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*Bridge Preliminary Design Report  
Addendum*

**Ramp B over Norfolk Southern Tracks  
SCI-823-1598**

**SCI-823-10.13  
PID No. 79977**

Prepared for  
**Ohio Department of Transportation**

May 2011

**CH2MHILL**

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## ATTACHMENTS

- Detailed Cost Estimate
- Responses to previous ODOT comments
- Responses to NSRR comments
- Railroad clearance email and sketch
- Final Structure Site Plan (Sheet 1 of 3)
- Typical Transverse Section (Sheet 2 of 3)
- Abutment Section and Framing Plan (Sheet 3 of 3)

## **1. Introduction**

Per the agreed upon scope of services CH2M HILL was tasked with addressing all review comments pertaining to the Preliminary Bridge Design Reports that were submitted to ODOT in November 2007. This addendum addresses two review comments in particular that required additional engineering investigation by CH2M HILL. One review comment was related to cost of the three bridges crossing the Norfolk Southern Tracks and the cost of the MSE walls located at each bridge. ODOT asked CH2M HILL to confirm that the length of the bridge (cost) as compared to the MSE wall length (cost) was balanced to provide a cost effective solution. The second review comment was related to investigating the feasibility and cost associated with supporting the proposed bridge piers on drilled shafts rather than steel H-piles as was originally proposed in the Preliminary Bridge Design Report.

## **2. Design Requirements / Specifications**

All structural design on this project has been done in accordance with both the AASHTO Standard Design Specifications (LFD) and the 2004 ODOT Bridge Design Manual (LFD). Per an email received from ODOT on October 14, 2010, LFD will continue to be used on this project. In addition, the guidelines for seismic design loading in section 301.4.3 of the ODOT BDM have been followed. As such no seismic design loading has been included in the design or analysis of the proposed bridge or drilled shafts. All design criteria as stated in the Bridge Preliminary Design Report remains accurate.

## **3. MSE Wall / Bridge Length Optimization**

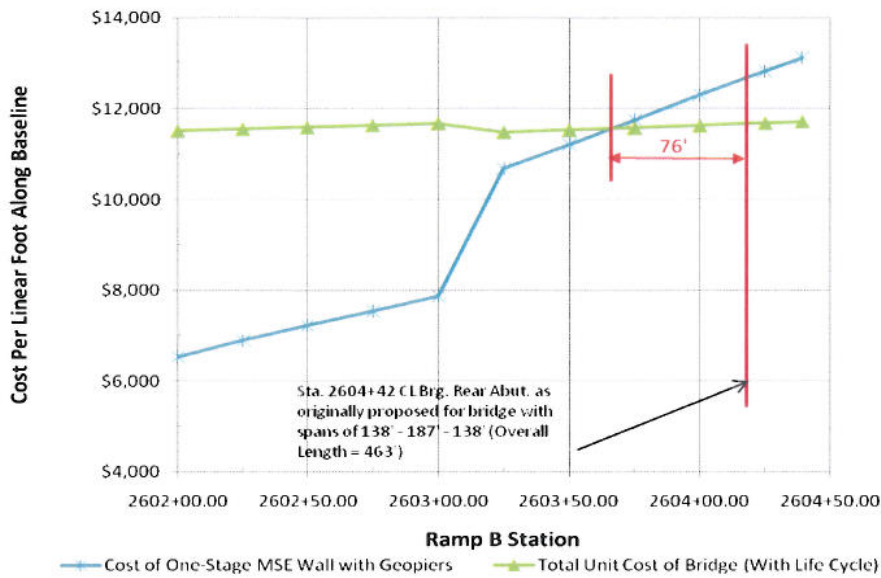
CH2M HILL was asked by ODOT to verify that the span lengths proposed in the November 2007 Bridge Preliminary Design Report provide an optimum balance between the costs for the bridge and the costs for MSE Wall 4 located at the rear abutment. The bridge proposed in the Report had span lengths of 138'-187'-138' (measured along baseline of construction) for a total length of 463 feet. MSE Wall 4 has a height of  $\pm 41.5'$  at the rear abutment. There are no walls at the forward abutment.

To accomplish this task, the bridge and wall costs from the 2007 report were updated to current costs. The MSE wall cost used was \$95 per square foot for wall heights less than or equal to 30 feet and \$135 per square foot for wall heights greater than 30 feet. These two unit prices were supplied to CH2M HILL by ODOT in an e-mail received on July 12, 2010. It was assumed that these unit prices included excavation, embankment, concrete leveling pads, precast panels and straps, drainage conduit, granular backfill, concrete coping cap on top of wall, and sealing of concrete surfaces. The updated wall costs include the use of Geopiers® as recommended by the project's geotechnical engineers, DLZ Inc., to mitigate settlement of the MSE wall. Also included in the MSE wall cost is roadway barrier, moment slab, and roadway pavement.

Total bridge and wall costs were then converted to a unit cost per foot of bridge and unit cost per foot of wall and were plotted in Figure 1. The wall and bridge unit costs intersect at a point  $\pm 76$  feet from the originally proposed location of the rear abutment. This would indicate that it may be economical to lengthen the bridge and reduce the length and height

of MSE Wall 4.

**Figure 1: - Bridge vs MSE Wall Cost Comparison**



The next step to further refine the costs was to determine total costs for a longer bridge and for the shorter walls. Two additional bridge lengths of 492 feet and 532 feet (measured along baseline of construction) were selected for further investigation. These two additional bridge lengths were selected as they resulted in reasonable span ratios. Preliminary girder designs were completed for the two new bridge lengths using a girder system analysis and MDX software. Those results were used to determine the structural steel weights for the longer bridges. The total bridge costs were then updated for the new steel quantities and for the additional concrete and reinforcing steel cost as a result of the longer bridge lengths. The reduction in wall areas was also calculated and the total wall costs were revised. The wall costs also reflect the savings in pavement, moment slab, and barrier costs associated with the reduced wall lengths. The results are shown in Figure 2.

**Figure 2: Bridge Costs for Various Length Bridges**

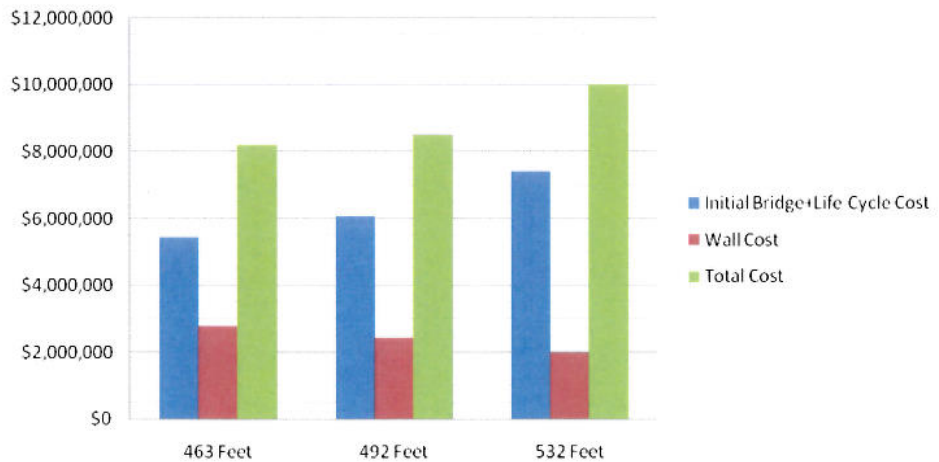




Figure 2 shows that as the bridge length increases the wall costs decrease, however the bridge costs are increasing at a faster rate than the wall costs. This results in the 463 foot long bridge, as proposed in the November 2007 report, as being the lowest cost solution.

#### 4. Drilled Shaft Pier Foundation Study

The feasibility and cost of supporting the piers on drilled shafts was performed as part of this Preliminary Bridge Design Report Addendum. The cost and constructability of drilled shaft supported piers was then compared to that of pile supported piers. Two drilled shaft supported pier options were investigated. The first option was a 2-shaft option and the second option was a 4-shaft option. The 2-shaft option consists of 60" diameter drilled shafts in soil connected to 54" diameter drilled shafts socketed into bedrock. The length of the 54" diameter drilled shaft in bedrock will be approximately 14'. The 4-shaft option consists of 48" diameter drilled shafts in soil connected to 42" diameter drilled shafts socketed into bedrock. The length of the 42" diameter drilled shaft in bedrock will be approximately 7'. The size of the steel piles that were proposed in the November 2007 Preliminary Bridge Design Report was HP 14x73, and the estimated length of those piles was 25' at both Pier 1 and Pier 2. Essentially five factors were considered when determining the recommended foundation support for the piers. Those five factors were redundancy, the need for temporary shoring, the effect on the NSRR, cost, and the need for additional rock cores being required. A comparison matrix of those 5 factors is shown in Table 1:

**Table 1: Foundation System Comparison**

	<b>Pile Option</b>	<b>2-Shaft Option</b>	<b>4-Shaft Option</b>
<b>Redundancy</b>	Yes	No	Yes
<b>Temporary Shoring</b>	Yes	No	Yes, but amount reduced
<b>Effect on NSRR</b>	Greatest due to shoring and potential for tiebacks	Minimal	Reduced
<b>Cost *</b>	\$168,000	\$141,000	\$208,000
<b>Additional Rock Cores Required</b>	No	Yes	Yes

\*The cost provided represents the estimated cost associated with constructing Pier 2 only.

The cost for supporting the two piers on 2 drilled shafts is estimated to be the lowest of the three alternatives. Furthermore, the 2-shaft option does minimize impacts on the Norfolk Southern railroad, and the 2-shaft option likely will not require temporary shoring. Due to these reasons, CH2M HILL recommends that each pier be supported on 2 drilled shafts.

## 5. Cost Estimate

**Table 2: Opinion of Probable Construction Cost**

	Updated costs for bridge proposed in the November 2007 Preliminary Design Report (138'-187'-138')
Bridge Cost (initial)	\$3,133,592
Bridge Life Cycle Cost	\$2,287,042
Bridge Cost (initial plus life cycle)	\$5,420,635
Wall Cost (1)	\$2,763,237
Total Cost	\$8,183,872

(1) Cost shown is for the MSE wall and Geopier® only. Costs for moment slab, barrier along wall, and pavement are not included.

The updated cost for the bridge and MSE Wall 4 is presented in Table 2. The updated detailed bridge cost estimate is included as an attachment to this addendum. CH2M HILL established all unit prices for the cost estimate by using ODOT's online CMS portal and then working with ODOT estimating staff to verify all estimated unit prices. All comments and revisions that were received from ODOT estimating staff were incorporated into the unit prices.

## 6. Recommendations:

Based upon the studies and cost estimates completed it is recommended that:

1. The preferred alternative recommended in the November 2007 Bridge Preliminary Design Report not be changed. It is recommended that the preferred alternative remain a three span curved steel plate girder bridge with spans of 138'-187'-138' (measured along baseline construction).
2. The deep foundations recommendation be revised from steel H-piles to two drilled shafts socketed into rock.
3. Additional rock cores be taken at both pier locations in order to complete final drilled shaft design.



**SCI-823-1598: Ramp B over NSRR**  
**DETAILED COST ESTIMATE**

Alternative A: 463' Bridge (138'-187'-138') proposed in Bridge Preliminary Design Report (Nov. 2007) with pile supported piers  
**Alternative B: 463' Bridge (138'-187'-138') with Piers supported by 2 Drilled Shafts**  
Alternative C: 463' Bridge (138'-187'-138') with Piers supported by 4 Drilled Shafts  
Alternative D: 532' Bridge (138'-197'-197') with Piers supported by 2 Drilled Shafts and 90" webs  
Alternative E: 492' Bridge (138'-195'-159') with Piers supported by 2 Drilled Shafts and 80" webs

Description	Unit Cost	Unit	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E	
			Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
QC/QA Concrete, Class QSC2, Superstructure (Parapet):	\$540.00	CY	148.7	\$80,298	148.7	\$80,298	148.7	\$80,298	172.4	\$93,096	157.4	\$84,996
QC/QA Concrete, Class QSC2, Superstructure:	\$550.00	CY	448.9	\$246,895	448.9	\$246,895	448.9	\$246,895	520.4	\$286,220	475.0	\$261,250
QC/QA Concrete, Class QSC2, Superstructure (Approach Slab), (T=17"), As Per Plan:	\$225.00	SY	220	\$49,500	220	\$49,500	220	\$49,500	220	\$49,500	220	\$49,500
QC/QA Concrete, Class QSC1, Substructure:	\$570.00	CY	351.9	\$200,583	349.5	\$199,215	399.9	\$227,943	349.5	\$199,215	349.5	\$199,215
Epoxy Coated Reinforcing Steel (superstructure):	\$1.10	LB	170,316	\$187,348	170,316	\$187,348	170,316	\$187,348	197,448	\$217,193	180,234	\$198,257
Epoxy Coated Reinforcing Steel (substructure):	\$1.10	LB	38,384	\$42,222	38,084	\$41,892	44,384	\$48,822	38,084	\$41,892	38,084	\$41,892
Structural Steel Members, Level 5:	\$1.50	LB	895,000	\$1,342,500	895,000	\$1,342,500	895,000	\$1,342,500	1,541,000	\$2,311,500	1,097,035	\$1,645,553
Steel Piles HP12x53, Furnished:	\$25.00	FT	1,050	\$26,250	1,050	\$26,250	1,050	\$26,250	1,270	\$31,750	1,270	\$31,750
Steel Piles HP12x53, Driven:	\$13.00	FT	950	\$12,350	950	\$12,350	950	\$12,350	1,150	\$14,950	1,150	\$14,950
Steel Piles HP14x73, Furnished:	\$35.00	FT	1,080	\$37,800		\$0		\$0		\$0		\$0
Steel Piles HP14x73, Driven:	\$13.00	FT	900	\$11,700		\$0		\$0		\$0		\$0
Drilled Shafts, 42" Diameter, Above Bedrock:	\$230.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 48" Diameter, Above Bedrock:	\$286.00	FT		\$0		\$0	152	\$43,472		\$0		\$0
Drilled Shafts, 54" Diameter, Above Bedrock:	\$377.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 60" Diameter, Above Bedrock:	\$400.00	FT		\$0	76	\$30,400		\$0	76	\$30,400	76	\$30,400
Drilled Shafts, 66" Diameter, Above Bedrock:	\$782.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 72" Diameter, Above Bedrock:	\$670.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 78" Diameter, Above Bedrock:	\$670.00	FT		\$0		\$0		\$0		\$0		\$0
Plan:	\$985.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 42" Diameter, Into Bedrock:	\$416.00	FT		\$0		\$0	56	\$23,296		\$0		\$0
Drilled Shafts, 48" Diameter, Into Bedrock:	\$540.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 54" Diameter, Into Bedrock:	\$616.00	FT		\$0	56	\$34,496		\$0	76	\$46,816	76	\$46,816
Drilled Shafts, 60" Diameter, Into Bedrock:	\$746.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 66" Diameter, Into Bedrock:	\$1,190.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 72" Diameter, Into Bedrock:	\$1,634.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 78" Diameter, Into Bedrock:	\$2,300.00	FT		\$0		\$0		\$0		\$0		\$0
Drilled Shafts, 84" Diameter, Into Bedrock:	\$2,900.00	FT		\$0		\$0		\$0		\$0		\$0
Cofferdams and Excavation Bracing:	\$15.00	SF	1,240	\$18,600		\$0	1,240	\$18,600		\$0		\$0
Structure Incidental Cost (Note 1)	16%			\$360,967		\$360,183		\$369,164		\$531,605		\$416,733
Contingency	20%			\$523,403		\$522,265		\$535,288		\$770,827		\$604,262
<b>TOTAL INITIAL BRIDGE COST</b>				<b>\$3,140,416</b>		<b>\$3,133,592</b>		<b>\$3,211,725</b>		<b>\$4,624,965</b>		<b>\$3,625,574</b>
<b>LIFE CYCLE COSTS:</b>												
Strip Seal:	\$375.00	FT	66	\$24,750	66	\$24,750	66	\$24,750	66	\$24,750	66	\$24,750
Paint weathering steel plate girders (prep, prime, intermediate, final coats):	\$14.00	SF	84,468	\$1,182,552	84,468	\$1,182,552	84,468	\$1,182,552	108,736	\$1,522,304	91,274	\$1,277,836
Superplasticized Dense Concrete Overlay Using Hydromodification:	\$95.00	SY	3,142	\$298,490	3,142	\$298,490	3,142	\$298,490	3,642	\$345,990	3,326	\$315,970
Full Depth Repair:	\$23.61	SF	1,414	\$33,385	1,414	\$33,385	1,414	\$33,385	1,639	\$38,697	1,496	\$35,321
Portions of Structure Removed, As Per Plan (for deck removal):	\$15.00	SF	15,555	\$233,325	15,555	\$233,325	15,555	\$233,325	18,031	\$270,465	16,459	\$246,885
(Parapet):	\$540.00	CY	148.7	\$80,298	148.7	\$80,298	148.7	\$80,298	172.4	\$93,096	157.4	\$84,996
QC/QA Concrete, Class QSC2, Superstructure:	\$550.00	SY	448.9	\$246,895	448.9	\$246,895	448.9	\$246,895	520.4	\$286,220	475.0	\$261,250
Epoxy Coated Reinforcing Steel (superstructure):	\$1.10	LB	170,316	\$187,348	170,316	\$187,348	170,316	\$187,348	197,448	\$217,193	180,234	\$198,257
<b>TOTAL LIFE CYCLE COST OF BRIDGE</b>				<b>\$2,287,042</b>		<b>\$2,287,042</b>		<b>\$2,287,042</b>		<b>\$2,798,715</b>		<b>\$2,445,265</b>
<b>BRIDGE</b>				<b>\$5,427,458</b>		<b>\$5,420,635</b>		<b>\$5,498,768</b>		<b>\$7,423,679</b>		<b>\$6,070,839</b>
MSE Wall (wall height greater than 30 ft)	\$135.00	SF	6,221	\$839,835	6,221	\$839,835	6,221	\$839,835	1565	\$211,275	4159	\$561,465
MSE Wall (wall height less than or equal to 30 ft)	\$95.00	SF	13,184	\$1,252,480	13,184	\$1,252,480	13,184	\$1,252,480	13184	\$1,252,480	13184	\$1,252,480
Geopiers®	\$310.500	LUMP	1	\$310,500	1	\$310,500	1	\$310,500	0.84	\$259,900	0.93	\$289,200
Contingency	15%			\$360,422		\$360,422		\$360,422		\$258,548		\$315,472
<b>TOTAL COST OF MSE WALL 4</b>				<b>\$2,763,237</b>		<b>\$2,763,237</b>		<b>\$2,763,237</b>		<b>\$1,982,203</b>		<b>\$2,418,616</b>
<b>TOTAL RELATIVE OWNERSHIP COST OF BRIDGE PLUS COST OF MSE WALL 4</b>				<b>\$8,190,695</b>		<b>\$8,183,872</b>		<b>\$8,262,005</b>		<b>\$9,405,883</b>		<b>\$8,489,456</b>

**Notes:**

1. Structure incidental cost allowance includes provision for structure excavation, porous backfill & drainage pipe, sealing of concrete surfaces, falsework bents, bearings, (minor) temporary shoring, crushed aggregate slope protection, pile driving equipment mobilization, shear connectors, settlement platforms, expansion joints, joint sealers, and joint fillers costs.



# inter-office communication

<b>to:</b>	James A. Brushart, District 9 Deputy Director	<b>date:</b>	Apr. 2, 2008
<b>from:</b>	Timothy J. Keller, Administrator, Office of Structural Engineering		
<b>by:</b>	Ananda Dharma, P.E.		
<b>subject:</b>	SCI-823-10.17; PID 79977; Bridge No. SCI-823-1598; Ramp B over Norfolk Southern Railroad; Preliminary Design Review		

Attn.: Thomas M. Barnitz, District 9 Project Manager

We have briefly reviewed Preliminary Design submission from CH2MHill for the proposed bridge along Ramp B over Norfolk Southern Railroad. Our comments are shown below.

## General Comments

1. We agree that the proposed structure should consist of three-span span composite curved steel plate girders (ASTM A709, Grade 50W) with reinforced concrete deck and jointed rear stub abutment supported on MSE wall and jointed forward abutment with spill-thru slope and T-Type piers. Review comments pertaining to the MSE wall will be submitted separately. Please incorporate MSE wall comments prior to proceeding with Detail Design.
2. The cost estimate shown in the Preliminary Design Report submission was based upon year 2006 costs. In the future, please update the cost estimate to reflect the costs at the time of the submission or the time of construction as stated in the ODOT's Project Development Process (PDP).
3. As stated in the e-mail from Rick Bruce in the ODOT – Office of Roadway Engineering Services dated May 30, 2007, the Design Consultant shall submit design exceptions for speed related deficiencies. The Technical Memorandum from CH2Mhill dated June 21, 2005 stated that design exceptions for speed related items were not required for ramps. However, Ramp B is considered to be a freeway to freeway connection which connects U.S.R. 23 to S.R. 823. The Technical Memorandum mentioned above was included in the Preliminary Design Report for Bridge No. SCI-823-1593 (Ramp B over Fairground Road).
4. In the Preliminary Design Report dated November 2007, page 5 discussed "H" steel piles vs. drilled shafts for pier foundation. The Design Consultant needs to prepare cost comparison and/or justification for the proposed pier foundation in order to determine the most economical pier foundation.



**Site Plan - Sheet 1 of 3**

5. The actual unfactored design loads of 75 tons and 95 tons correspond to HP10x42 and HP12x53, respectively. Please refer to BDM 202.2.3.2.a which was updated in the 2007 Fourth Quarter Revisions. The increase in the maximum allowable design loads for H-piles driven to refusal is to take advantage of the Grade 50 steel that is now used for steel piles.
6. Please provide the location and description of benchmarks in the next submittal. (BDM 202.2.1)
7. In the Proposed Structure data block, Length of Span on curved alignments should be measured along a reference line which is a chord drawn from centerline of abutment bearings at the centerline of survey or baseline of construction. (BDM 202.2.1)

Our office recommends that the District approves the Preliminary Design submission subject to resolution of these comments. Your concurrence with the above comments submitted in writing constitutes compliance.

Nothing in these comments is to be construed as authorizing extra work for which additional compensation may be claimed. If you have reason to believe that these comments require work outside the limits of your Scope of Services, please contact this office before proceeding.

Should you have any questions concerning our review comments for the above referenced project, please contact our office.

TJK:JS:ad

c: Gary E. Cochenour, ODOT District 9  
Lawrence A. Wills, ODOT District 9  
Timothy J. Keller, Office of Structural Engineering  
Jawdat Siddiqi, Office of Structural Engineering  
Richard A. Bruce, Office of Roadway Engineering Services  
file



**DESIGNER RESPONSE TO REVIEW COMMENTS**

BY: Jirschele  
DATE: 8/31/2010

**Portsmouth Bypass – Stage I Comments**

PROJECT: **SCI-823-10.13: Portsmouth Bypass; PID 79977** PROJ. NO: **408549.08.ST.CM**

REVIEWER: **Comments by ODOT OSE (Reviewer: Ananda Dharma, PE),  
Inter-office communication to ODOT D9 dated April 2, 2008** PHASE: **Preliminary Design**

Step 8 – Major PDP

Comment No.	Review Comment	Designer Response
	<b>Preliminary Design Review: SCI-823-1598 Ramp B over Norfolk Southern Railroad</b>	
1	We agree that the proposed structure should consist of three-span span composite curved steel plate girders (ASTM A709, Grade 50W) with reinforced concrete deck and jointed rear stub abutment supported on MSE wall and jointed forward abutment with spill-thru slope and T-Type piers. Review comments pertaining to the MSE wall will be submitted separately. Please incorporate MSE wall comments prior to proceeding with Detail Design.	Acknowledged.
2	The cost estimate shown in the Preliminary Design Report submission was based upon year 2006 costs. In the future, please update the cost estimate to reflect the costs at the time of the submission or the time of construction as stated in the ODOT's Project Development Process (PDP).	Acknowledged. The cost estimate for the preferred alternative for this structure is being updated as part of our current work on the project.



## Portsmouth Bypass – Stage I Comments

PROJECT: **SCI-823-10.13: Portsmouth Bypass; PID 79977** PROJ. NO: **408549.08.ST.CM**

REVIEWER: **Comments by ODOT OSE (Reviewer: Ananda Dharma, PE),  
Inter-office communication to ODOT D9 dated April 2, 2008** PHASE: **Preliminary Design**

3	As stated in the e-mail from Rick Bruce in the ODOT – Office of Roadway Engineering Services dated May 30, 2007, the Design Consultant shall submit design exceptions for speed related deficiencies. The Technical Memorandum from CH2Mhill dated June 21, 2005 stated that design exceptions for speed related items were not required for ramps. However, Ramp B is considered to be a freeway to freeway connection which connects U.S.R. 23 to S.R. 823. The Technical Memorandum mentioned above was included in the Preliminary Design Report for Bridge No. SCI-823-1593 (Ramp B over Fairground Road).	Acknowledged. The design exception is being prepared and will be submitted to ODOT.
4	In the Preliminary Design Report dated November 2007, page 5 discussed “H” steel piles vs. drilled shafts for pier foundation. The Design Consultant needs to prepare cost comparison and/or justification for the proposed pier foundation in order to determine the most economical pier foundation.	Acknowledged. This study is underway and will be submitted to ODOT as an addendum to the Bridge Preliminary Design Report.
5	The actual unfactored design loads of 75 tons and 95 tons correspond to HP10x42 and HP12x53, respectively. Please refer to BDM 202.2.3.2.a which was updated in the 2007 Fourth Quarter Revisions. The increase in the maximum allowable design loads for H-piles driven to refusal is to take advantage of the Grade 50 steel that is now used for steel piles.	Acknowledged.





**DESIGNER RESPONSE TO REVIEW COMMENTS**

BY: Jirschele  
DATE: 8/31/2010

## Portsmouth Bypass – Stage I Comments

PROJECT: **SCI-823-10.13: Portsmouth Bypass; PID 79977** PROJ. NO: **408549.08.ST.CM**

REVIEWER: **Comments by ODOT OSE (Reviewer: Ananda Dharma, PE),  
Inter-office communication to ODOT D9 dated April 2, 2008** PHASE: **Preliminary Design**

6	Please provide the location and description of benchmarks in the next submittal. (BDM 202.2.1)	Benchmark information will be provided as soon as that information is available.
7	In the Proposed Structure data block, Length of Span on curved alignments should be measured along a reference line which is a chord drawn from centerline of abutment bearings at the centerline of survey or baseline of construction. (BDM 202.2.1)	Acknowledged. Span lengths will be measured along the construction chord and Proposed Structure data block will be updated accordingly.



## STV/Ralph Whitehead Associates

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(770)452-0797 fax:(770)936-9171

June 18, 2008

Ms. R. A. Moore  
Engineer, Public Improvements  
Bridges and Structures  
Norfolk Southern Corporation  
1200 Peachtree St.  
Atlanta, GA 30309

**Lucasville, OH      SR 823/US 23 Interchange Bridges over Norfolk Southern  
ODOT Project SCI-823-10.13, PID 79977  
MP N-618.49                                      File BR0086615 / 117-29408**

Dear Ms. Moore:

On June 5, 2008, a site visit was made to the location of the three proposed SR 823/US 23 interchange bridges over the Norfolk Southern double main tracks north of Lucasville, OH. The following are comments made using the plans provided on May 22, 2008. Our comments are as follows:

1. Within the project limits along the railroad, there are no visible railroad utilities, the pole line has been removed, and there are no advertising billboards present on railroad property.
2. At the location of the Ramp "B" overhead bridge, Railroad Station 580+50, there is currently a private grade crossing. This crossing has a 16-foot wide, timber and asphalt type surface. The asphalt has generally been removed in the area of the track, and replaced by ballast. The crossing has a post and chain closure on the east side of the tracks secured by a non-railroad lock. There is a note indicating that the existing drive is to be removed. This crossing should be removed as part of the project once construction begins.
3. Near the grade crossing under proposed Ramp "B", the main track drainage is along the east side of the track. This ditch catches water draining along the farm road, toward the crossing. After the crossing is removed, the ditch along the tracks should be improved by the removal of the old roadway, and the ditch should be continuous.
4. Proposed Channel No. 2, which is south of the Ramp "B" area, is shown as a new ditch from Fairgrounds Road curving under the Ramp "B" structure and flowing into the existing Norfolk Southern ditch near Railroad Station 582+00. This water would then flow north toward the existing concrete culvert under the railroad at Railroad Station 585+70. There is no improvement shown for the existing railroad ditch between Railroad Station 582+00 and 585+70. Since this is additional water, drainage computations should



## STV/Ralph Whitehead Associates

Ms. R. A. Moore  
June 18, 2008  
Files BR0086615  
Page two

- be provided to verify that the ditch and culvert can accept this additional water and still meet the Norfolk Southern's 100-year storm requirements. Improvements made to this ditch should be constructed such that it would not need to be relocated for the installation of the proposed future track shown on the east side of the existing mainline tracks.
5. The existing culvert under the tracks at Railroad Station 585+70 also is shown as accepting water from proposed Channel No. 3. This drainage would need to be analyzed, along with the flows from the existing ditch (including the added flows from proposed Channel No. 2), to verify that the culvert can handle this additional drainage and that it will handle the 100-year storm with both ditches flowing through this culvert.
  6. The existing box culvert at Railroad Station 585+70 is currently clean and free of debris.
  7. The proposed new drainage structure and associated ditches along the tracks at Railroad Station 587+70 will need to be designed for the 100-year storm; it should be verified that the ditches on each side of the tracks are designed so that water stays within the rip-rapped areas of the ditch.
  8. North of the location of the Ramp "C" overhead bridge, Railroad Station 591+25, there is currently a private grade crossing. This crossing has a 16-foot wide, timber and asphalt type surface. The asphalt has generally been removed in the area of the track and replaced by ballast. The crossing has a steel gate closure on the east side of the tracks secured by a non-railroad lock. There is a note indicating that the existing drive is to be removed. This crossing should be removed as part of the project once construction begins, and the drainage ditch along the east side improved to eliminate the existing water ponding near the crossing.
  9. All bridge vertical clearances are greater than the 23' minimum but there are no minimum horizontal clearances indicated. For the curved steel ramp girders the plans include erection plans and sequencing for the girders. The final sections are shown being placed over the tracks with craned located adjacent to the tracks.
  10. The plans include an Erection Sequence Plan which assumes crane types, capacities, and lifting locations. These erection plans are not shown for construction, but as a guide for the contractor. The selected contractor's erection plans will need to be reviewed and approved by Norfolk Southern before proceeding with the erection.
  11. As the plans become further developed, they will need to be reviewed for conformance to current Norfolk Southern criteria. The plans are currently at the Stage 1 Submission level.





## STV/Ralph Whitehead Associates

Ms. R. A. Moore  
June 18, 2008  
Files BR0086615  
Page three

Site photographs were taken during this site visit, and have been placed on the CD that accompanies this report.

If you have further questions or need additional information, please call me at 770-452-0797.

Sincerely yours,

STV Incorporated

George T. Zimmerman, P.E.  
Project Manager

Enclosures



**DESIGNER RESPONSE TO REVIEW COMMENTS**

BY:  
Wolpert  
Jirschele  
Sherk

DATE: 8/31/2010

**Portsmouth Bypass – Stage I Comments**

PROJECT: SCI-823-10.13: Portsmouth Bypass; PID 79977      PROJ. NO: 408549.08.ST.CM  
 REVIEWER: Comments by NSRR (STV/Ralph Whitehead Associates), Letter dated June 18, 2008      PHASE: Preliminary Design  
 Step 8 – Major PDP

Comment No.	Review Comment	Designer Response
	<b>SR 823/US23 Interchange Bridges over Norfolk Southern</b>	
1	Within the project limits along the railroad, there are no visible railroad utilities, the pole line has been removed, and there are no advertising billboards present on railroad property.	Acknowledged.
2	At the location of the Ramp "B" overhead bridge, Railroad Station 580+50, there is currently a private grade crossing. This crossing has a 16-foot wide, timber and asphalt type surface. The asphalt has generally been removed in the area of the track and replaced by ballast. The crossing has a post and chain closure on the east side of the tracks secured by a non-railroad lock. There is a note indicating the existing drive is to be removed. This crossing should be removed as part of the project once construction begins.	The intent of the work associated with the roadway improvements is to only remove the access point to US 23 NB. Any additional removal of the existing drive should be discussed with ODOT.
3	Near the grade crossing under proposed Ramp "B", the main track drainage is along the east side of the track. This ditch catches water draining along the farm road, toward the crossing. After the crossing is removed, the ditch along the tracks should be improved by the removal of the old roadway, and the ditch should be continuous.	The intent of the work associated with the roadway improvements is to only remove the access point to US 23 NB. Any additional removal of the existing drive should be discussed with ODOT.



**DESIGNER RESPONSE TO REVIEW COMMENTS**

BY:  
Wolpert  
Jirschele  
Sherk

DATE: 8/31/2010

## Portsmouth Bypass – Stage I Comments

PROJECT: SCI-823-10.13: Portsmouth Bypass; PID 79977 PROJ. NO: 408549.08.ST.CM

REVIEWER: Comments by NSRR (STV/Ralph Whitehead Associates), Letter dated June 18, 2008 PHASE: Preliminary Design

Step 8 – Major PDP

Comment No.	Review Comment	Designer Response
4	Proposed Channel No. 2, which is south of the Ramp "B" area, is shown as a new ditch from Fairgrounds Road curving under the Ramp "B" structure and flowing into the existing Norfolk Southern ditch near Railroad Station 582+00. This water would then flow north toward the existing concrete culvert under the railroad at Railroad Station 585+70. There is no improvement shown for the existing railroad ditch between Railroad Station 582+00 and 585+70. Since this is additional water, drainage computations should be provided to verify that the ditch and culvert can accept this additional water and still meet the Norfolk Southern's 100-year storm requirements. Improvements made to this ditch should be constructed such that it would not need to be relocated for the installation of the proposed future track shown on the east side of the existing mainline tracks.	Acknowledged. Ditch grading from STA. 582+00 to 585+70 will be coordinated with Norfolk Southern Railway and revised in the next stage of the project.  Calculations for the new drainage patterns were performed for the existing culvert and the 100-year storm requirements were met. The installation of the dual 48" culverts under the NFSS at STA. 587+62 removes a significant amount of flow from the existing culvert.
5	The existing culvert under the tracks at Railroad Station 585+70 also is shown as accepting water from proposed Channel No. 3. This drainage would need to be analyzed, along with the flows from the existing ditch (including the added flows from proposed Channel No. 2), to verify that the culvert can handle this additional drainage and that it will handle the 100-year storm with both ditches flowing through this culvert.	Calculations for the new drainage patterns were performed for the existing culvert and the 100-year storm requirements were met. The installation of the dual 48" culverts under the NFSS at STA. 587+62 removes a significant amount of flow from the existing culvert.





**DESIGNER RESPONSE TO REVIEW COMMENTS**

BY:  
Wolpert  
Jirschele  
Sherk

DATE: 8/31/2010

**Portsmouth Bypass – Stage I Comments**

PROJECT: **SCI-823-10.13: Portsmouth Bypass; PID 79977** PROJ. NO: 408549.08.ST.CM

REVIEWER: **Comments by NSRR (STV/Ralph Whitehead Associates), Letter dated June 18, 2008** PHASE: Preliminary Design

Step 8 – Major PDP

Comment No.	Review Comment	Designer Response
6	The existing box culvert at Railroad Station 585+70 is currently clean and free of debris.	Acknowledged.
7	The proposed new drainage structure and associated ditches along the tracks at Railroad Station 587+70 will need to be designed for the 100-year storm; it should be verified that the ditches on each side of the tracks are designed so that water stays within the rip-rapped areas of the ditch.	Calculations for the new drainage patterns were performed and the dual 48" culverts at STA. 587+62 meet the 100-year storm requirements.
8	North of the location of the Ramp "C" overhead bridge, Railroad Station 591+25, there is currently a private grade crossing. This crossing has a 16-foot wide, timber and asphalt type surface. The asphalt has generally been removed in the area of the track and replaced by ballast. The crossing has a steel gate closure on the east side of the tracks secured by a non-railroad lock. There is a note indicating the existing drive is to be removed. This crossing should be removed as part of the project once construction begins, and the drainage ditch along the east side improved to eliminate the existing water ponding near the crossing.	The intent of the work associated with the roadway improvements is to only remove the access point to US 23 NB. Any additional removal of the existing drive should be discussed with ODOT.
9	All bridge vertical clearances are greater than the 23' minimum but there are no minimum horizontal clearances indicated. For the curved steel ramp girders the plans include erection plans and sequencing for the girders. The final sections are shown being placed over the tracks with cranes located adjacent to the tracks.	The actual horizontal clearances are shown as 25'-0" (minimum) on sheets 833 and 846 for the Ramp B and C bridges. The actual horizontal clearances are shown as 25'-6" and 25'-10" on sheet 841 for the SR 823 bridge.



**DESIGNER RESPONSE TO REVIEW COMMENTS**

BY:  
Wolpert  
Jirschele  
Sherk

DATE: 8/31/2010

## Portsmouth Bypass – Stage I Comments

PROJECT: SCI-823-10.13: Portsmouth Bypass; PID 79977 PROJ. NO: 408549.08.ST.CM

REVIEWER: Comments by NSRR (STV/Ralph Whitehead Associates), Letter dated June 18, 2008 PHASE: Preliminary Design

Step 8 – Major PDP

Comment No.	Review Comment	Designer Response
10	The plans include an Erection Sequence Plan which assumes crane types, capacities, and lifting locations. These erection plans are not shown for construction, but as guide for the contractor. The selected contractor's erection plans will need to be reviewed and approved by Norfolk Southern before proceeding with the erection.	Acknowledged.
11	As the plans become further developed, they will need to be reviewed for conformance to current Norfolk Southern criteria. The plans are currently at the Stage 1 Submission level.	Acknowledged.

-----Original Message-----

From: Wyatt, Dave [<mailto:dave.wyatt@nscorp.com>]  
Sent: Tuesday, June 05, 2007 8:39 AM  
To: Thompson, Shawn/COL  
Subject: RE: RR Minimum Clearances - Portsmouth Bypass Project, OH

Shawn:

As discussed, your interpretation is somewhat confused. The T portion of the cap can not be any closer to the track than 10'-0" if bottom portion is less than 23'-0" above top of rail.

Thanks,

David Wyatt  
System Engineer Public Improvements  
Norfolk Southern Corporation  
1200 Peachtree Street, N.E.  
Atlanta, Georgia 30309

Telephone: 404/529-1641  
Cell Phone: 404/245-2596  
Fax: 404/527-2769  
e-mail: [dave.wyatt@nscorp.com](mailto:dave.wyatt@nscorp.com)

-----Original Message-----

From: [Shawn.Thompson@CH2M.com](mailto:Shawn.Thompson@CH2M.com) [<mailto:Shawn.Thompson@CH2M.com>]  
Sent: Friday, April 13, 2007 4:01 PM  
To: Wyatt, Dave  
Cc: [steve.jirschele@ch2m.com](mailto:steve.jirschele@ch2m.com); [jrcox@transystems.com](mailto:jrcox@transystems.com); [mdweeks@transystems.com](mailto:mdweeks@transystems.com);  
[robert.miller@ch2m.com](mailto:robert.miller@ch2m.com); [Richard.Behrendt@dot.state.oh.us](mailto:Richard.Behrendt@dot.state.oh.us)  
Subject: RR Minimum Clearances - Portsmouth Bypass Project, OH

David,

Good afternoon. I hope you are doing well. Attached is a .pdf drawing showing our interpretation of your criteria for clearances at the US-23/SR-823 Interchange, as we understand them. Both Norfolk Southern and ODOT have clearance requirements. We will use the most conservative requirement, in the event of conflicts or differences between the two agencies.

One thing of note is the location of the T-type pier. Our understanding is that as long as the pier stem is a minimum of 22'-0" from the centerline of the track and 10'-0" high, the pier cap can extend inside of the 22'-0" clearance envelope. Again, due to the two new tracks and the curvature of the ramps, our goal is to shorten the span lengths as much as possible.

At your earliest convenience, please provide a response re: acceptance of our clearance understanding.

Thanks David. Have a great weekend.

Shawn





3

SCI-823-10.13  
PID 79977

**RAILROAD MINIMUM CLEARANCE REQUIREMENTS**

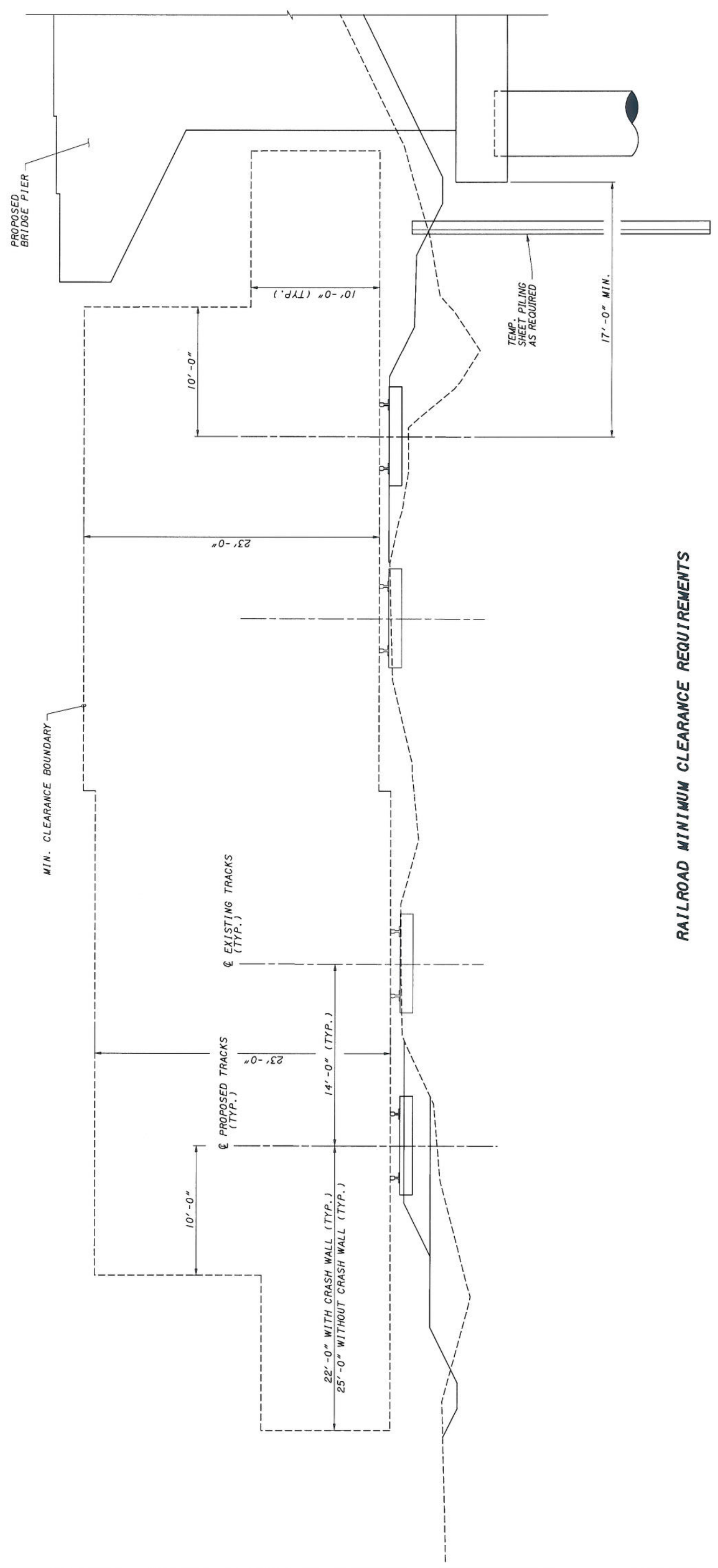
BRIDGE NO. SCI-823-1598  
RAMP B OVER NORFOLK SOUTHERN

DESIGNED	DGS	JBA	REVIEWED	DATE
CHECKED	SCJ	REVISD	STRUCTURE FILE NUMBER	7306776
SCJ/DGS				

CH2MHILL  
DESIGN AGENCY  
1103 SCHROCK ROAD, SUITE 400  
COLUMBUS, OHIO 43228

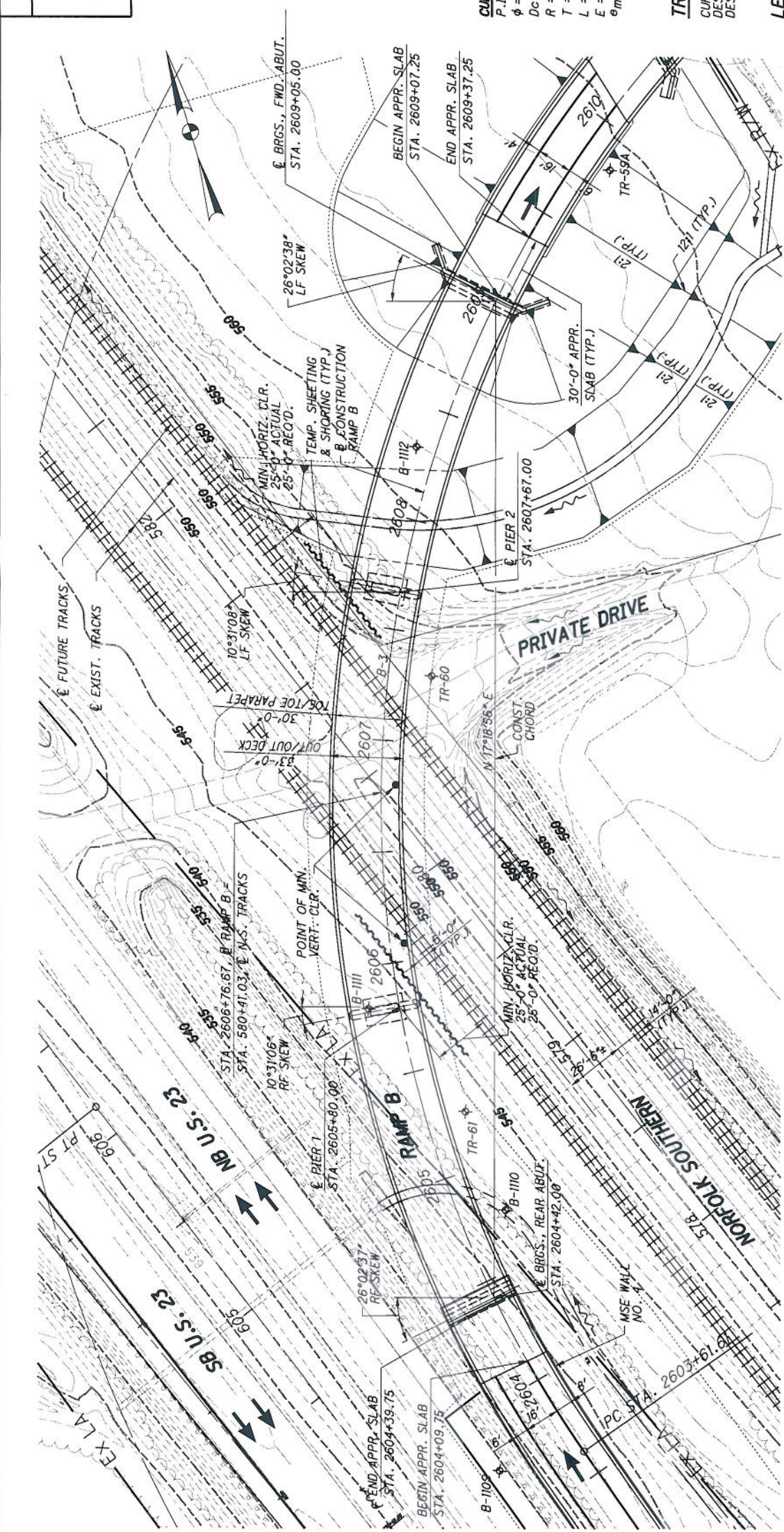
FOR NORFOLK SOUTHERN CORP. APPROVAL  
CH2M HILL, REVISED AUGUST 26, 2010  
SCI-823-0.00 PID 19415

**RAILROAD MINIMUM CLEARANCE REQUIREMENTS**





**BENCHMARKS**



**PLAN**

**CURVE B-3**  
 P.I. STA. = 2609+99.07  
 $\phi = 102^\circ 45' 15''$  (RT.)  
 $DC = 1115' 00''$   
 $R = 509.30'$   
 $T = 637.46'$   
 $L = 913.37'$   
 $E = 306.63'$   
 $\theta_{max} = 0.071$

**TRAFFIC DATA**  
 CURRENT ADT (2010) = 2700  
 DESIGN ADT (2030) = 3600  
 DESIGN ADTT = 500

**LEGEND**

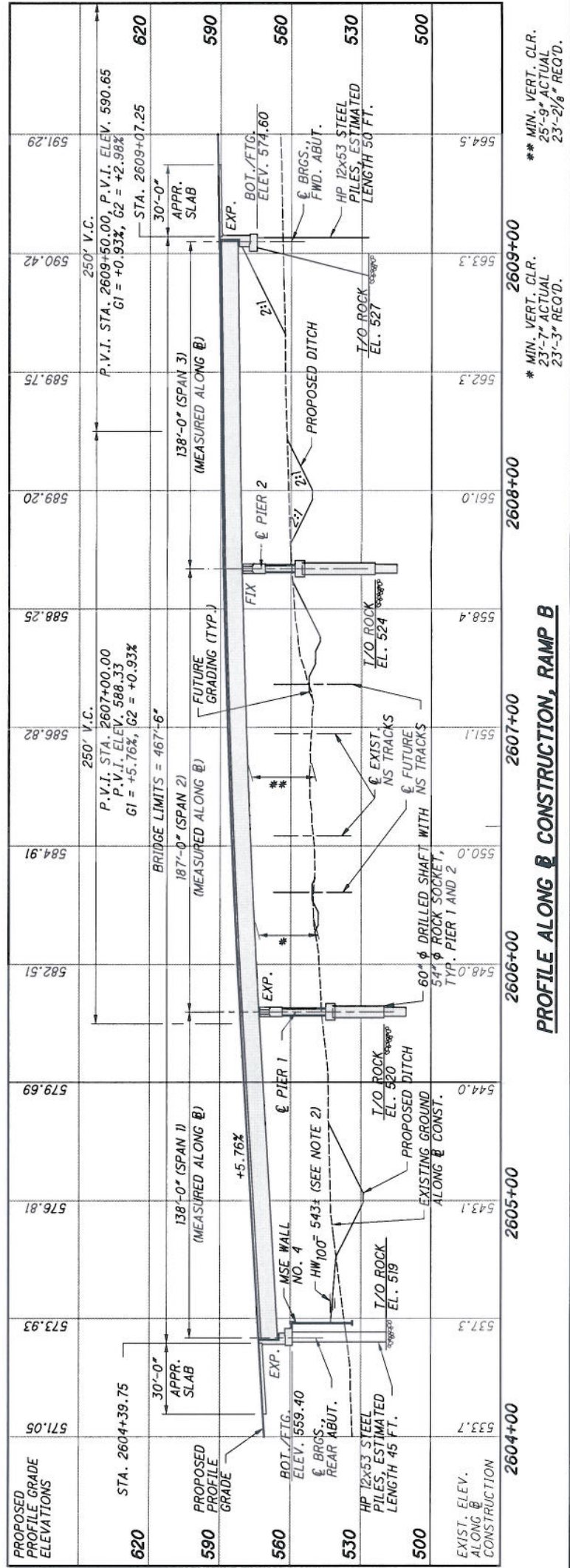
✦ DENOTES SOIL BORING LOCATION

**NOTES:**

- EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
- HIGHWATER (HW) ELEV. 543± IS THE 100 YEAR SCIOTO RIVER BACKWATER ELEVATION AS DETERMINED BY FEMA.

**PROPOSED STRUCTURE**

**TYPE:** THREE SPAN COMPOSITE CURVED STEEL PLATE GIRDERS (WEATHERED ASTM A709, GR 50W) WITH REINFORCED CONCRETE DECK ON JOINTED STUB ABUTMENT ON MSE WALL (REAR) AND JOINTED STUB ABUTMENT BEHIND 2:1 EMBANKMENT (FWD.) WITH T-TYPE PIERS  
**LENGTH OF SPAN:** 130'-7 1/2", 185'-11 1/2", 130'-7 1/2"  
**ROADWAY:** 30'-0" TOE/TOE PARAPETS  
**SIDEWALK:** NONE  
**DESIGN LOADING:** HS25 (CASE II) AND THE ALTERNATE MILITARY LOADING, FWS = 60 LB/FT<sup>2</sup>  
**SKREW:** 26°02'37" RF (REAR ABUTMENT), 10°31'06" RF (PIER 1), 10°31'08" LF (PIER 2), 26°02'38" LF (FORWARD ABUTMENT). MEASURED FROM THE NORMAL TO THE CONSTRUCTION CHORD  
**WEARING SURFACE:** MONOLITHIC CONCRETE  
**APPROACH SLABS:** AS-1-81 (30'-0" LONG)  
**ALIGNMENT:** HORIZONTALLY CURVED (RADIUS= 509.30 FT.)  
**SUPERELEVATION:** 0.071 FT/FT  
**LATITUDE:** N 38°53'28"  
**LONGITUDE:** W 82°59'54"

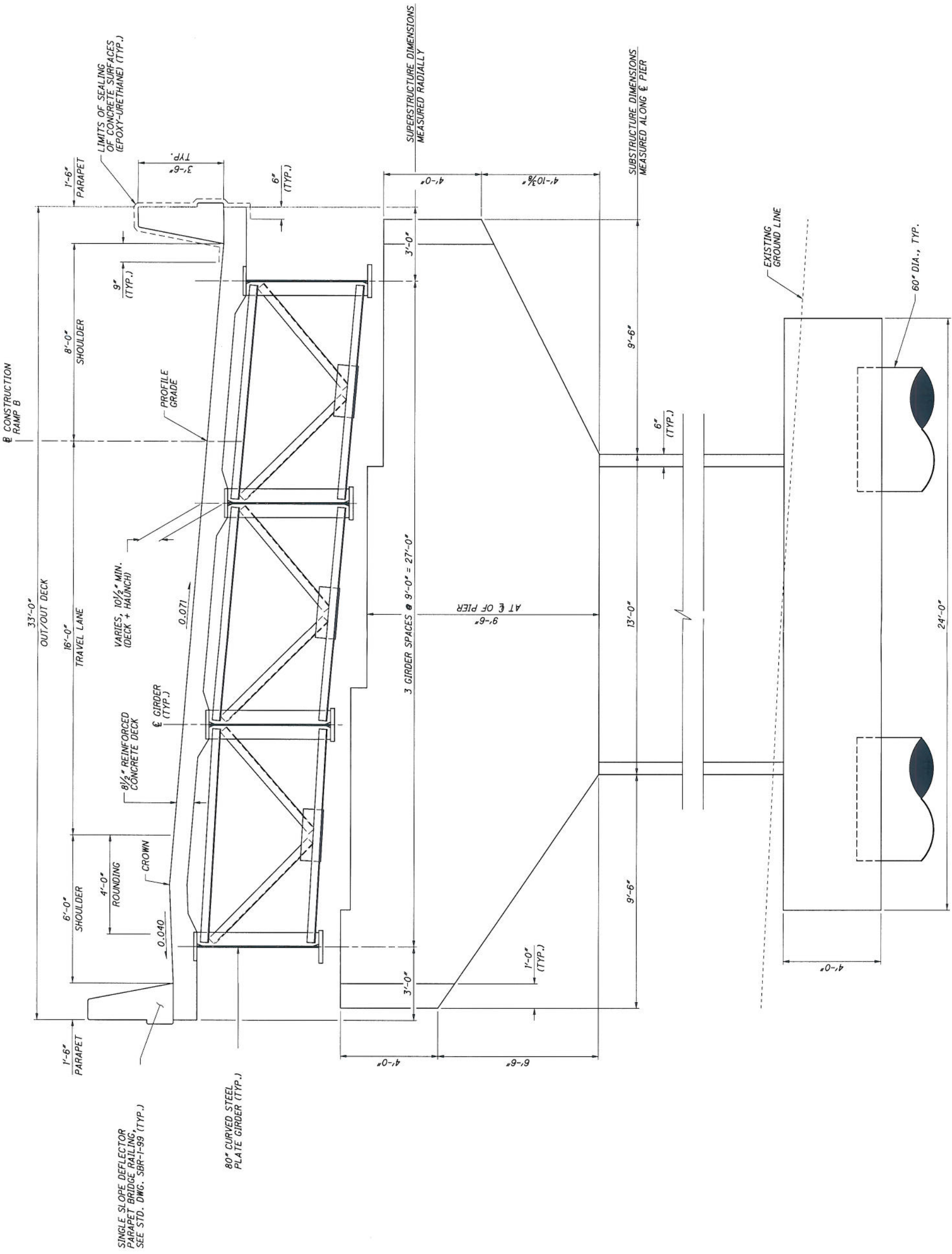


**PROFILE ALONG CENTERLINE CONSTRUCTION, RAMP B**

\*\* MIN. VERT. CLR. 25'-9" ACTUAL 23'-3" REQ'D.  
 \* MIN. VERT. CLR. 23'-7" ACTUAL 23'-3" REQ'D.

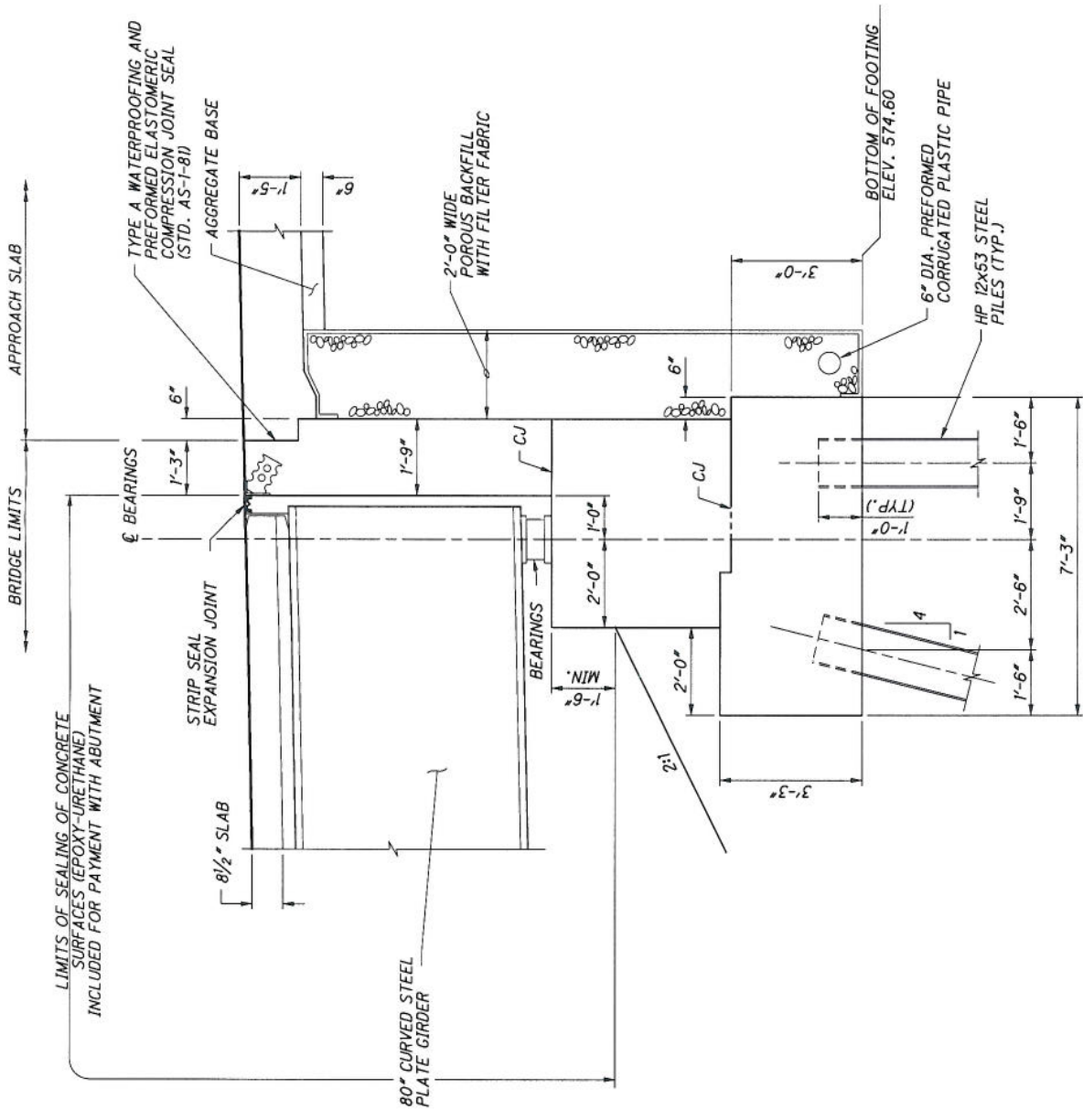


DESIGNED	DGS	JBA	YKN	DATE	REVIEWED
CHECKED	SCJ	SCJ/DGS	STRUCTURE FILE NUMBER	7306776	

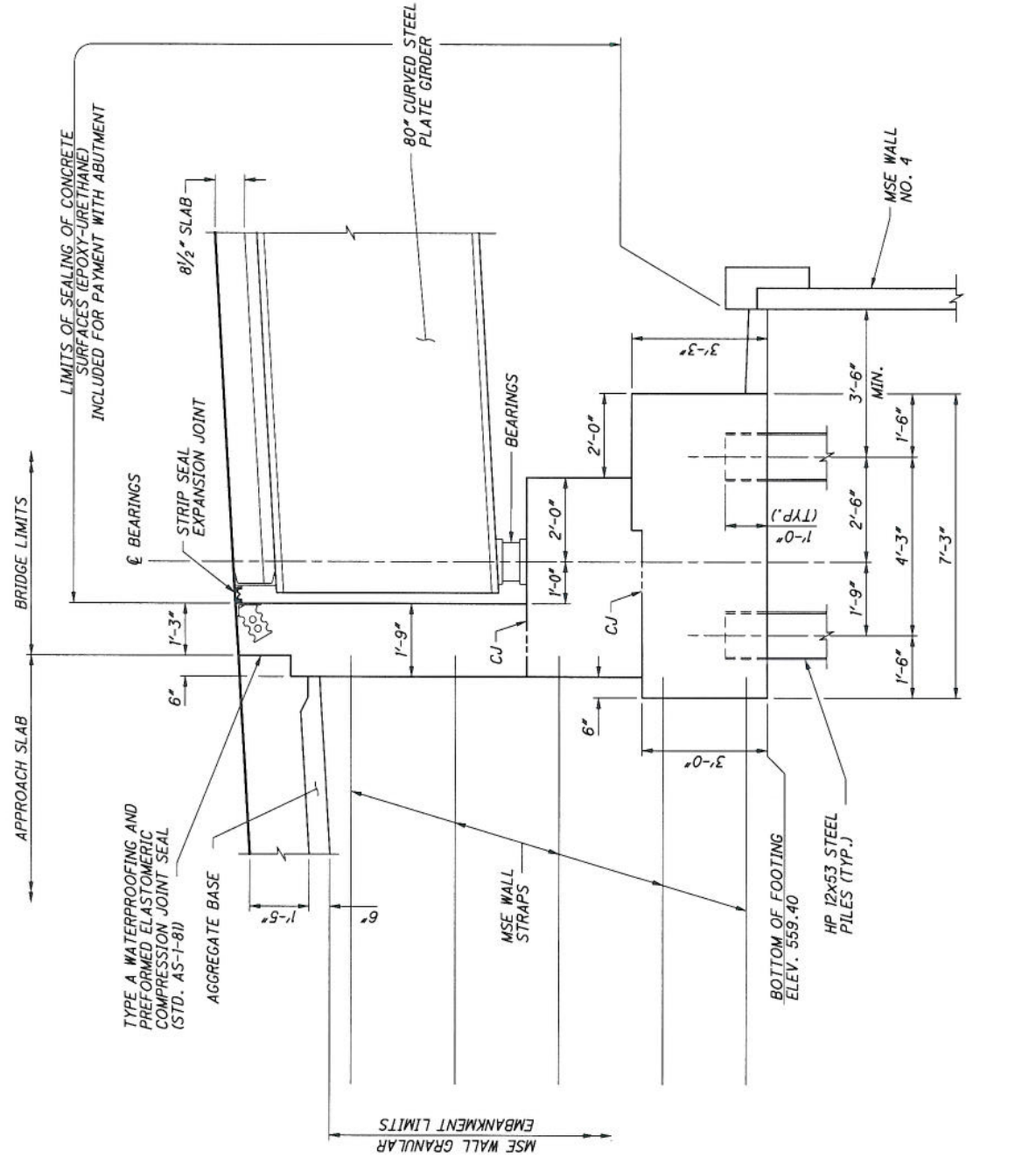


TYPICAL TRANSVERSE SECTION

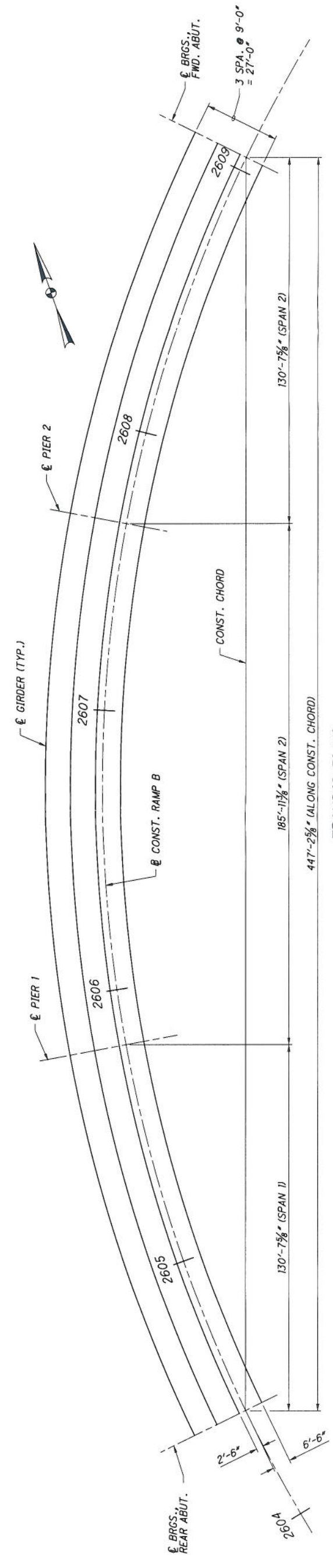




**FORWARD ABUTMENT SECTION**



**REAR ABUTMENT SECTION**



**FRAMING PLAN**