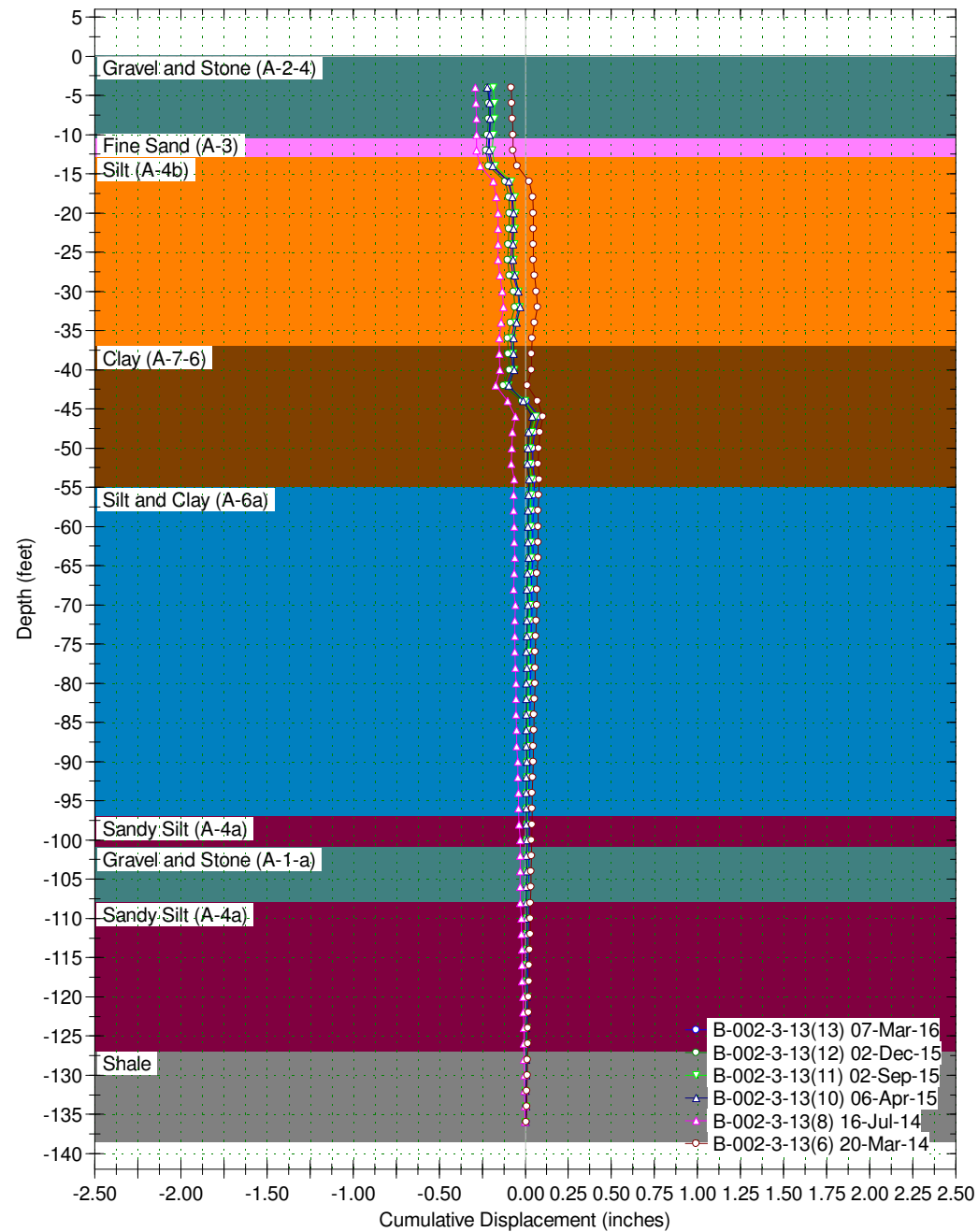
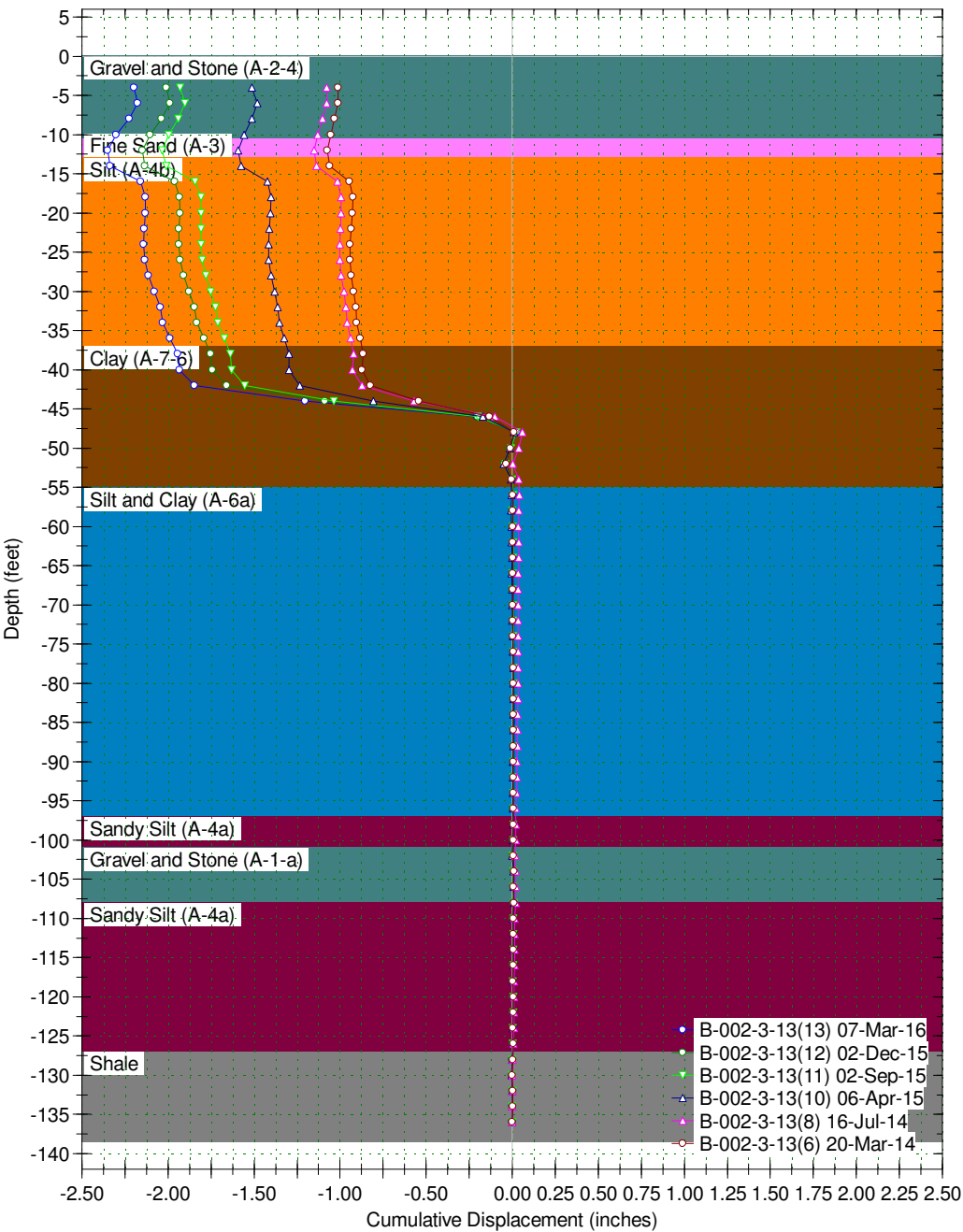
- B-002-3-13(13) 07-Mar-16
- B-002-3-13(12) 02-Dec-15
- B-002-3-13(11) 02-Sep-15
- B-002-3-13(10) 06-Apr-15
- B-002-3-13(8) 16-Jul-14
- B-002-3-13(6) 20-Mar-14

Borehole : B-002-3-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 136.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 15 14:34  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

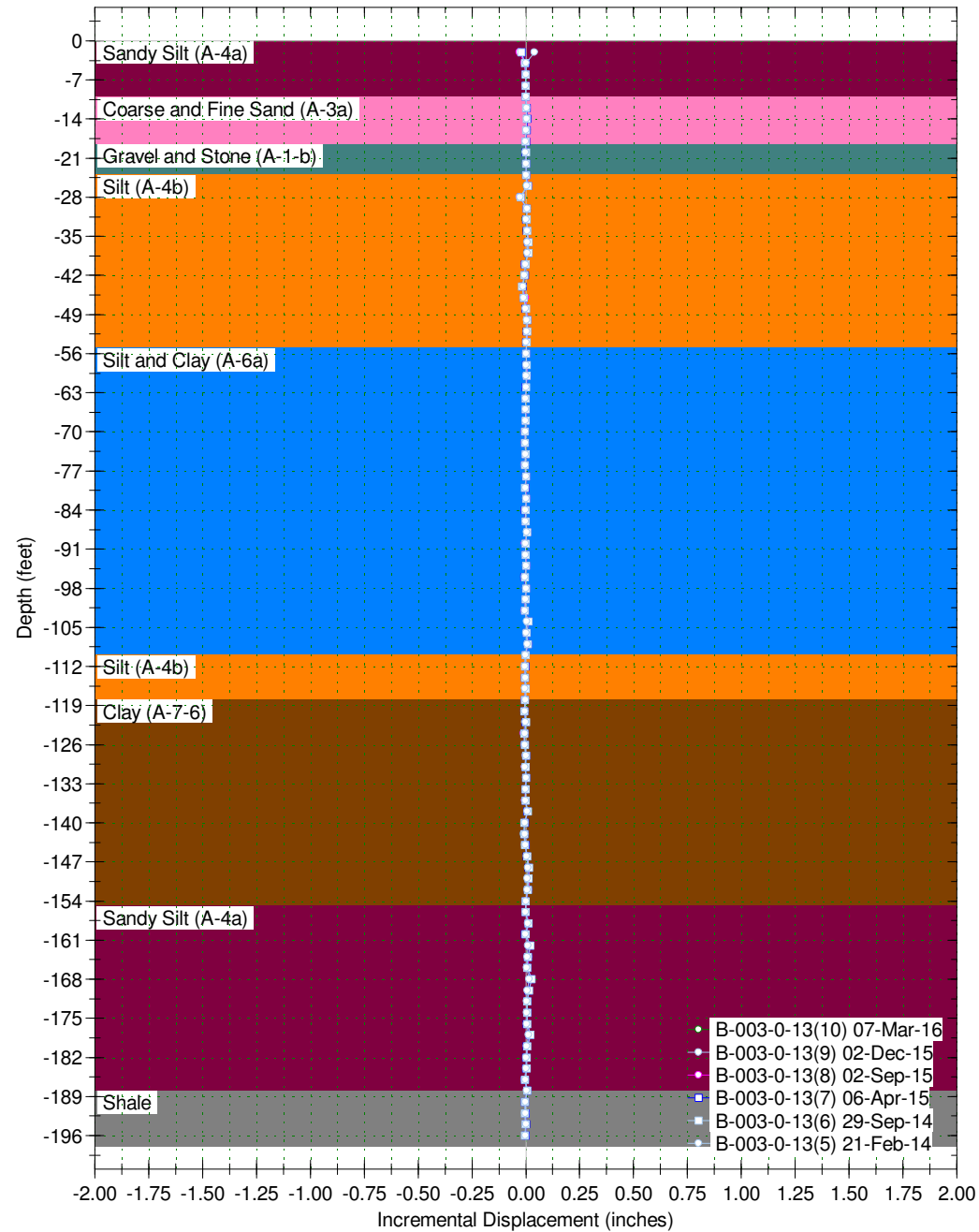
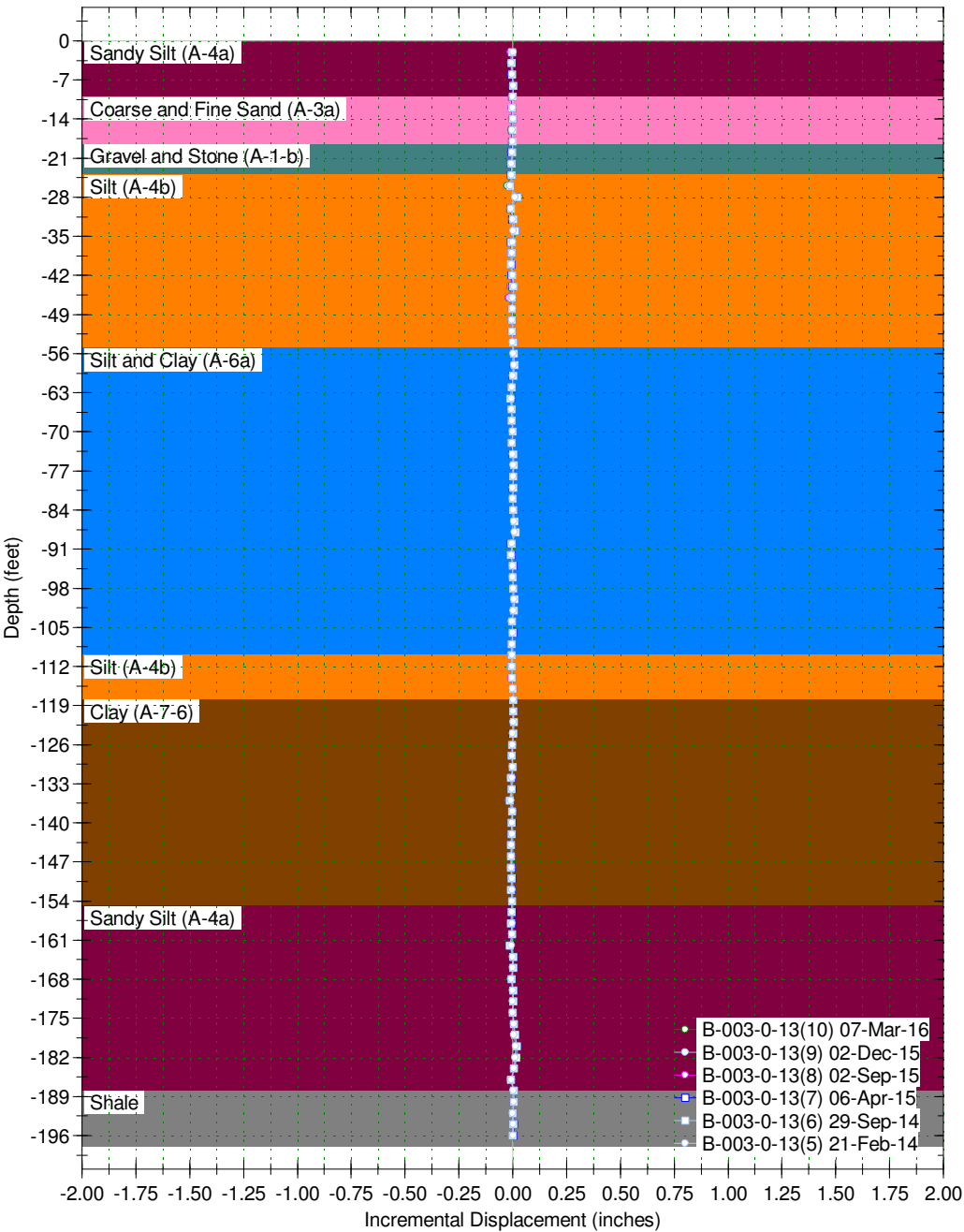


Borehole : B-003-0-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 196.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 21 14:25  
 Applied Azimuth : 0.0 degrees

Axis - A

Axis - B

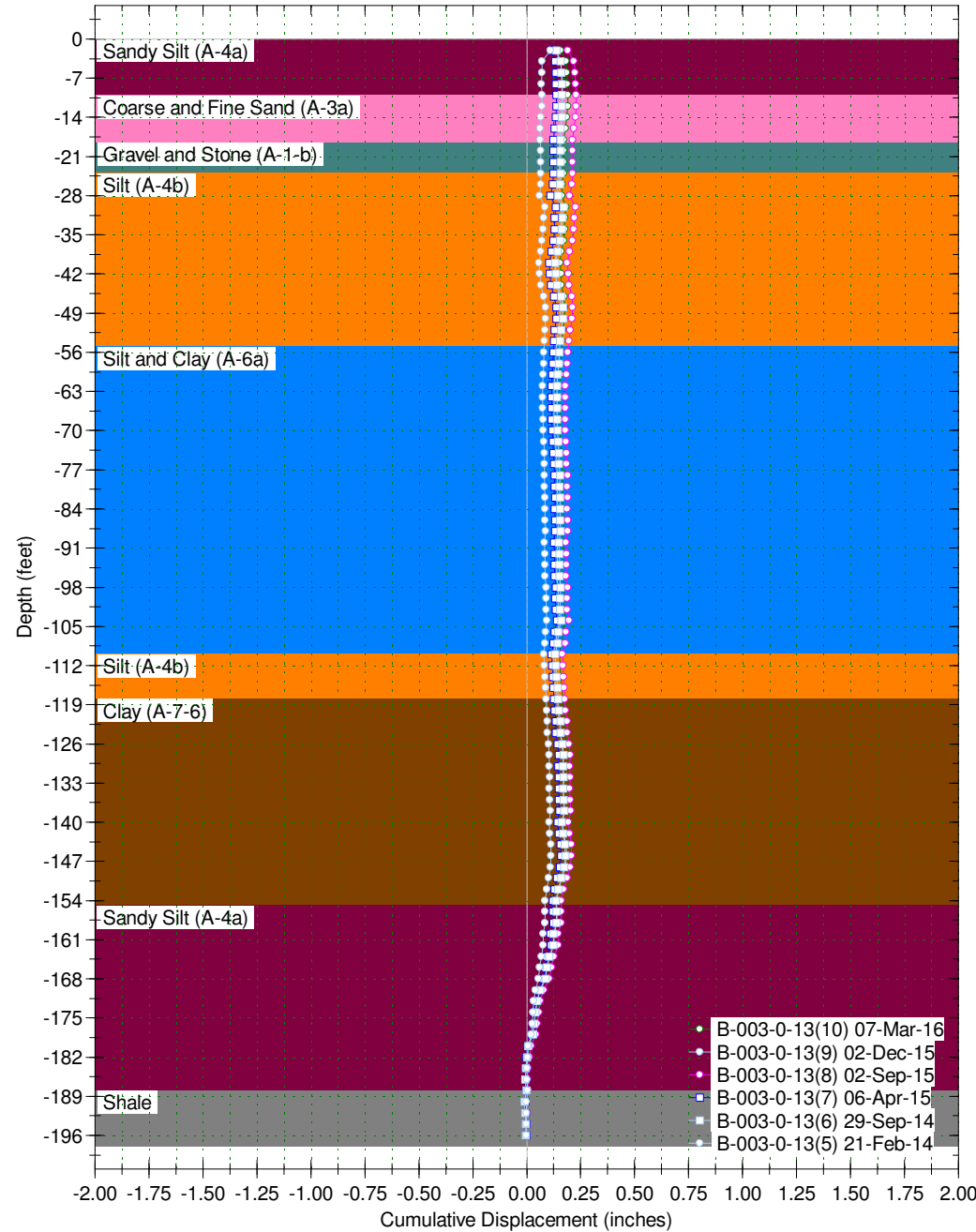
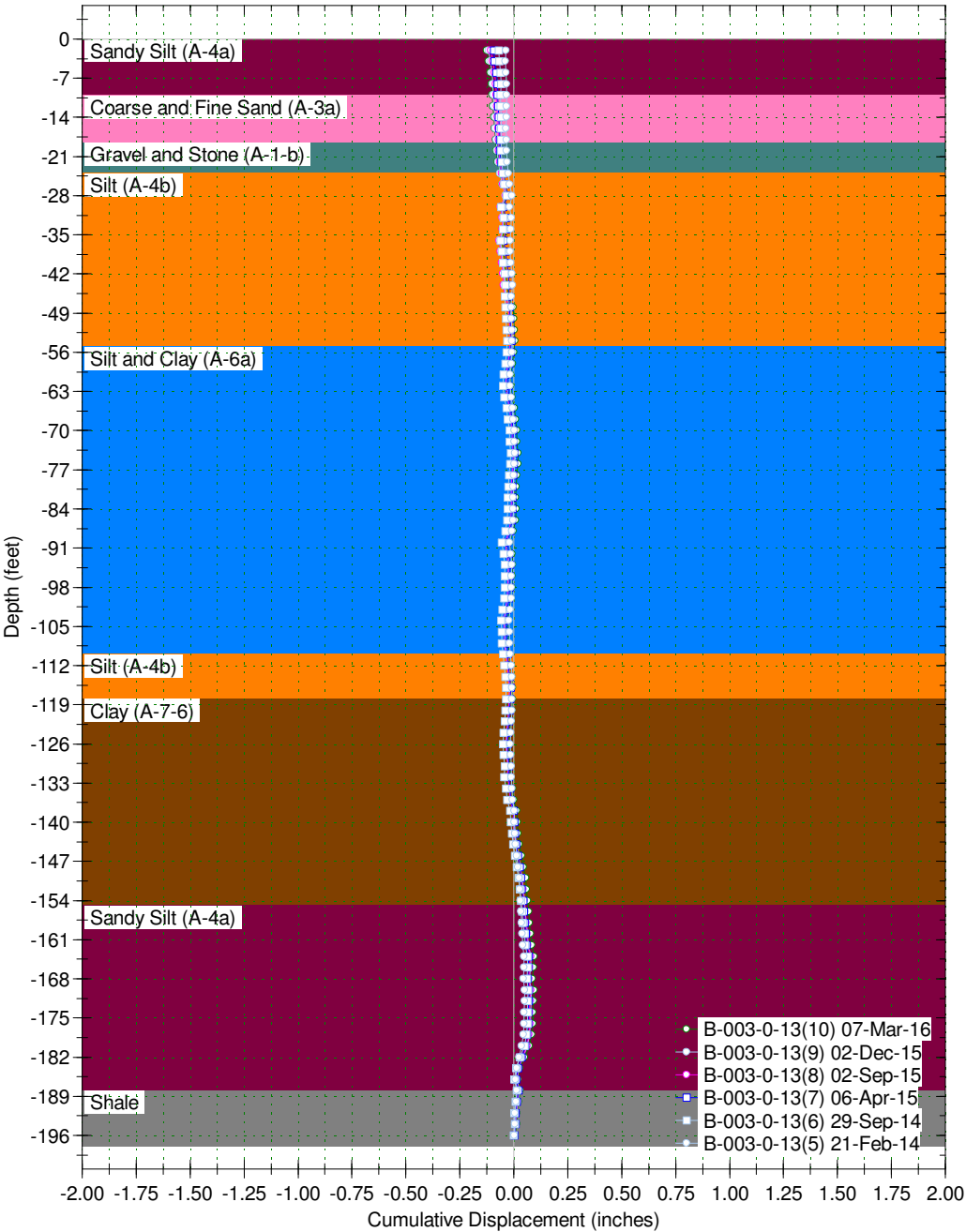


Borehole : B-003-0-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 196.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 21 14:25  
 Applied Azimuth : 0.0 degrees

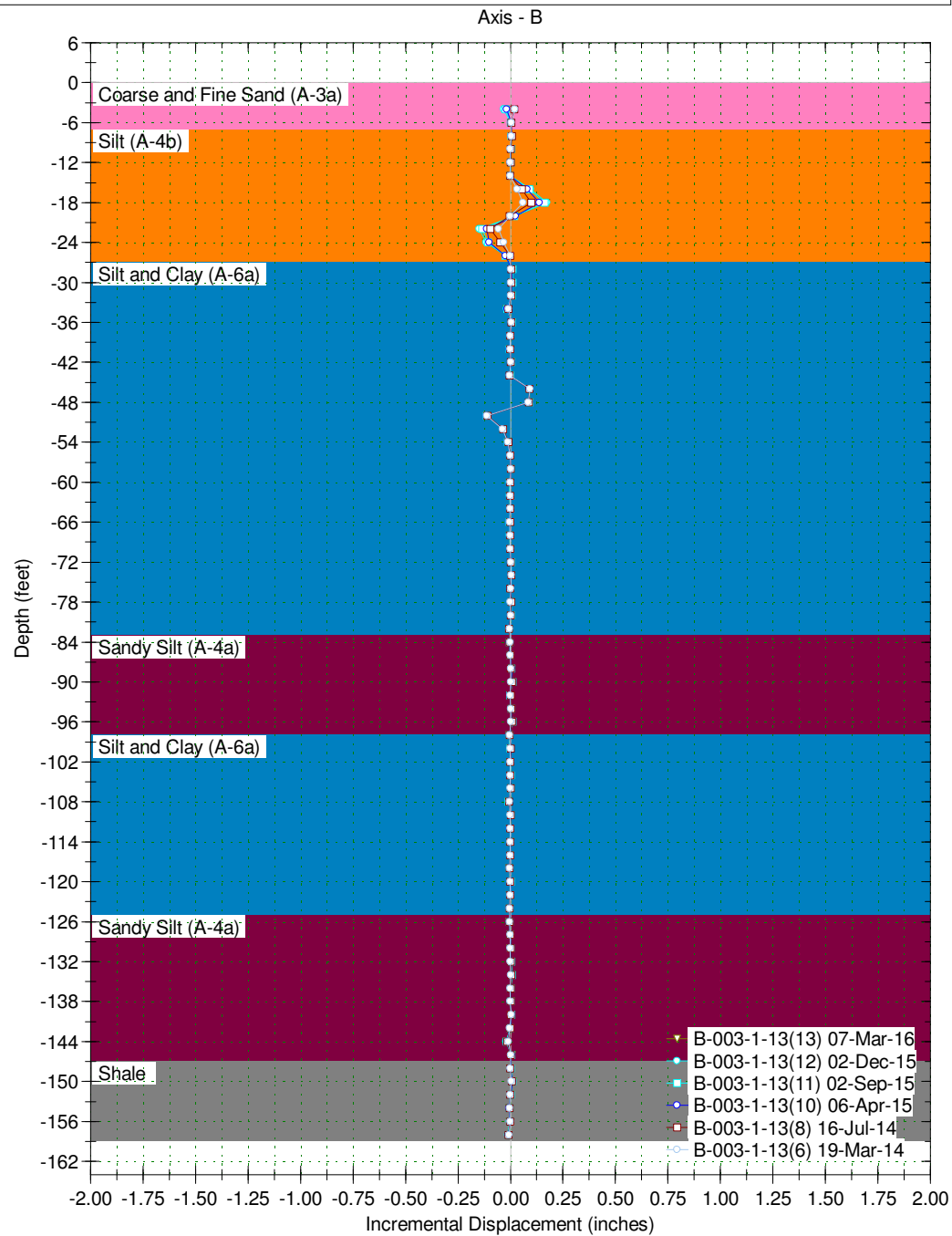
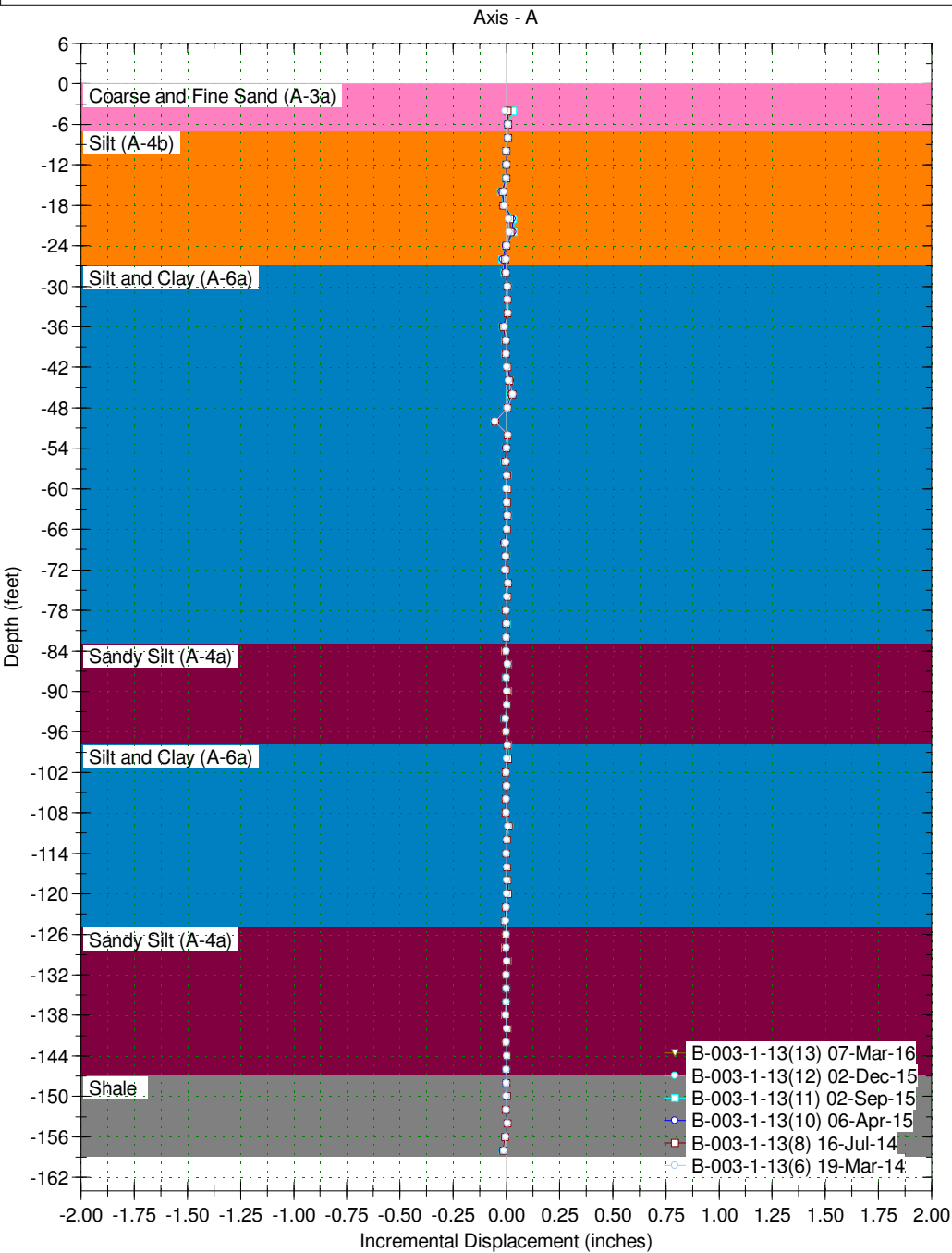
Axis - A

Axis - B



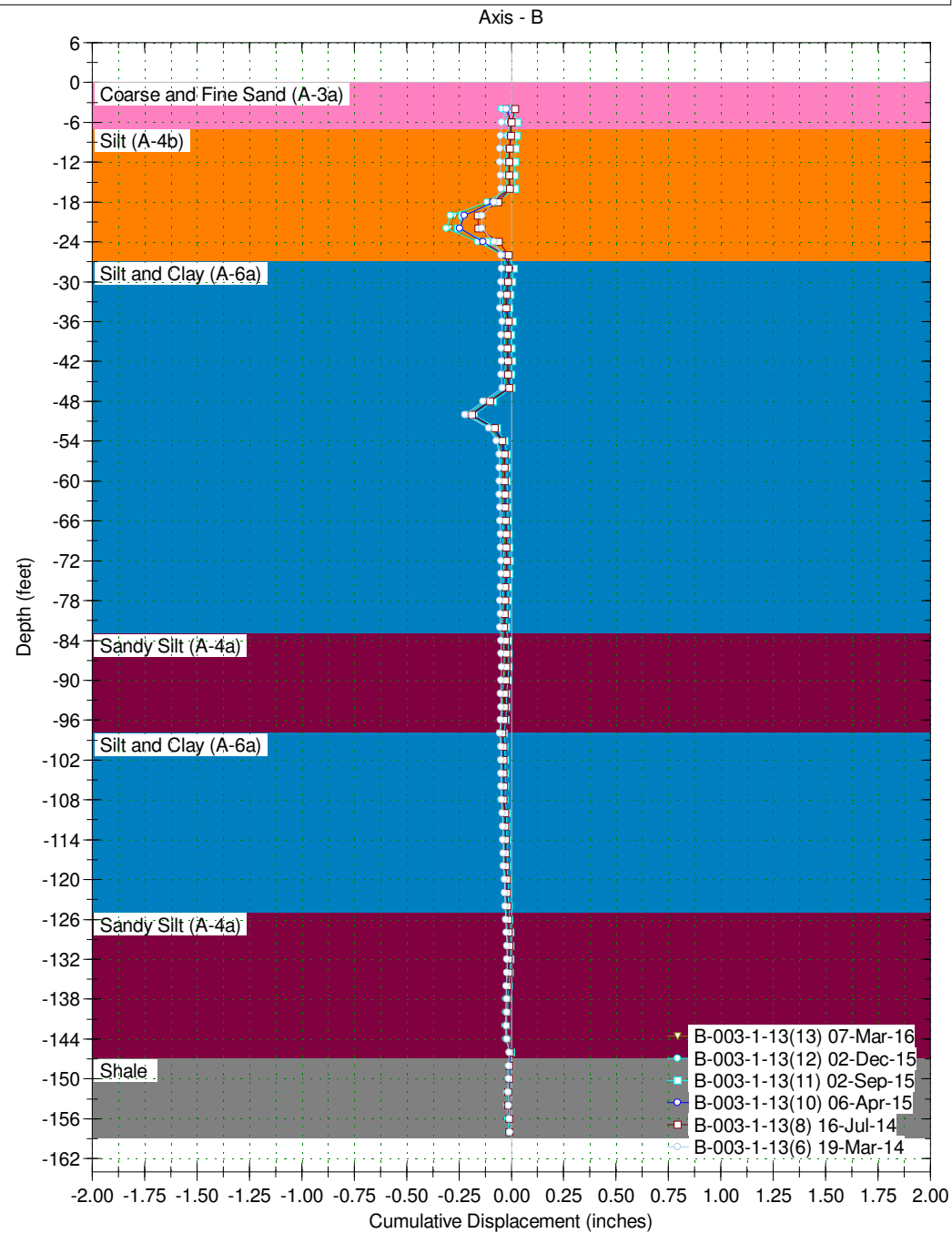
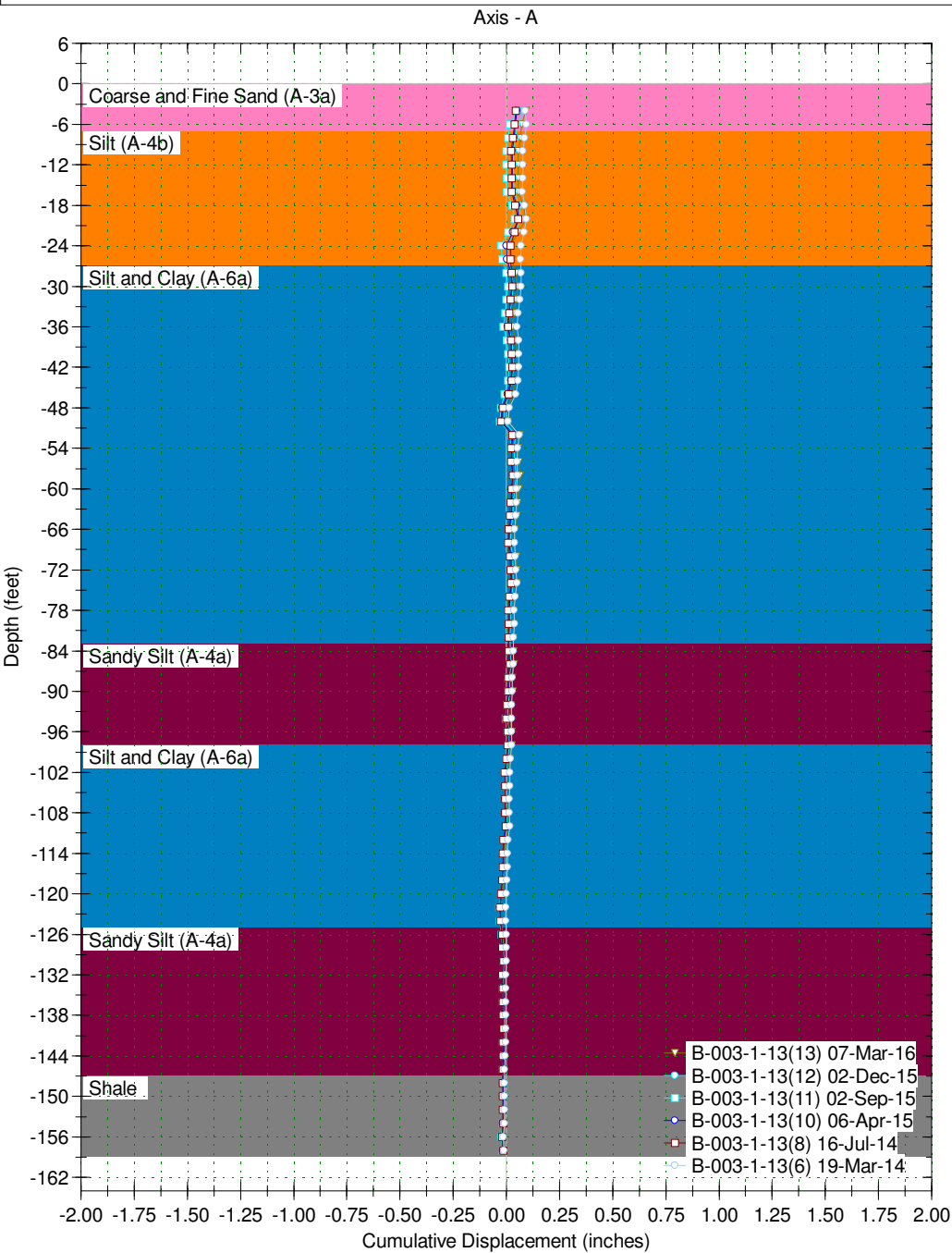
Borehole : B-003-1-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 158.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 15 15:21  
 Applied Azimuth : 0.0 degrees



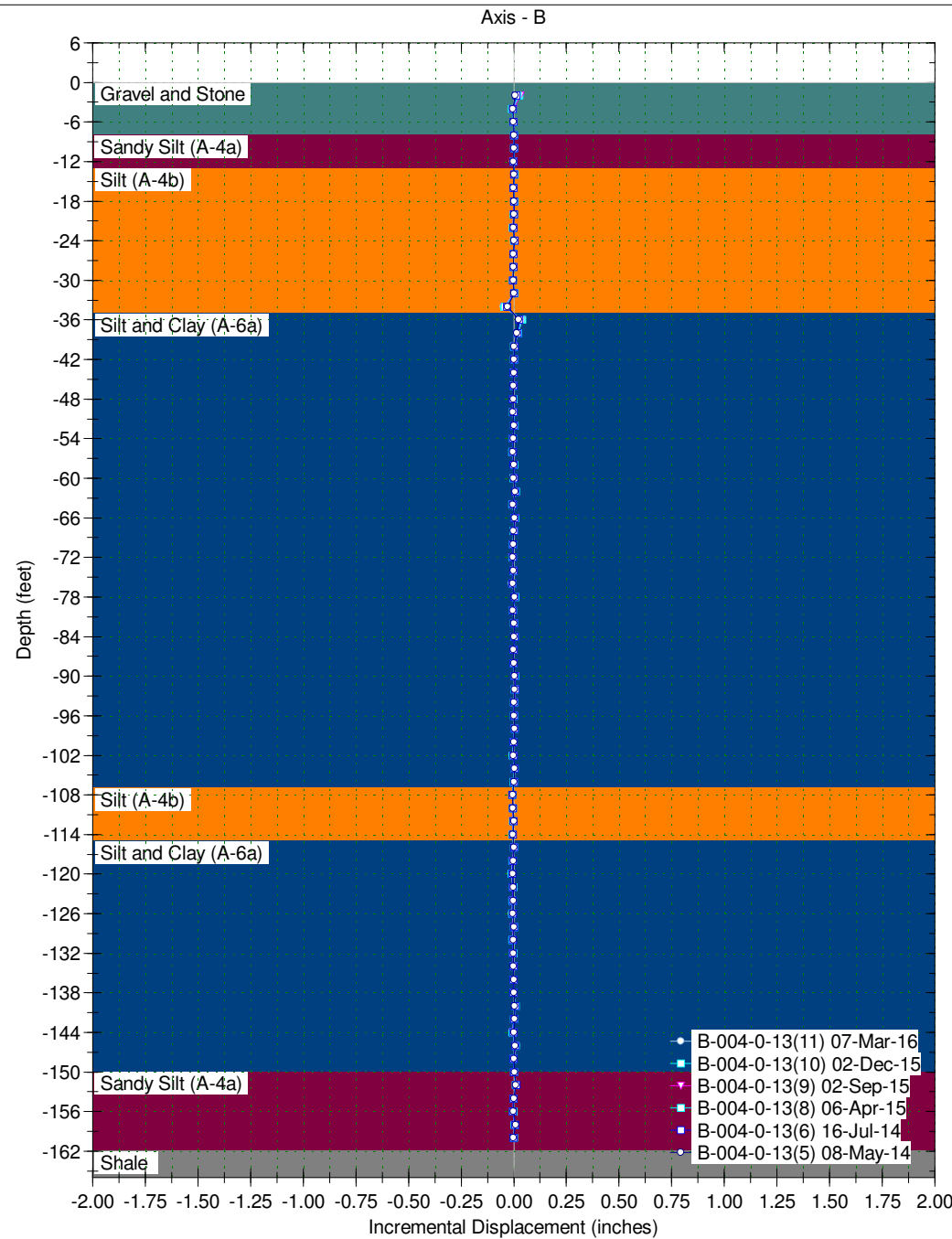
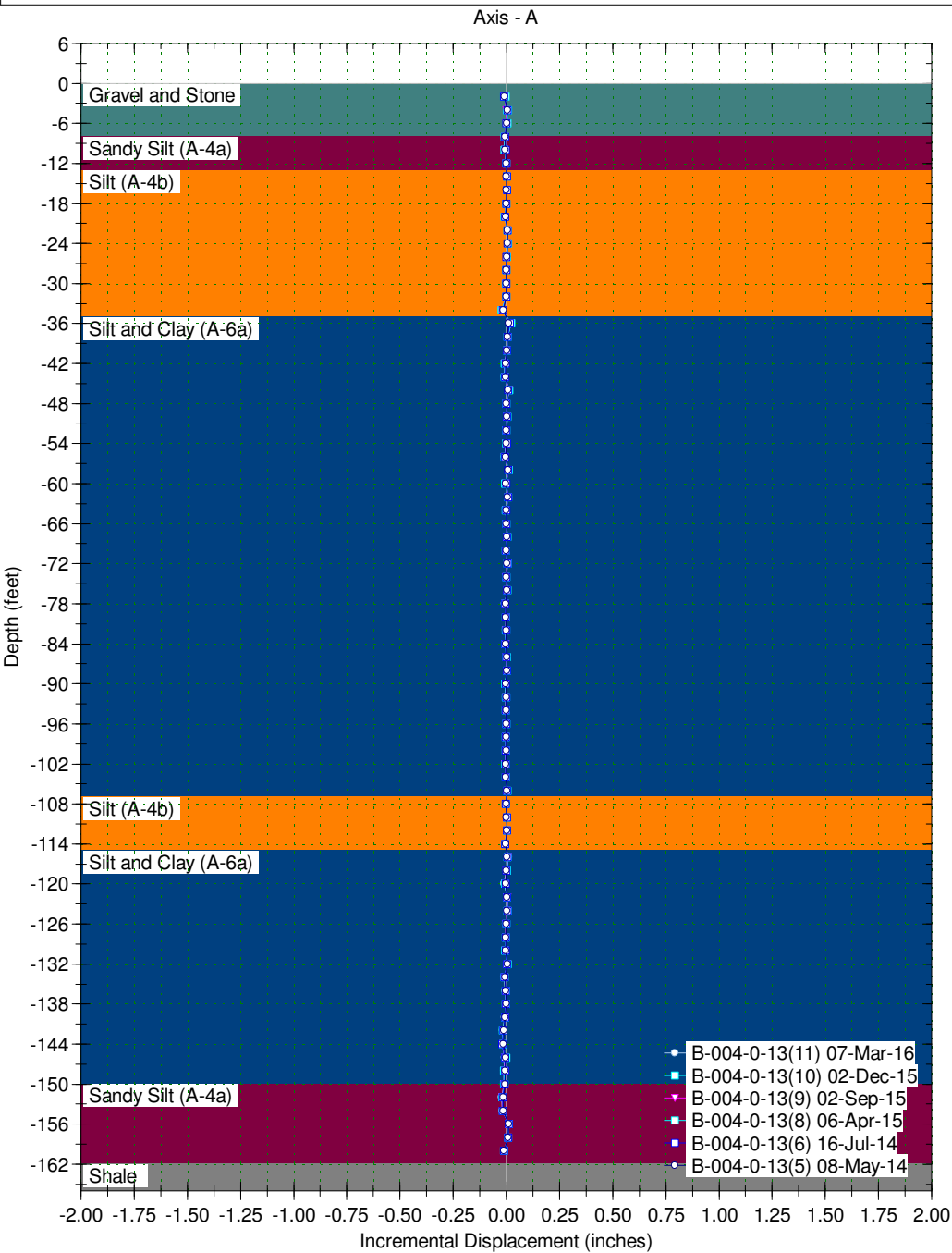
Borehole : B-003-1-13  
Project : Detroit Superior Bridge  
Location :  
Northing :  
Easting :  
Collar :

Spiral Correction : N/A  
Collar Elevation : 0.0 feet  
Borehole Total Depth : 158.0 feet  
A+ Groove Azimuth :  
Base Reading : 2013 Oct 15 15:21  
Applied Azimuth : 0.0 degrees



Borehole : B-004-0-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

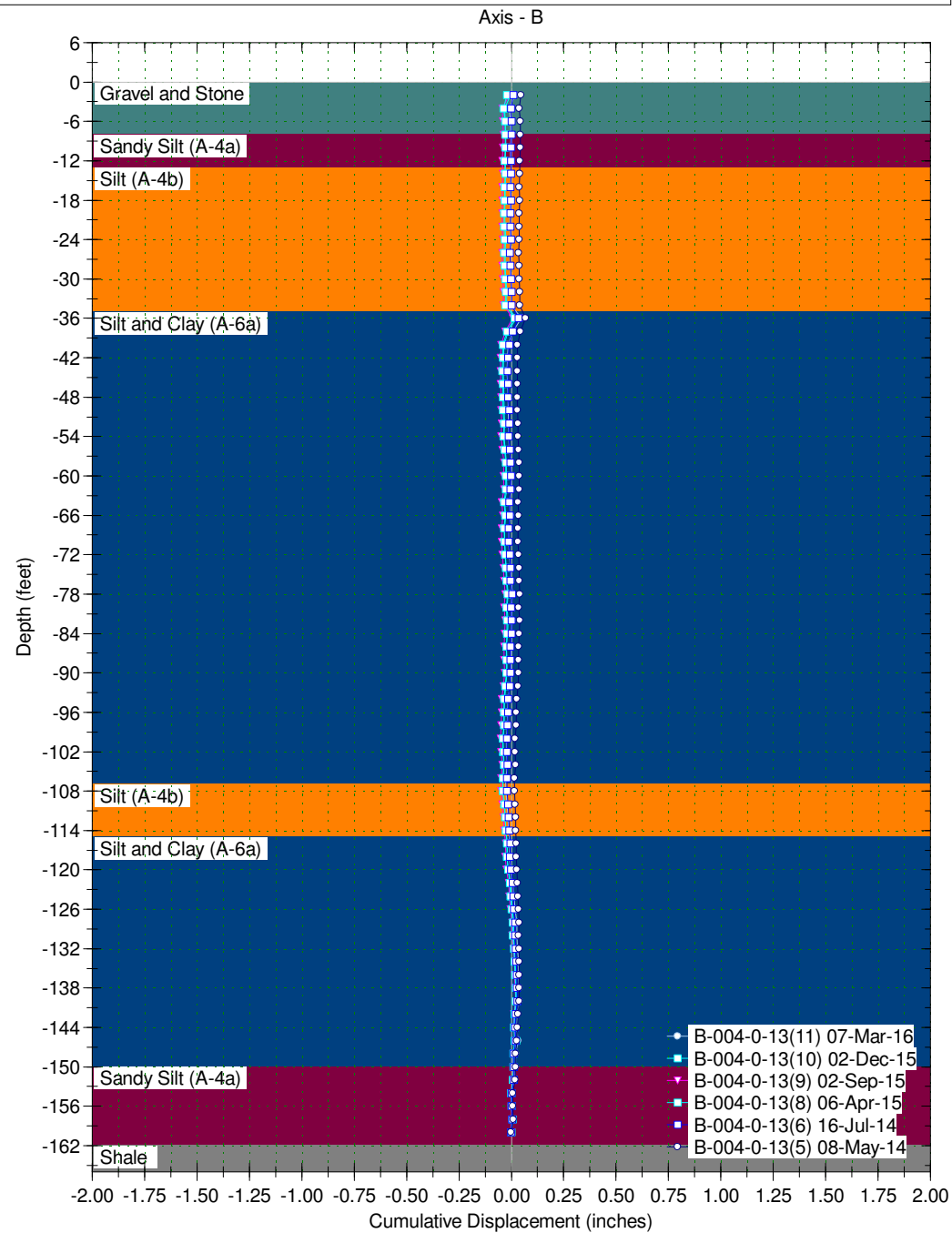
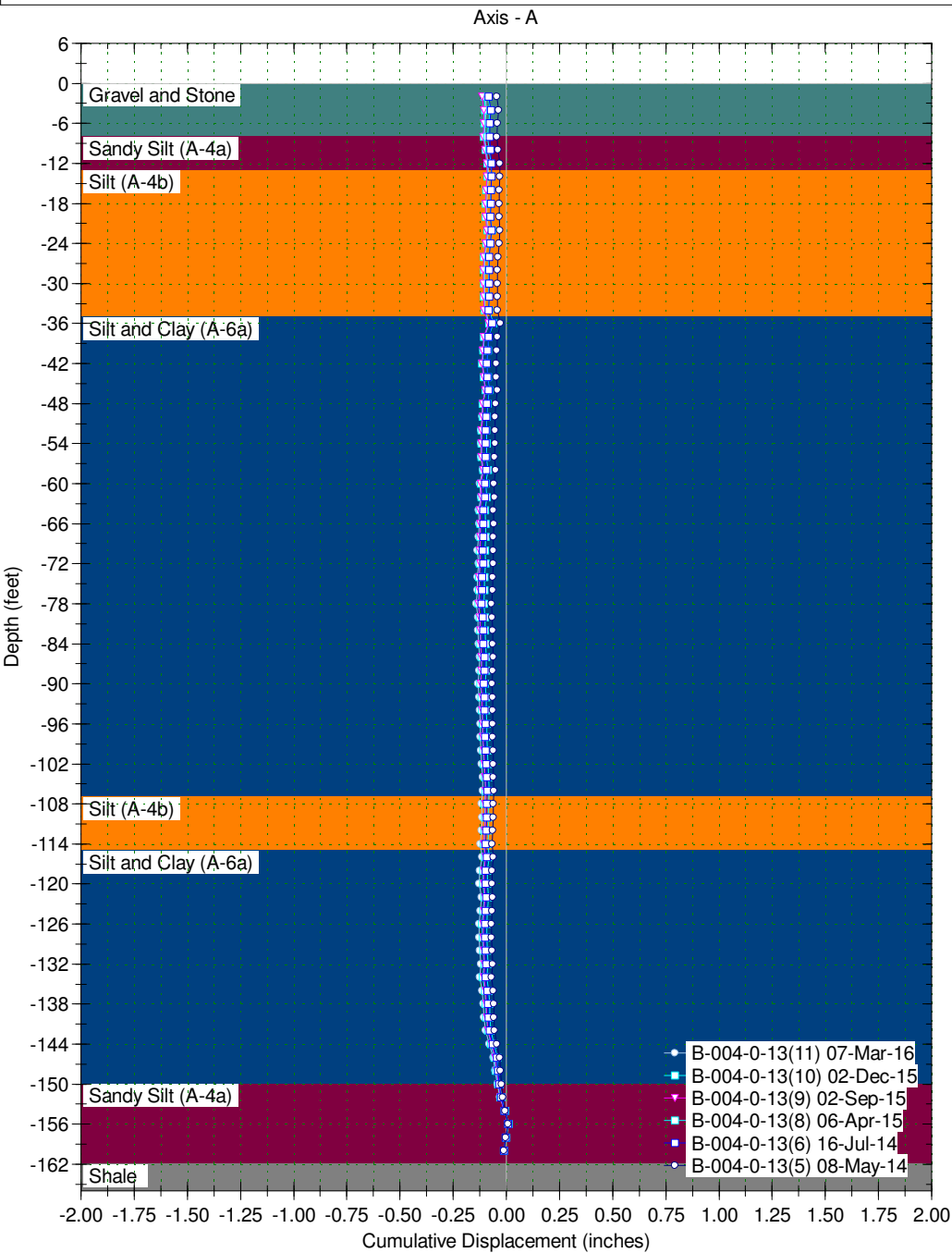
Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 160.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 15 16:29  
 Applied Azimuth : 0.0 degrees





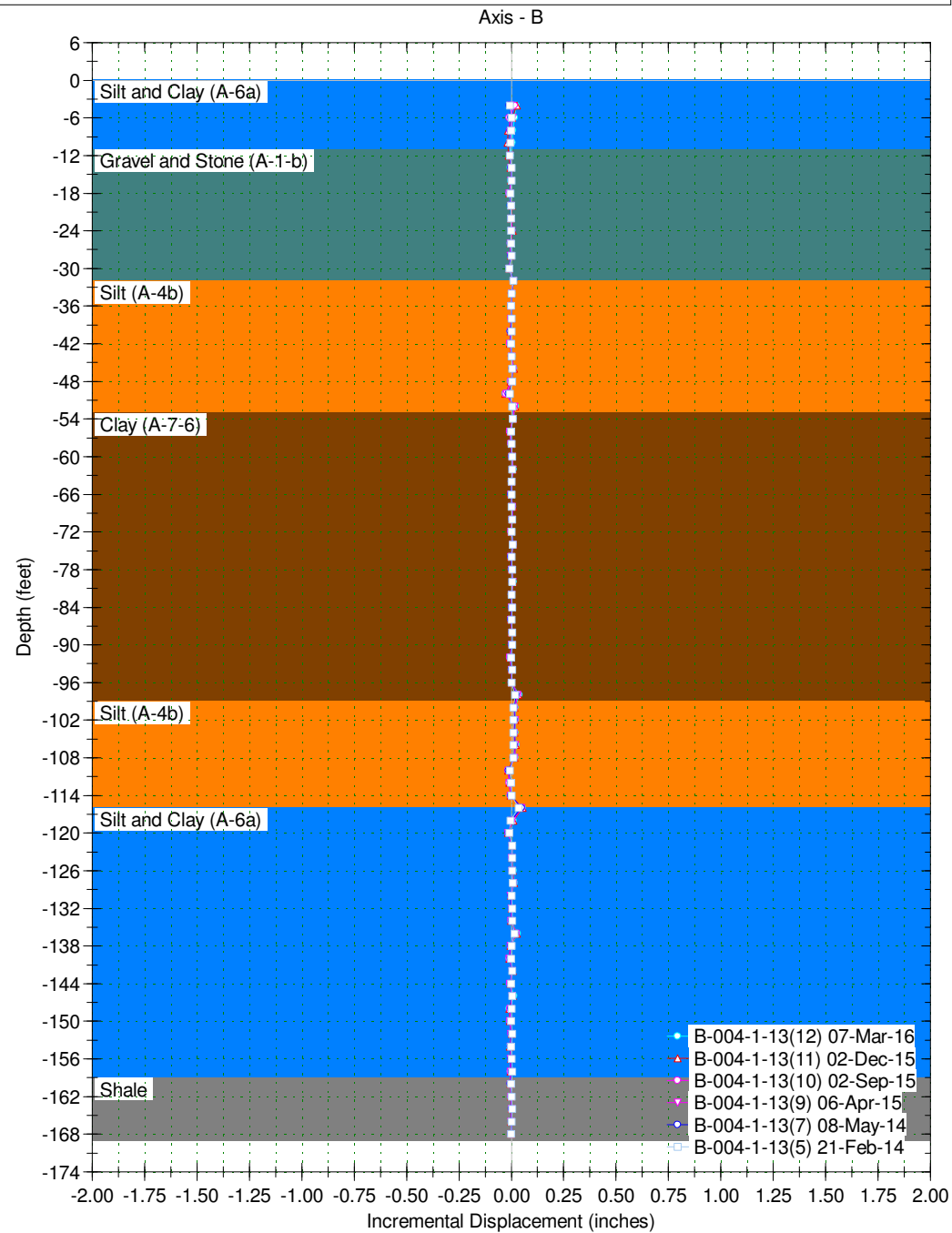
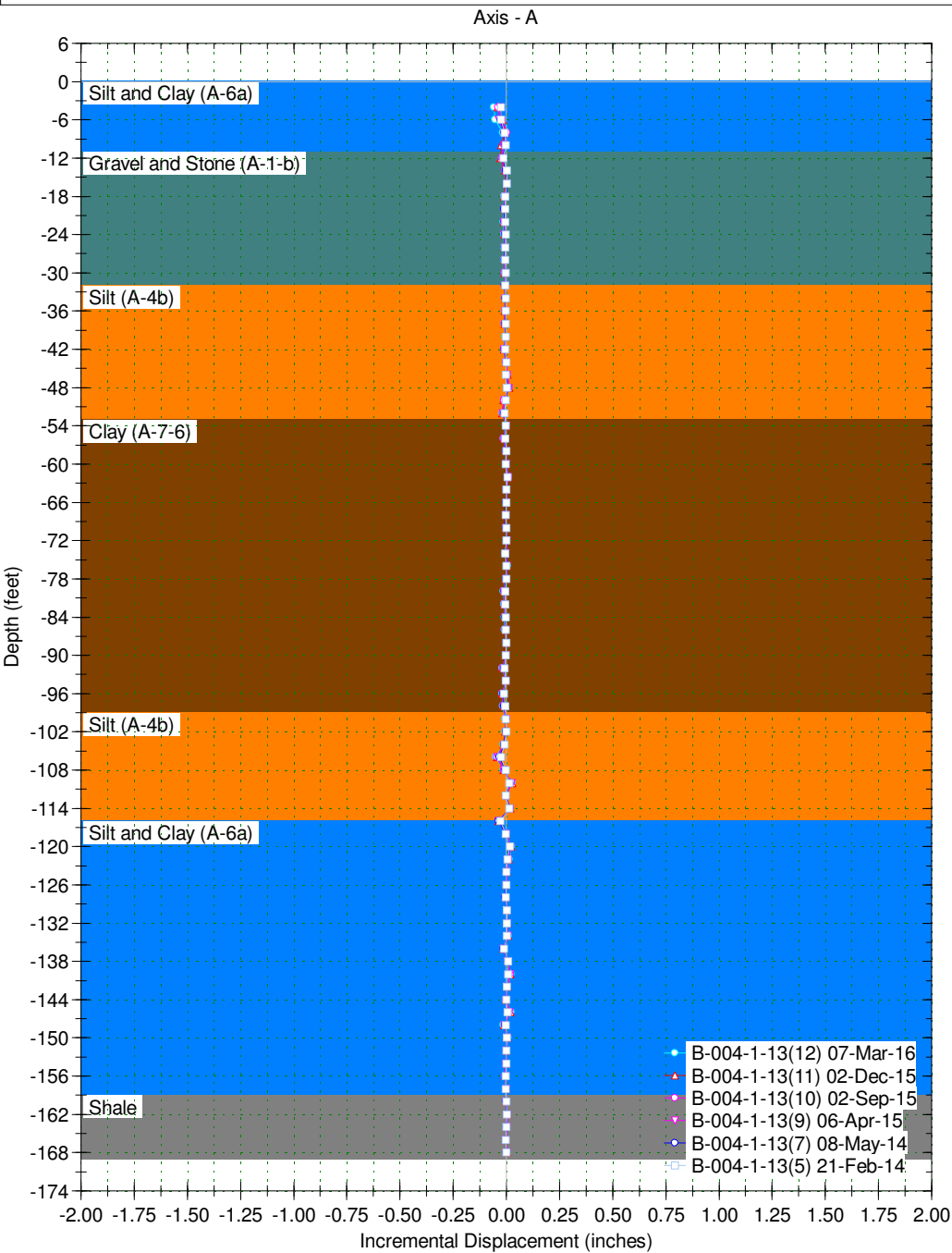
Borehole : B-004-0-13  
Project : Detroit Superior Bridge  
Location :  
Northing :  
Easting :  
Collar :

Spiral Correction : N/A  
Collar Elevation : 0.0 feet  
Borehole Total Depth : 160.0 feet  
A+ Groove Azimuth :  
Base Reading : 2013 Oct 15 16:29  
Applied Azimuth : 0.0 degrees



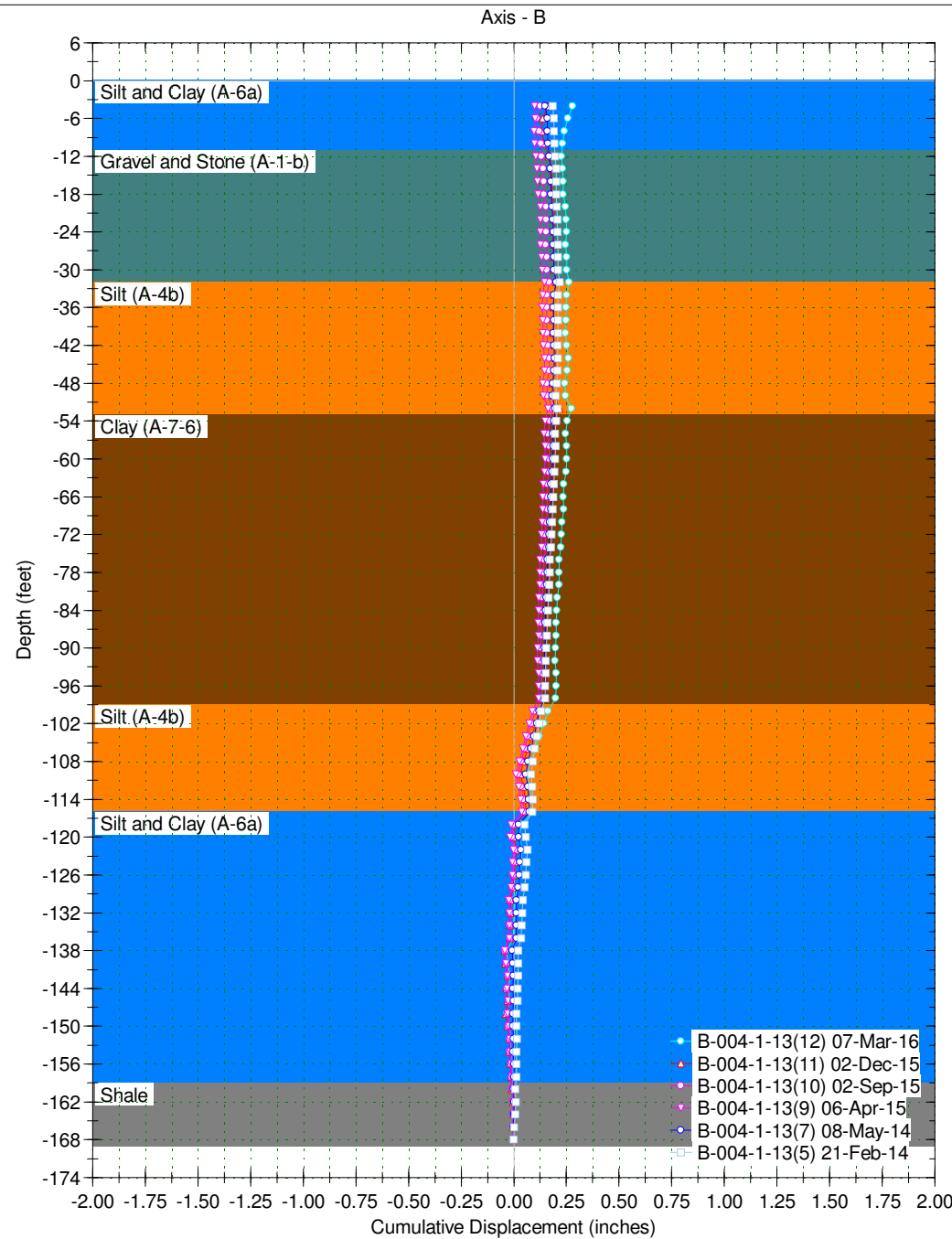
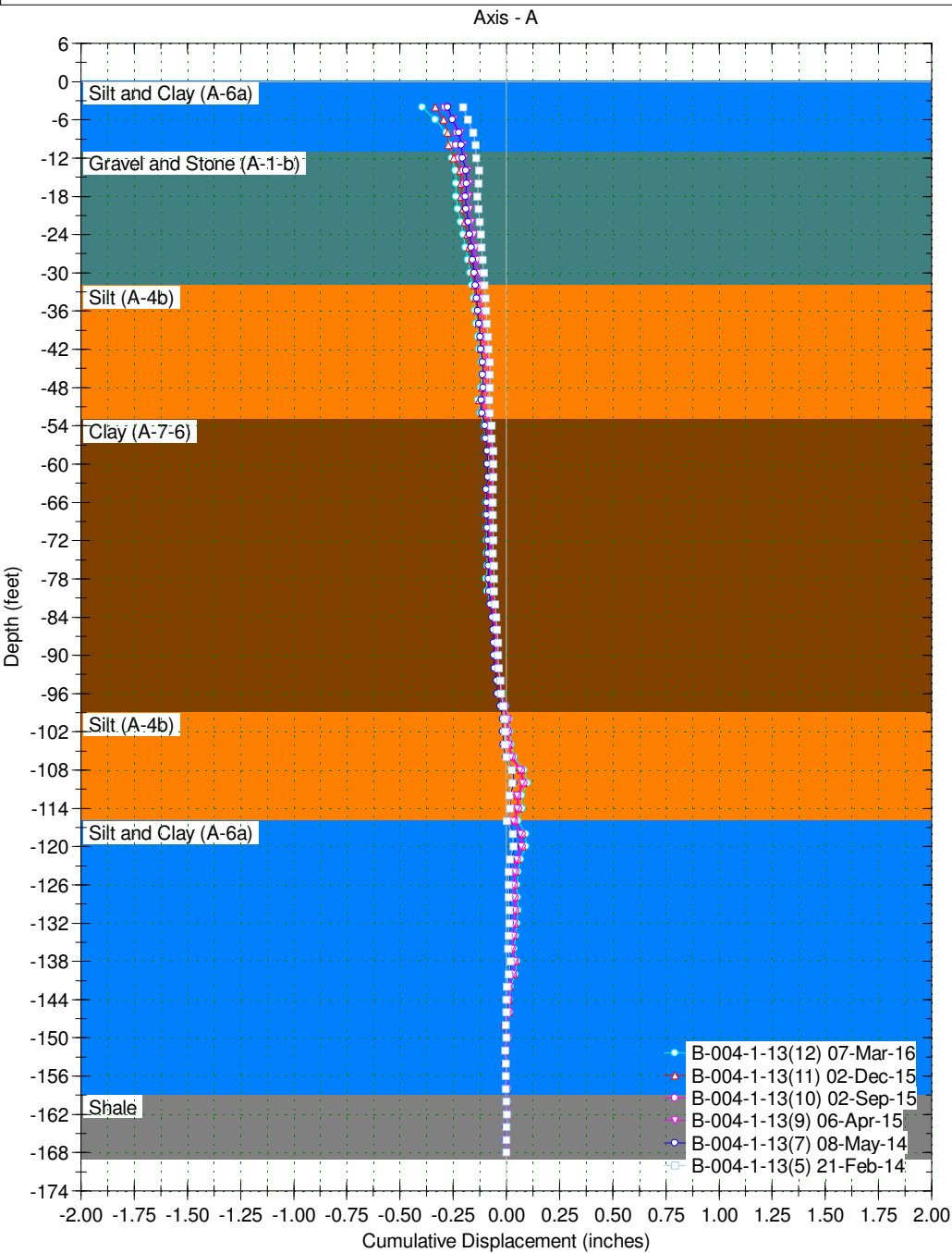
Borehole : B-004-1-13  
 Project : Detroit Superior Bridge  
 Location :  
 Northing :  
 Easting :  
 Collar :

Spiral Correction : N/A  
 Collar Elevation : 0.0 feet  
 Borehole Total Depth : 168.0 feet  
 A+ Groove Azimuth :  
 Base Reading : 2013 Oct 15 15:53  
 Applied Azimuth : 0.0 degrees



Borehole : B-004-1-13  
Project : Detroit Superior Bridge  
Location :  
Northing :  
Easting :  
Collar :

Spiral Correction : N/A  
Collar Elevation : 0.0 feet  
Borehole Total Depth : 168.0 feet  
A+ Groove Azimuth :  
Base Reading : 2013 Oct 15 15:53  
Applied Azimuth : 0.0 degrees



# **APPENDIX E**

## ***2015 UNDERWATER INSPECTION REPORT***

**Underwater Inspection of  
SFN - 1800930  
Veteran's Memorial Bridge (US 6) over the Cuyahoga River  
(CUY-06-14.56)  
July 14, 2015  
For  
Ohio Department of Transportation  
District-12**



*(South Elevation of Bridge)*

By  
**GPI/Greenman-Pedersen, Inc.**

Eric Thorkildsen, P.E. 78663  
Reviewer

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## Structure Inventory Data

### Structure Data - General Information

Superstructure Type:	Steel Truss and Concrete Arch
Number of Spans:	Thirteen Spans
Total Length:	3,112 Feet

### Substructure Data - General Information

Abutments:	N/A
Wingwalls:	None
Piers:	Reinforced concrete piers on reinforced concrete spread footings
Slope Protection:	East embankment has sheet pile bulkhead. West embankment has none.

### Channel Description - General Description of Channel

The Cuyahoga River flows South to North under this structure. The thalweg of this river runs between Pier 3 and Pier 4 mid-span. A maximum water depth of 30.0 feet was found along North fascia mid-span in the thalweg. Flow at this bridge was approximately less than 1 foot per second.

## Inspection Report

### Inspection Inventory and Appraisal Information

#### Structure Location Information

Structure File Number: 1800930  
Facility: US Route 6  
Feature: Cuyahoga River  
County: Cuyahoga

#### Inspection Data

Team Leader-Diver: Dave Cornish, P.E.  
P.E. Reviewer: Eric Thorkildsen, P.E.  
Dive Team: Michael Nitchman  
Marty Faulk

Type of Equipment Used: Commercial Scuba

Date & Time: 07/14/2015  
Water Temperature: 70 Degrees F  
Waterway Velocity (Current): 1 Foot/Second  
Depth Turbidity (Visibility): Less than 1 Foot  
Type of Material of Streambed: Construction debris (rebar, concrete) and soft mud.

Presence & Condition of Riprap  
Or Scour Countermeasures: N/A

Extent of Marine Growth on  
Substructure Elements: Light marine growth.



### Substructure Inspection Data

Substructures Inspected:	Piers 3 and 4.
General Shape:	- Reinforced concrete piers on reinforced concrete spread footings
Maximum Water Depth At Substructure Inspected:	-Approximately 30.0 feet was found along north fascia mid-span.

### Waterline

Water Level References:	The top surface of the wall concrete cap on the west side of pier 4.
Water Surfaces:	The waterline was approximately 2.6 feet below the reference.

### Description of Structure

Bridge CUY-06-14.56 (1800930) carries State Route 6 over the Cuyahoga River in Cleveland, OH. The original bridge was constructed in 1917. Rehabilitation projects have taken place over the years. Only two piers of this structure were inspected during this underwater inspection. No other SSU's were underwater. The numbering convention will follow ODOT standards, numbering from rear (East) to forward (West) abutment.

### Inspection Operations

The underwater inspection was performed by Greenman-Pedersen Inc. on July 14, 2015. This regularly scheduled Underwater Dive Inspection included a 100% Level I inspection and a 10% Level II inspection. Commercial scuba, probing and tactile methods were used to complete inspection. Soundings were taken along all substructure units, mid span and up to 30 feet upstream and downstream of the bridge using a fathometer.

## Inspection Findings

### Channel

- The channel has stayed relatively the same since the last inspection with some minor changes in streambed elevation.
- The bottom material around Pier 3 consists of rebar, concrete chunks and other construction debris. The bottom material around Pier 4 consists of soft silt with 2' penetration to hard refusal.

### Pier 3

- Scaling from 4 to 8 inches deep is present on all faces of Pier 3 in splash zone. This has advanced in severity since last inspection in 2010. (See photo 6)
- Corner spall 3 feet high x 2 feet wide x 2 feet deep located at south corner of Pier 3 in splash zone was confirmed as documented in underwater inspection done in 2010 and has not advanced in severity. (See photo 7)
- Corner spall 3 feet high x 3 feet wide x 3 inches deep located 6 deep above mudline at south corner of Pier 3 was confirmed as documented in underwater inspection done in 2010 and has not advanced in severity.
- Corner spall starting at splash zone on south corner continuing underwater approximately 10 feet high x 2 feet wide x 3 to 4 inches deep.
- Corner spall 4 feet high x 2 feet wide x 1.5 feet deep located at north corner of Pier 3 in splash zone was confirmed as documented in underwater inspection done in 2010 and has not advanced in severity.
- Corner spall 1.5 feet high x 2 feet wide x 6 inches deep located 3 feet above mudline at north corner of Pier 3 was confirmed as documented in underwater inspection done in 2010 and has not advanced in severity.
- Scupper drain is disconnected allowing water to leak onto south corner contributing to large spall as documented in underwater inspection done in 2010 and has not advanced in severity. (See photo 7)
- Void at interface of Pier 3 and southwest embankment with 2.5 feet of penetration. (See photo 8)

### Pier 4

- Scaling from 1/8 inch to ¼ inch deep is typical on all concrete faces of Pier 4. (See photo 10)
- Heavy zebra mussel growth on sheet pile.
- Sheet pile has 100% coverage of rust nodules with up to ¼ inch pitting.
- Void at west interface of sheet pile and concrete wall cap at Pier 4. Void starts 2 feet above water surface elevation and is 4 feet high with plus 5 feet penetration with no refusal.
- Vertical voids at northwest and northeast interface of Pier 4 and sheet pile from concrete wall cap to mudline is 6 feet wide. Penetration of northwest void was up to 8 feet with no refusal and northeast void penetration up to 2.6 feet with

refusal as documented in underwater inspection done in 2010 and has not advanced in severity.

- Bridge scupper drain exits directly onto concrete wall cap adjacent to pier corner. There is a spall 10 to 15 feet long up to 3 feet wide with exposed reinforcing on pier cap. This deficiency was documented in underwater inspection done in 2010 and has advanced in severity. (See photo 10)
- Sinkhole 9 feet long by 2.5 feet wide with 6 feet deep located between concrete wall cap and Pier 4 face above water. Water elevation in sinkhole was same as water elevation in river. This deficiency was documented in underwater inspection done in 2010 and has stayed relatively same in severity.
- Sinkhole 7 feet long by 4 feet wide with 4 feet deep located behind concrete wall cap and east of Pier 4 face above water. No water was present in sinkhole at time of inspection.

### Embankments

- Minor erosion and sloughing observed on northwest and southwest embankments adjacent to Pier 3.

## Comparison to Previous Report and Summary of Inspection

Overall majority of deficiencies noted in this report are same from 2010 inspection with no major changes. The concrete surfaces of Pier 3, were found to have scaling in the splash zone advance in severity and an additional corner spall was observed during this inspection. Concrete was sounded in numerous locations and found to be in good condition. The concrete surfaces of Pier 4 were in good condition with light scaling. Voids observed and probed along sheet pile and interface of Pier 4 was confirmed and have not advanced in severity. However, new void was observed at west interface of concrete wall cap and sheet pile. Sinkhole noted in previous report appears to have been partially filled in, but not completely. Also a new sinkhole was observed east and adjacent to Pier 4. This sinkhole did not have standing water in it. No undermining of footers was observed.

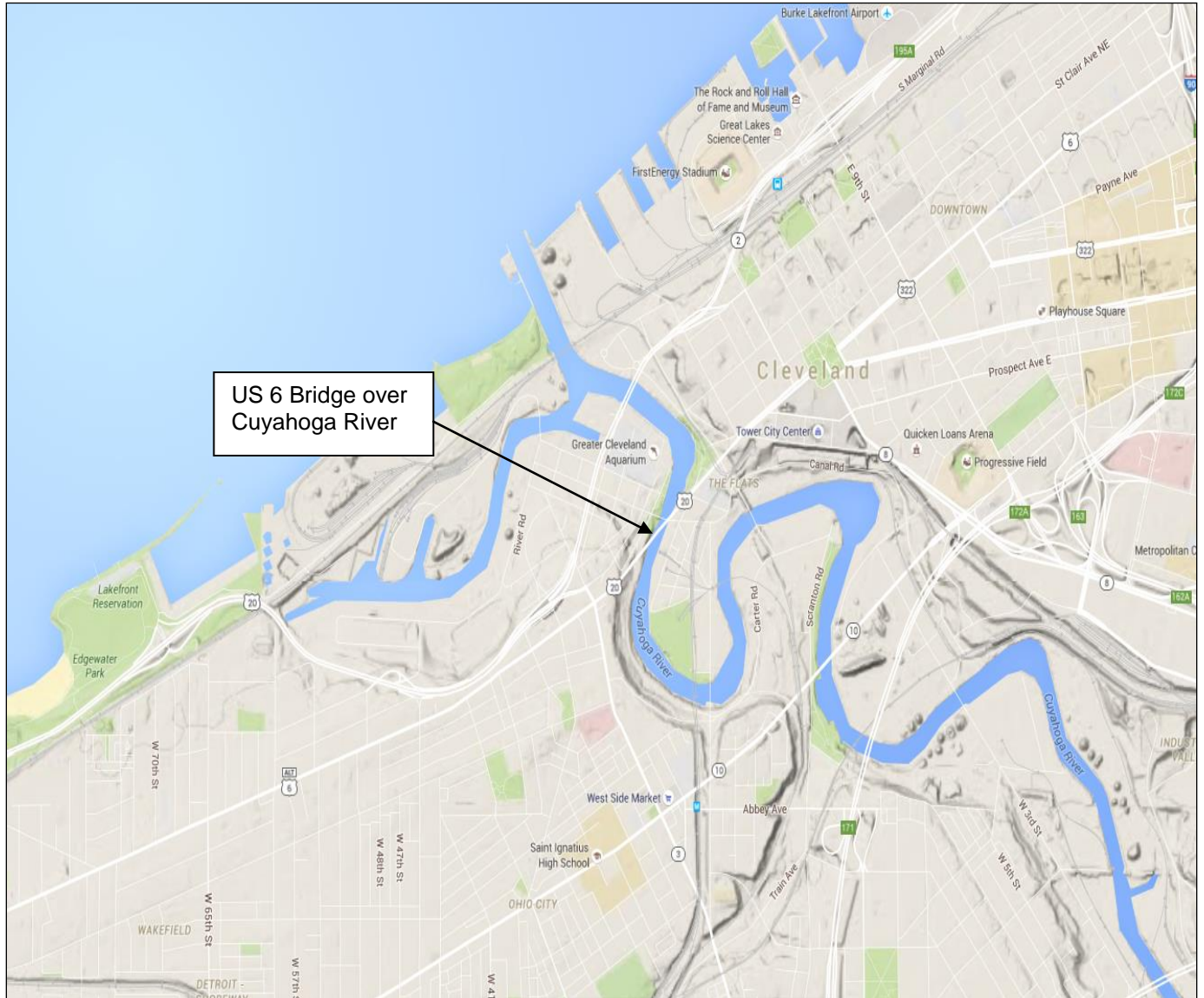
## Conclusions and Recommendations

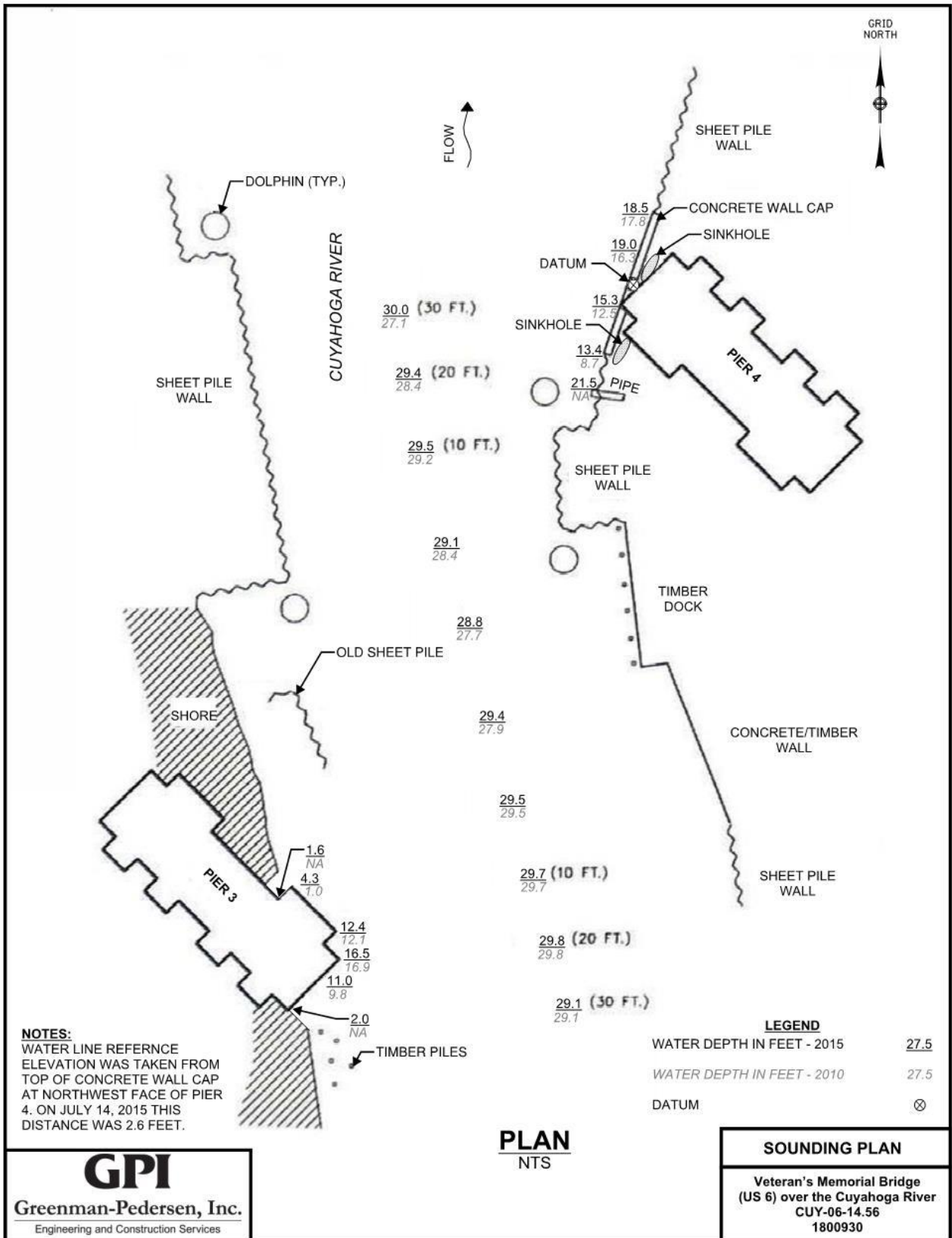
- We recommend a fendering system be installed to protect Pier 3 from boat and barge impacts. Place riprap or drive sheet pile along embankment adjacent to Pier 3 to prevent erosion and bank sloughing. Repair broken scupper drains and direct water flow from pier faces. Resurface all concrete pier faces. Grout voids at interfaces of sheet pile and concrete. Place riprap in sinkholes. Re-inspect the submerged substructure units at the normal maximum recommended interval of five (5) years and after a significant event such as flood, impact or other phenomenon that could affect the structural integrity of the bridge.

**GPI/Greenman-Pedersen, Inc.**

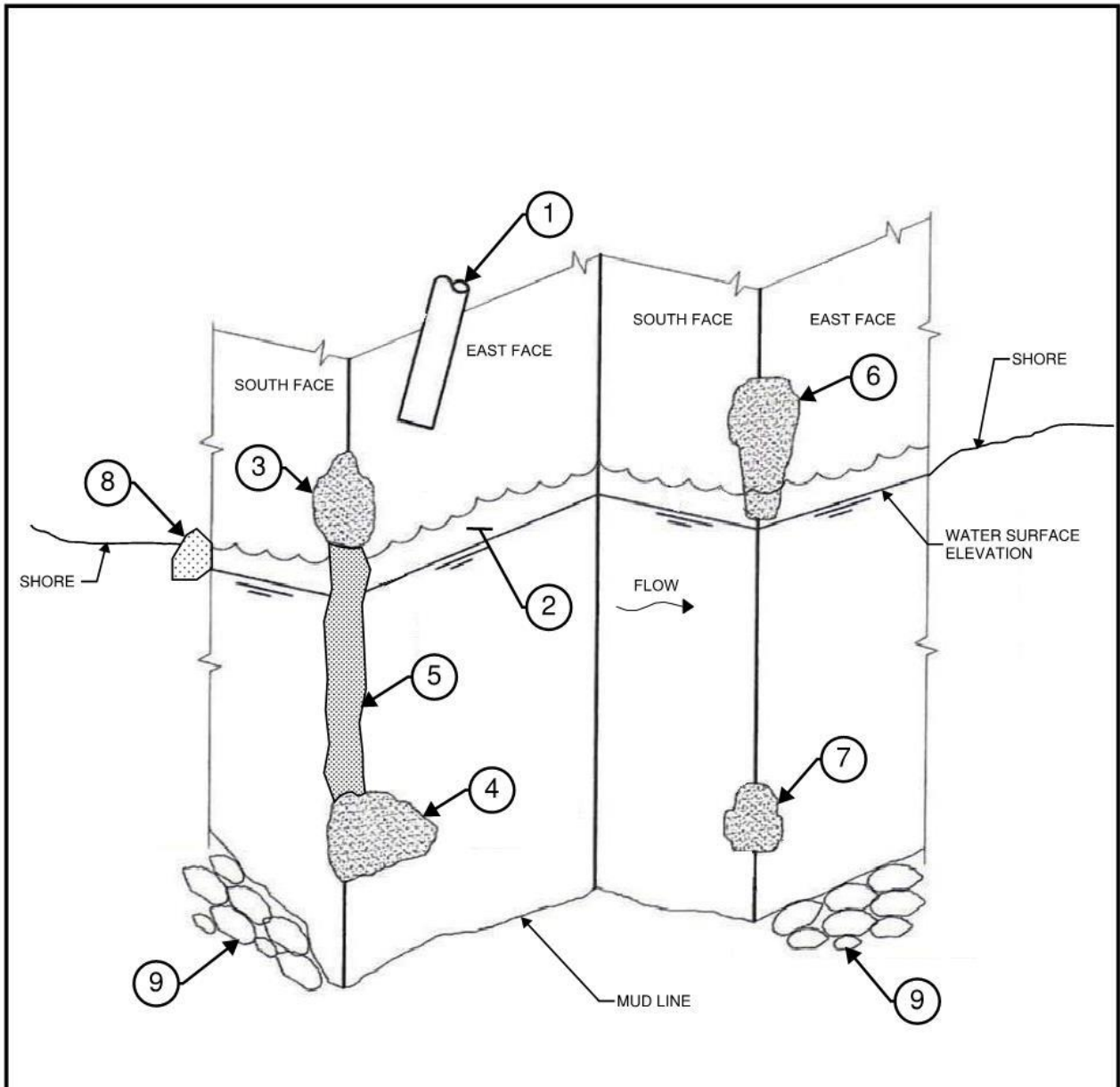
## Appendix A

# Location Map, Soundings and Drawings









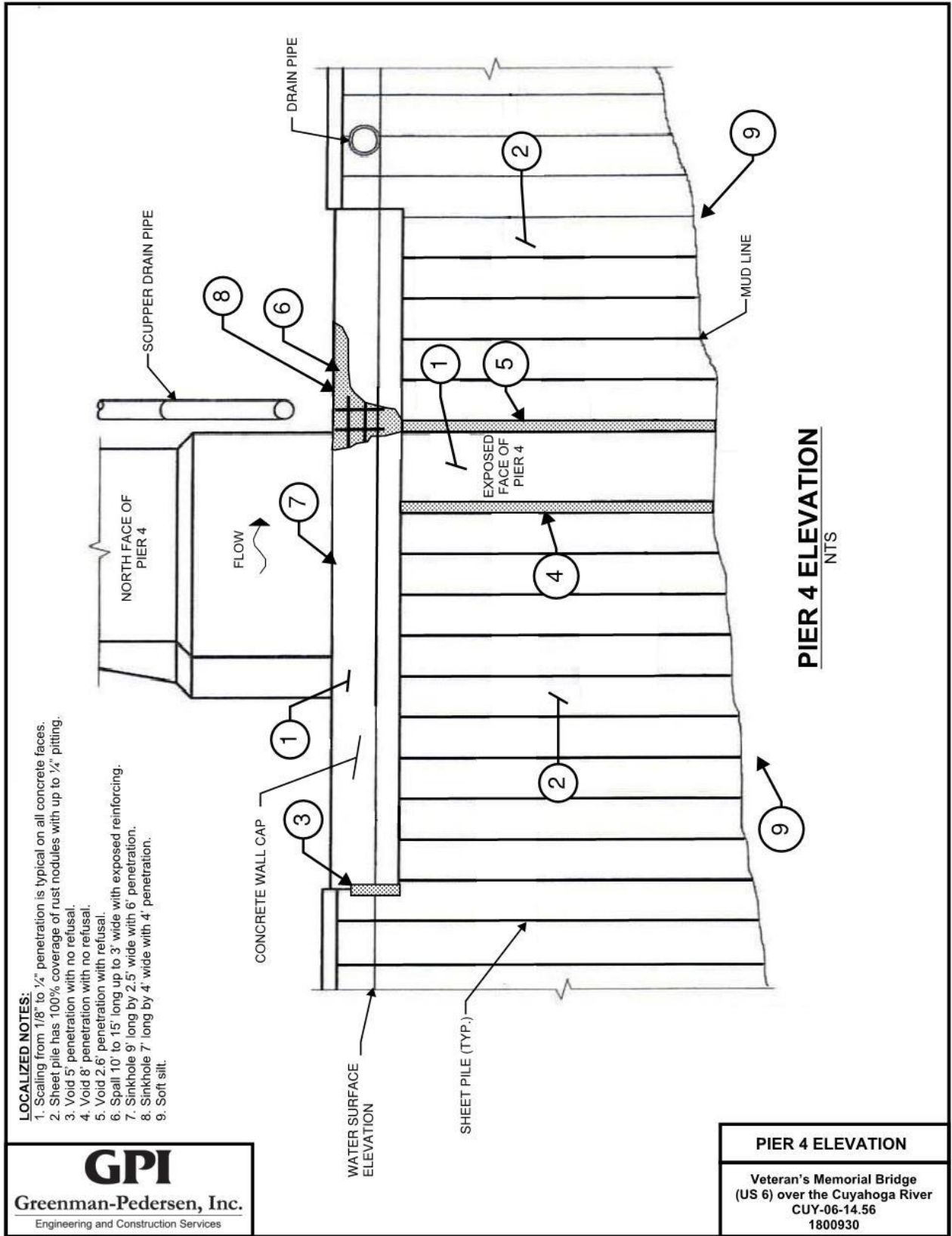
**PIER 3 ELEVATION**  
NTS

**LOCALIZED NOTES:**

1. Scupper drain pipe disconnected.
2. Scaling 4" to 8" penetration in splash zone.
3. Spall 3' high x 2' wide x 2' penetration.
4. Spall 3' high x 3' wide x 3" penetration.
5. Spall 10' high x 2' wide x 3" to 4" penetration.
6. Spall 4' high x 2' wide x 1.5' penetration.
7. Spall 1.5' high x 2' wide x 6" penetration.
8. Void with 2.5' of penetration.
9. Construction debris and concrete chunks with reinforcing protruding from mud line.

**GPI**  
Greenman-Pedersen, Inc.  
Engineering and Construction Services

**PIER 3 ELEVATION**  
Veteran's Memorial Bridge  
(US 6) over the Cuyahoga River  
CUY-06-14.56  
1800930





## Appendix B

# Photographs



Photograph 1  
Overall View of  
the North  
Elevation.  
Looking South



Photograph 2  
Overall View of  
the South  
Elevation.  
Looking North.



Photograph 3  
North approach  
(downstream)  
Looking North.



Photograph 4  
South approach  
(upstream).  
Looking south.





Photograph 5  
View of Pier 3,  
East Face.  
Looking West.



Photograph 6  
View of Pier 3,  
Typical scaling at  
the splash zone.



Photograph 7  
View of Pier 3  
South corner.  
Spall at waterline  
and  
disconnected  
scupper drain.



Photograph 8  
View of void at  
interface of  
Southwest  
embankment  
and Pier 3.





Photograph 9  
View of Pier 4  
West Elevation.  
Looking West.



Photograph 10  
View of Pier 4.  
Spall with  
exposed rebar.



Photograph  
11  
View of  
Northeast  
Embankment.



Photograph  
12  
View of  
Southeast  
Embankment.





Photograph  
13  
View of  
Northwest  
Embankment.



Photograph  
14  
View of View of  
Southwest  
Embankment.