

Structure Type Study

HAS-151-04.85

PID NO. 100038

HAS-151-0485

SR 151 over the Columbus & Ohio River Railroad

Prepared for

Ohio Department of Transportation - District 11

June 2020

Jacobs

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1. Introduction

This report has been prepared by Jacobs for the Ohio Department of Transportation, District 11 to determine the preferred replacement alternative for bridge HAS-151-0485, SR 151 over the Columbus & Ohio River Railroad (CORR). This project will remove and replace the existing continuous slab bridge (HAS-151-0485) carrying SR 151 over CORR, with a new bridge on the existing horizontal alignment. The existing HAS-151-0485 structure is a 17-span, 455' long, heavily skewed bridge carrying traffic over one active CORR track. The new bridge is configured to reduce the total bridge length and minimize adjustments to the SR 151 profile in order to maintain a minimum of 23-foot vertical clearance over the CORR tracks. It also limits impacts to the adjacent intersections at Main Street (east) and SR 212 (west).

Two alternatives were investigated for this Structure Type Study. Both alternatives have been designed to span the existing CORR track and a future track located to the north of the existing track. Alternative 1 includes 2 options. Alternative 1A is a three-span bridge with cast-in-place wall type abutments and two integral concrete straddle bent piers with a curved steel plate girder superstructure. Alternative 1B is identical to alternative 1A, except integral steel straddle bents were utilized for the piers. Alternative 2 is an eight-span continuous slab bridge utilizing spill-through slopes at the abutments and five steel straddle bent piers over the railroad and two traditional capped pile piers outside the clear zone. The span lengths were established using the maximum span configuration provided in ODOT Standard Drawing CS-1-08. With geotechnical exploration deferred until Stage 1, the piers and abutments were assumed to be supported on steel piles similar to the existing bridge foundations.

Each alternative was evaluated with regards to estimated construction cost, horizontal and vertical clearances, projected lifecycle maintenance costs and environmental considerations to facilitate the selection of the most viable type for the bridge replacement.

2. Bridge Transverse Section and Alignment

The bridge will accommodate 4-foot shoulders and two 12-foot lanes (WB & EB SR 151). With 1'-6" single slope deflector parapets and 2" deck extensions on each side, the proposed out-to-out deck width is 35'-4".

The proposed bridge will be constructed on the existing SR 151 horizontal alignment, which consists of a 2°30'00" right curve (2,291.83' radius) across the length of the bridge. The proposed SR 151 profile for Alternative 1 will comprise of a 900-foot crest vertical curve across the bridge, while Alternative 2 will include a 950-foot curve. Profiles were designed to account for the structure depths for the two alternatives. Alternative 2 profile required the largest adjustment compared to the existing profile. The horizontal alignment and proposed profile options satisfy both horizontal and vertical stopping sight distance (SSD) on SR 151 for 50 mph design speed. Although the proposed crest curves for both alternatives provide full 50 mph SSD along SR 151, the minimum required, they do not meet the higher intersection sight distance (ISD) threshold for left turn movements due to the close proximity of the intersections. Intersection sight triangles are, however, not restricted by the proposed structure alternatives. Each of the SR 151 proposed profile alternatives extends beyond the SR 212 and Main Street intersections and require minor profile adjustments on both SR 212 and Main Street to tie down proposed elevations to existing conditions.

The existing CORR track below is on a horizontally curved alignment (3500-foot radius).

3. Proposed Maintenance of Traffic Solution

Stage construction of the new bridge is not required since traffic on SR 151 will be detoured during bridge construction. Coordination will be required with the railroad for erection of the steel girders and work zone access during construction. A minimum 22-foot vertical clearance will be maintained during construction.

4. Evaluation of Proposed Bridge Alternatives

Construction costs for each alternative were developed for identical lengths of improvement along SR 151, equal to the length of the longest alternative (Alternative 2). Estimated construction costs for each alternative include the proposed work between these limits. The removal cost for the existing bridge was not included since it will be the same for both alternatives.

In coordination with District 11 and CORR, the span arrangements are based on the addition of a future railroad track. The centerline of the future track will be located 15 feet north of the existing CORR track centerline.

CORR is a subsidiary of Genesee & Wyoming, Inc (G&W). Per the G&W Public Project Manual (PPM), the minimum vertical clearance required is 23'-0" for structures over railroads. Based on the proposed roadway profile, the minimum vertical clearance for Alternative 1A is 23'-6", Alternative 1B is 23'-1" and 23'-7" for Alternative 2. Upon ODOT's selection of the preferred alternative, the proposed roadway profile will be optimized as necessary.

Per the PPM, crash wall requirements based on the American Railway Engineering and Maintenance-of-Way Association (AREMA) manual shall be followed. AREMA requires a crash wall when a substructure is located 25'-0" or less from the centerline of an adjacent railroad track. For both alternatives, the horizontal distance from the face of the substructures to the centerline of the CORR tracks are 18'-0", the minimum allowed per AREMA and therefore, requires the use of a crash wall.

Deck drainage calculations were not included as part of the STS report and will be evaluated during Stage 1 Design.

A geotechnical investigation was not completed for this bridge but will be completed in future stages. The existing SR 151 bridge, directly adjacent to this proposed structure, is supported on HP 12x53 steel piles. For the purpose of establishing preliminary cost analysis for each alternative, substructures were assumed to be constructed on similar HP 12x53 steel piles

Alternative #1

Alternative 1 consists of 3-spans equal to 90', 111'-3", and 90' measured along the SR 151 centerline of construction, resulting in a total bridge length of 291'-3". The proposed superstructure consists of an 8 1/2" thick, composite reinforced concrete deck supported on five curved steel plate girders. The web depth of the steel plate girders is 52 inches. The steel plate girders will be ASTM A709 Grade 50W steel and will be spaced at 7'-5" center-to-center. The girders will be supported on elastomeric bearing pads at the abutments and multi-rotational bearings at the piers to provide for thermal expansion. The substructures will consist of jointed type wall abutments and integral concrete straddle bent piers oriented radial to the

centerline of SR 151. Abutments and straddle bent columns were placed at the minimum 18'-0" horizontal clearance. Pier column areas were increased per the AREMA "heavy construction" provision, omitting the need for crash walls. Column cross sectional area needs to be greater than 50 square feet (5'-0" x 10'-0" column provided). Once 6'-0" above the top of rail, the column cross sectional area will be reduced to the required area to support the bridge loads. The tall abutment walls will have a thickness greater than 2'-6" and are longer than the 10', which meets the requirements of a crash wall. By placing the face of concrete columns at the 18'-0 clear zone, the integral cap will span less than 60' from center-to-center of column. For Alternative 1A, the pier cap will have an overall depth of 7'-6" and width of 5'-0". Preliminary design indicates the cap can be reinforced with traditional reinforcing steel. By avoiding a post-tensioned cap, multi-rotational bearings will not be needed at the straddle bents resulting in "simple" connections of the cap to the column and girders. With a reinforced concrete cap, the bent will not be designated fracture critical, avoiding costs of in-depth field inspections every 2 years over the life of the bridge. No special designs will be needed at the girder/cap interface for fatigue. While the traditional concrete cap has many benefits, a post-tensioned straddle bent designed for zero tension under live load will have a superior service life, minimizing concrete cracking. A normally reinforced concrete pier cap was selected for this alternative. Stub abutments supported on MSE Walls were initially considered. However, by utilizing wall type abutments, the bridge end spans were shortened by over 20'. Furthermore, with MSE walls located beyond the 25' clear zone, the wall reinforced soil zone was primarily founded in the existing spill through requiring substantial excavation.

For Alternative 1B, a 66" deep steel girder straddle bent was considered. The benefit to the steel girder is it will eliminate the need for temporary falsework being placed adjacent to the existing tracks. Additionally, formwork for the cast-in-place concrete over the railroad will be avoided. Construction time for the two straddle bents will be significantly reduced. Special steel details will be necessary for the integral connection between the superstructure steel girders and the steel bent. A transverse section showing the integral steel cap is shown in Appendix C.

A precast invert tee cap with prestressed concrete beams and link slab was evaluated for Alternative 1. This is a detail commonly used by the Texas Department of Transportation (See Appendix F). With the slight horizontal curve, chorded concrete beams could be used for the superstructure. This option was eliminated from consideration as it would be very expensive to ship and erect. The precast cap potentially could weigh between 300 to 400 kips. Cranes erecting over the railroad are required to have 150% capacity, thus requiring a pair of 200-ton cranes with a large boom to lift the unit over tracks. In order to avoid a deck joint at the precast straddle bent, a link slab detail would need to be utilized for deck continuity. Link slabs have been used in Ohio but it is not common practice. One of the main reasons for considering a precast cap was to eliminate falsework needed to place concrete for the cast-in-place option over the railroad. Through discussions with a local contractor, we believe temporary towers can be placed on either side of the existing track at a 10' minimum offset on both sides of the straddle bent. This should allow enough clearance to support the proposed girders and construct formwork for the concrete cap, while maintaining 22'-0" of vertical clearance during construction.

Alternative #2

This alternative consists of 8-spans of 46', 6 spans of 57'-6", and 46' measured along the SR 151 centerline of construction for a total bridge length of 457'-0". The proposed superstructure is comprised of a 27" thick, continuous reinforced concrete deck detailed per ODOT Standard Drawing CS-1-08. The maximum spans were utilized to minimize the number of substructure units, specifically the number of straddle bents over

the railroad. Abutments will be capped pile abutments per ODOT Standard Drawing CPA-1-08. The five piers spanning over the railroad (and future tracks) will be 96" deep steel girder straddle bents with the concrete slab cast directly on the top flange. Like Alternative 1, it was deemed beneficial to place the pier columns at the minimum 18'-0" horizontal offset using the "heavy construction" criteria. The two piers adjacent to the abutments will be capped pile piers per ODOT Standard Drawing CPP-1-08. All substructure units are oriented on the same bearing angle resulting in varying skew angles from 12° to 23° measured normal to the centerline of SR 151. This was established by placing the straddle bents normal to the centerline of the existing railroad track.

Alternative 2 has the longest overall bridge length. Additional project work beyond Alternative 2 was not included in this cost estimate. A segment of retaining wall will need to continue from the retaining walls along the southeast and northwest shoulders for SR 151, shown in the Alternative 1A site plan.

5. Estimated Construction Cost

The estimated construction cost of the proposed work for this structure was calculated for the alternatives under consideration. The construction costs were estimated using the ODOT Historical Bid Data Item Search (2016-2020) and escalated using ODOT's Business Plan Inflation Calculator assuming a construction mid-point date of January 1, 2023.

Life cycle costs are included and a detailed, itemized cost estimate for each structure alternative is included in **Appendix A**.

The estimated construction cost for each of the Alternatives is summarized as follows:

Alternative	Structure Description	2023 Subtotal (Cost + Contingency)	Life Cycle Cost	Total Ownership Cost
1A	3-Span 52" Web Steel Plate Girders with Concrete Straddle Bent	\$5,472,000	\$1,720,000	\$7,192,000
1B	3-Span 52" Web Steel Plate Girders with Steel Straddle Bent	\$5,285,000	\$1,708,000	\$6,993,000
2	8-Span 27" Thick Continuous Slab Bridge with Steel Straddle Bent	\$7,114,000	\$3,408,000	\$10,522,000

6. Conclusions and Recommendations

Three structural solutions for the SR 151 Bridge over CORR were evaluated for the Structure Type Study report. Initial construction and total ownership cost for both Alternatives 1A and 1B are similar, while Alternative 2 has a substantially higher overall cost. In addition to a slightly lower ownership cost, Alternatives 1A and 1B provide a shorter and shallower structure that minimizes the impacts to the adjacent intersections at Main Street and SR 212. Since Alternative 1A utilizes a traditional concrete cap,

the piers are not considered a fracture critical member simplifying future maintenance and bridge inspections. For these reasons, **Alternative #1A is recommended for the proposed structure type.**

7. Subsurface Conditions and Foundation Recommendations

A geotechnical investigation has not been completed for this bridge but will be completed in subsequent stages. As previously stated, the adjacent existing SR 151 bridge is supported by HP 12x53 steel piles. For the purpose of the Structure Type Study, HP 12x53 piles were assumed for use.

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS
 PRELIMINARY CONSTRUCTION COST ESTIMATE

ITEM	EXTENSION	ITEM DESCRIPTION	TOTAL QUANTITY	UNIT	2019 UNIT PRICE ¹	2023 UNIT PRICE ²	TOTAL 2023 CONSTRUCTION COST
202	11002	STRUCTURE REMOVED, OVER 20 FOOT SPAN	1	LS	\$330,000.00	\$375,000.00	\$375,000
505	11100	PILE DRIVING EQUIPMENT MOBILIZATION	1	LS	\$21,000.00	\$23,900.00	\$23,900
507	00200	STEEL PILES HP12X53, FURNISHED	1540	FT	\$31.00	\$36.00	\$55,500
507	00250	STEEL PILES HP12X53, DRIVEN	1260	FT	\$11.60	\$14.00	\$17,700
509	10000	EPOXY COATED REINFORCING STEEL	364260	LB	\$1.77	\$2.02	\$735,900
511	34446	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK	299	CY	\$690.00	\$790.00	\$236,300
511	34450	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)	174	CY	\$640.00	\$730.00	\$127,100
511	41012	CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS	321	CY	\$1,000.00	\$1,140.00	\$365,600
511	44112	CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING	345	CY	\$650.00	\$740.00	\$255,000
511	46512	CLASS QC1 CONCRETE WITH QC/QA, FOOTING	508	CY	\$400.00	\$460.00	\$233,900
512	10100	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	1627	SY	\$31.90	\$37.00	\$60,200
513	10300	STRUCTURAL STEEL MEMBERS, LEVEL 5	380950	LB	\$1.78	\$2.03	\$773,400
513	10301	STRUCTURAL STEEL MEMBERS, SPECIALIZED MULTI ROTATIONAL BEARING (SMR), LEVEL UF, AS PER PLAN	4	EACH	\$4,000.00	\$4,600.00	\$18,400
514	00060	FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	2316	SF	\$6.26	\$7.12	\$16,500
514	00066	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	2316	SF	\$5.43	\$6.17	\$14,300
516	11120	STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	71	FT	\$490.00	\$560.00	\$39,800
516	44100	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	10	EACH	\$1,040.00	\$1,190.00	\$11,900
518	21200	POROUS BACKFILL WITH GEOTEXTILE FABRIC	313	CY	\$100.00	\$114.00	\$35,700
526	30010	REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=17")	214	SY	\$270.00	\$310.00	\$66,400
		RETAINING WALLS INCLUDING PARAPETS ⁴	1	LS	\$471,000.00	\$535,100.00	\$535,100
		SR 151 ROADWAY ⁵	0.23	MILE	\$1,800,000.00	\$2,100,000.00	\$490,500
		SR 212 ROADWAY ⁵	0.02	MILE	\$1,800,000.00	\$2,100,000.00	\$43,800
SUBTOTAL:							\$4,531,900
INCIDENTAL %: 5%							\$226,595
CONTINGENCY %: 15%							\$713,774
Total Cost (2023)							\$5,472,000
Life Cycle Cost							\$1,720,000
Total Ownership Cost							\$7,192,000

- Utilized ODOT Historical Bid Data Item Search (2016-2020), where possible.
- Annual inflation rates were determined based on ODOT's Business Plan Inflation Calculator assuming the construction mid-point date of 1/1/2023.
- Pier Above Footing unit cost increased by 25% to account straddle bent cap complex formwork
- Quantities for cast-in-place retaining walls begin at the end of approach slabs.
See Quantity calcs for summary of Retaining Wall unit cost
- Roadway cost per mile is based on 2-12' lanes and 4' shoulders

Assumed Annual Inflation (%) ²	13.6%
Unit Price Basis Year	2019
Assumed Construction Year	2023

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BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS
 LIFE CYCLE ANALYSIS

75-YEAR LIFE ESTIMATE: **\$1,720,000**

Date	Year	Repair Work	Est. Cost
2023	0	New Bridge Constructed	\$0.00
2028	5	Patching & maintenance of deck	\$42,613.31
2033	10		
2038	15		
2043	20		
2043	20	Deck overlay, patching of concrete substructures	\$132,033.27
2048	25	Painting of steels girders	\$109,048.53
2053	30	Patching & maintenance of deck	\$42,613.31
2058	35		
2063	40	Deck replacement (including all bearings and approach slabs), patching of concrete substructures	\$1,067,300.00
2068	45		
2073	50	Patching & maintenance of deck, painting of steel girders	\$151,661.84
2078	55		
2083	60	Deck overlay, patching of concrete substructures	\$132,033.27
2088	65		
2093	70	Patching & maintenance of deck	\$42,613.31
2098	75		
SALVAGE VALUE (based on 0-year remaining life of bridge)			\$0.00

TOTAL

\$1,720,000

Assumptions:

Maintenance Costs

Patching & maintenance of deck assumes 5% of deck patched every 10 years
 Deck Overlay (microsilica w/hydro)
 Deck Replacement includes deck, parapets, approach slabs, and removals
 Patching of Concrete Substructures

Expected Service Life

	<u>Years</u>
Structure Life	75
Deck Replacement	40
Paint steel girders ends at bearings	25
Concrete Deck Overlay	20
Patching of Concrete Substructures	20
Patching & maintenance of deck	10

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1B - 3-SPAN 52" WEB DEPTH PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS
 PRELIMINARY CONSTRUCTION COST ESTIMATE

ITEM	EXTENSION	ITEM DESCRIPTION	TOTAL QUANTITY	UNIT	2019 UNIT PRICE ¹	2023 UNIT PRICE ²	TOTAL 2023 CONSTRUCTION COST	
202	11002	STRUCTURE REMOVED, OVER 20 FOOT SPAN	1	LS	\$330,000.00	\$375,000.00	\$375,000	
505	11100	PILE DRIVING EQUIPMENT MOBILIZATION	1	LS	\$21,000.00	\$23,900.00	\$23,900	
507	00200	STEEL PILES HP12X53, FURNISHED	1680	FT	\$31.00	\$36.00	\$60,500	
507	00250	STEEL PILES HP12X53, DRIVEN	1440	FT	\$11.60	\$14.00	\$20,200	
509	10000	EPOXY COATED REINFORCING STEEL	317965	LB	\$1.77	\$2.02	\$642,300	
511	34446	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK	299	CY	\$690.00	\$790.00	\$236,300	
511	34450	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)	174	CY	\$640.00	\$730.00	\$127,100	
511	41012	CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS	130	CY	\$800.00	\$910.00	\$118,400	
511	44112	CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING	345	CY	\$650.00	\$740.00	\$255,000	
511	46512	CLASS QC1 CONCRETE WITH QC/QA, FOOTING	508	CY	\$400.00	\$460.00	\$233,900	
512	10100	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	1421	SY	\$31.90	\$37.00	\$52,600	
513	10300	STRUCTURAL STEEL MEMBERS, LEVEL 5	380950	LB	\$1.78	\$2.03	\$773,400	
513	10301	STRUCTURAL STEEL MEMBERS, LEVEL 5, AS PER PLAN	129270	LB	\$1.78	\$2.03	\$262,500	
513	15001	STRUCTURAL STEEL MEMBERS, SPECIALIZED MULTI ROTATIONAL BEARING (SMR), LEVEL UF, AS PER PLAN	4	EACH	\$4,000.00	\$4,600.00	\$18,400	
514	00060	FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	2316	SF	\$6.26	\$7.12	\$16,500	
514	00066	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	2316	SF	\$5.43	\$6.17	\$14,300	
516	11120	STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	71	FT	\$490.00	\$560.00	\$39,800	
516	44100	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	10	EACH	\$1,040.00	\$1,190.00	\$11,900	
518	21200	POROUS BACKFILL WITH GEOTEXTILE FABRIC	313	CY	\$100.00	\$114.00	\$35,700	
526	30010	REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=17")	214	SY	\$270.00	\$310.00	\$66,400	
		RETAINING WALLS INCLUDING PARAPETS ³	1	LS	\$471,000.00	\$535,100.00	\$535,100	
		SR 151 ROADWAY ⁴	0.23	MILE	\$1,800,000.00	\$1,800,000.00	\$420,500	
		SR 212 ROADWAY ⁴	0.02	MILE	\$1,800,000.00	\$1,800,000.00	\$37,500	
SUBTOTAL:							\$4,377,200	
						INCIDENTAL %:	5%	\$218,860
						CONTINGENCY %:	15%	\$689,409
Total Cost (2023)							\$5,285,000	
Life Cycle Cost							\$1,708,000	
Total Ownership Cost							\$6,993,000	

- Utilized ODOT Historical Bid Data Item Search (2016-2020), where possible.
- Annual inflation rates were determined based on ODOT's Business Plan Inflation Calculator assuming the construction mid-point date of 1/1/2023.
- Quantities for cast-in-place retaining walls begin at the end of approach slabs.
See Quantity calcs for summary of Retaining Wall unit cost
- Roadway cost per mile is based on 2-12' lanes and 4' shoulders

Assumed Annual Inflation (%) ²	13.6%
Unit Price Basis Year	2019
Assumed Construction Year	2023

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BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)

ALTERNATIVE 1B - 3-SPAN 52" WEB DEPTH PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS

LIFE CYCLE ANALYSIS

75-YEAR LIFE ESTIMATE: **\$1,708,000**

Date	Year	Repair Work	Est. Cost
2023	0	New Bridge Constructed	\$0.00
2028	5		
2033	10	Patching & maintenance of deck	\$42,613.31
2038	15		
2043	20	Deck overlay, patching of concrete substructures	\$128,833.27
2048	25	Painting of steels girders	\$109,048.53
2053	30	Patching & maintenance of deck	\$42,613.31
2058	35		
2063	40	Deck replacement (including all bearings and approach slabs), patching of concrete substructures	\$1,061,100.00
2068	45		
2073	50	Patching & maintenance of deck, painting of steel girders	\$151,661.84
2078	55		
2083	60	Deck overlay, patching of concrete substructures	\$128,833.27
2088	65		
2093	70	Patching & maintenance of deck	\$42,613.31
2098	75		
SALVAGE VALUE (based on 0-year remaining life of bridge)			\$0.00

TOTAL

\$1,708,000

Assumptions:

Maintenance Costs

Patching & maintenance of deck assumes 5% of deck patched every 10 years
 Deck Overlay (microsilica w/hydro)
 Deck Replacement includes deck, parapets, approach slabs, and removals
 Patching of Concrete Substructures

Expected Service Life

	<u>Years</u>
Structure Life	75
Deck Replacement	40
Paint steel girders ends at bearings	25
Concrete Deck Overlay	20
Patching of Concrete Substructures	20
Patching & maintenance of deck	10

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
 PRELIMINARY CONSTRUCTION COST ESTIMATE

ITEM	EXTENSION	ITEM DESCRIPTION	TOTAL QUANTITY	UNIT	2019 UNIT PRICE ¹	2023 UNIT PRICE ²	TOTAL 2023 CONSTRUCTION COST
202	11002	STRUCTURE REMOVED, OVER 20 FOOT SPAN	1	LS	\$330,000.00	\$375,000.00	\$375,000
505	11100	PILE DRIVING EQUIPMENT MOBILIZATION	1	LS	\$21,000.00	\$23,900.00	\$23,900
507	00200	STEEL PILES HP12X53, FURNISHED	6230	FT	\$31.00	\$36.00	\$224,300
507	00250	STEEL PILES HP12X53, DRIVEN	3615	FT	\$11.60	\$14.00	\$50,700
509	10000	EPOXY COATED REINFORCING STEEL	690487	LB	\$1.77	\$2.02	\$1,394,800
511	32210	CLASS QC2 CONCRETE, SUPERSTRUCTURE	1292	CY	\$900.00	\$1,030.00	\$1,330,800
511	34450	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)	297	CY	\$640.00	\$730.00	\$216,900
511	41012	CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS	556	CY	\$800.00	\$910.00	\$505,900
511	43512	CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT INCLUDING FOOTING	142	CY	\$590.00	\$680.00	\$96,700
511	46512	CLASS QC1 CONCRETE WITH QC/QA, FOOTING	492	CY	\$400.00	\$460.00	\$226,600
512	10100	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	1981	SY	\$31.90	\$37.00	\$73,300
513	10301	STRUCTURAL STEEL MEMBERS, LEVEL 5, AS PER PLAN	283760	LB	\$1.78	\$2.03	\$576,100
513	15001	STRUCTURAL STEEL MEMBERS, SPECIALIZED MULTI ROTATIONAL BEARING (SMR), LEVEL UF, AS PER PLAN	12	EACH	\$4,000.00	\$4,600.00	\$55,200
518	21200	POROUS BACKFILL WITH GEOTEXTILE FABRIC	123	CY	\$100.00	\$114.00	\$14,100
526	25010	REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=15")	178	SY	\$270.00	\$310.00	\$55,200
		RETAINING WALLS INCLUDING PARAPETS ³	1	LS	\$160,000.00	\$181,800.00	\$181,800
		SR 151 ROADWAY ⁴	0.21	MILE	\$1,800,000.00	\$2,100,000.00	\$446,100
		SR 212 ROADWAY ⁴	0.02	MILE	\$1,800,000.00	\$2,100,000.00	\$43,800
SUBTOTAL:							\$5,891,200
INCIDENTAL %: 5%							\$294,560
CONTINGENCY %: 15%							\$927,864
Total Cost (2023)							\$7,114,000
Life Cycle Cost							\$3,408,000
Total Ownership Cost							\$10,522,000

- Utilized ODOT Historical Bid Data Item Search (2016-2020), where possible.
- Annual inflation rates were determined based on ODOT's Business Plan Inflation Calculator assuming the construction mid-point date of 1/1/2023.
- Quantities for cast-in-place retaining walls begin at the end of approach slabs.
See Quantity calcs for summary of Retaining Wall unit cost
- Roadway cost per mile is based on 2-12' lanes and 4' shoulders

Assumed Annual Inflation (%) ²	13.6%
Unit Price Basis Year	2019
Assumed Construction Year	2023

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
 LIFE CYCLE ANALYSIS

75-YEAR LIFE ESTIMATE: **\$3,408,000**

Date	Year	Repair Work	Est. Cost
2023	0	New Bridge Constructed	\$0.00
2028	5		
2033	10	Patching & maintenance of deck	\$52,142.19
2038	15		
2043	20	Deck overlay, patching of concrete substructures	\$158,367.80
2048	25	Painting of steels girders	\$0.00
2053	30	Patching & maintenance of deck	\$52,142.19
2058	35		
2063	40	Deck replacement (including all bearings and approach slabs), patching of concrete substructures	\$2,882,000.00
2068	45		
2073	50	Patching & maintenance of deck, painting of steel girders	\$52,142.19
2078	55		
2083	60	Deck overlay, patching of concrete substructures	\$158,367.80
2088	65		
2093	70	Patching & maintenance of deck	\$52,142.19
2098	75		
SALVAGE VALUE (based on 0-year remaining life of bridge)			\$0.00

TOTAL

\$3,408,000

Assumptions:

Maintenance Costs

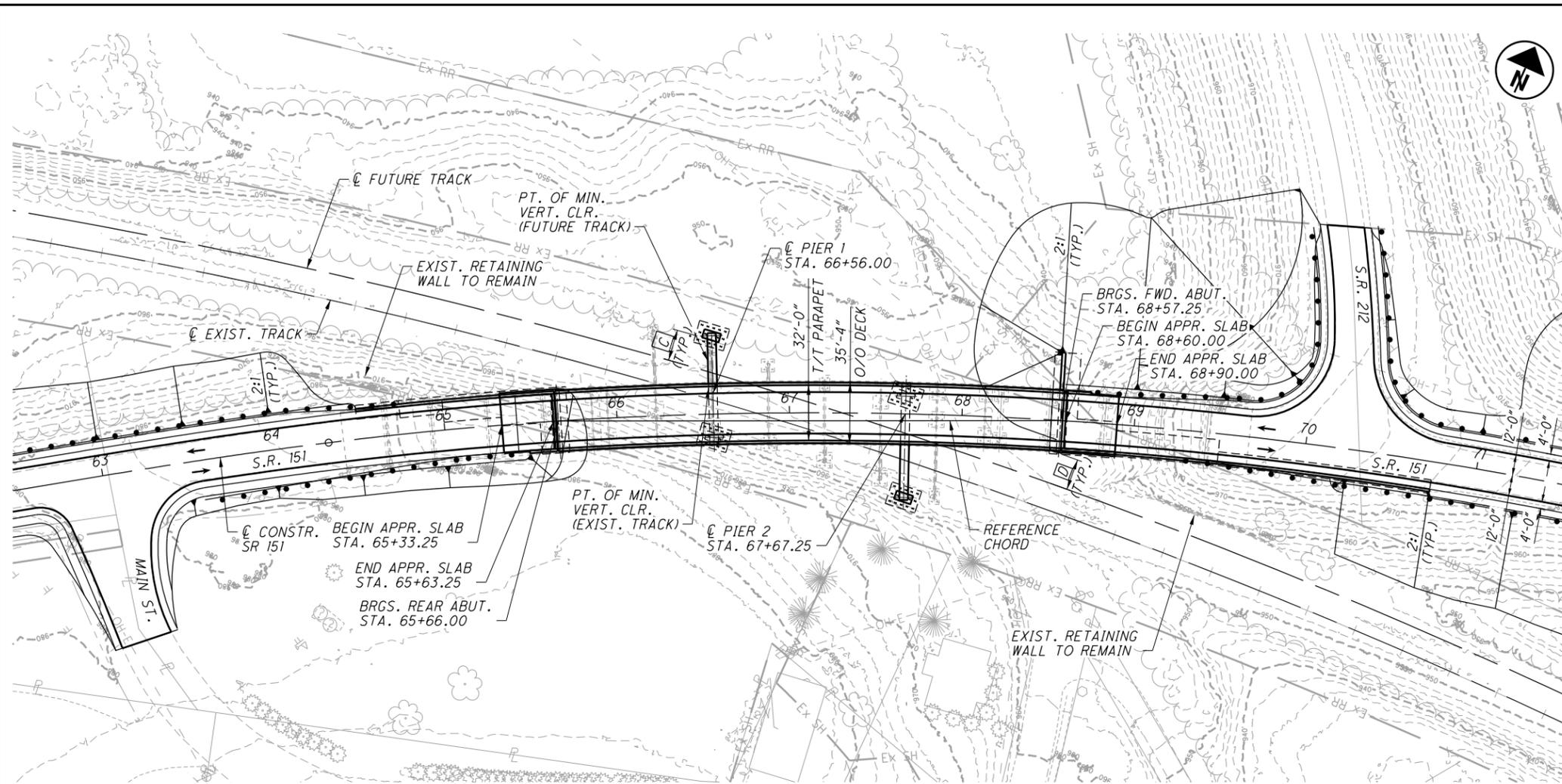
Patching & maintenance of deck assumes 5% of deck patched every 10 years
 Deck Overlay (microsilica w/hydro)
 Deck Replacement includes deck, parapets, approach slabs, and removals
 Patching of Concrete Substructures

Expected Service Life

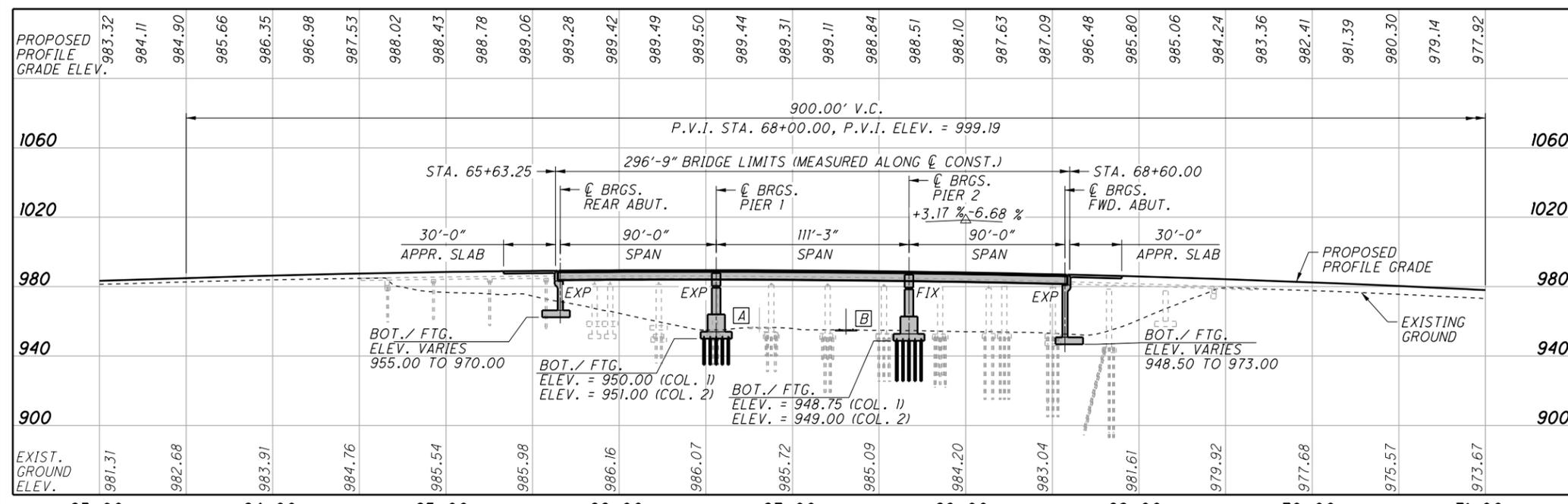
Years

Structure Life 75
 Deck Replacement 40
 Paint steel girders ends at bearings 25
 Concrete Deck Overlay 20
 Patching of Concrete Substructures 20
 Patching & maintenance of deck 10

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PLAN



PROFILE ALONG C CONSTRUCTION

BENCHMARK DATA	
BENCHMARK DATA TO BE ESTABLISHED DURING SUBSEQUENT STAGES OF DESIGN	

FOR ADDITIONAL BENCHMARK INFORMATION. SEE ROADWAY PLAN SHEET

NOTES
 1. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

DESIGN TRAFFIC:
 2021 ADT = 3200 2021 ADTT = 224
 2041 ADT = 3200 2041 ADTT = 224
 DIRECTIONAL DISTRIBUTION = 0.57

HORIZONTAL CURVE DATA
 P.I. STA. = 70+97.88 ST= 66.68'
 $\Delta = 36^\circ 56' 00''$ RT. Lc= 1277.33'
 $Dc = 2^\circ 30' 00''$ Ts= 865.59'
 $R = 2,291.83'$ Es= 125.18'
 $Ls = 200.00'$ emax=4.6%
 $Os = 02^\circ 30' 00''$
 $Lt = 133.35'$

MINIMUM VERTICAL CLEARANCE:
 A = 23'-8" PROVIDED, 23'-0" REQUIRED (EXIST. TRACK)
 B = 23'-6" PROVIDED, 23'-0" REQUIRED (FUTURE TRACK)

MINIMUM HORIZONTAL CLEARANCE:
 C = 18'-0" MIN. ACTUAL, 18'-0" REQUIRED
 D = 18'-0" MIN. ACTUAL, 18'-0" REQUIRED

EXISTING STRUCTURE
 TYPE: CONTINUOUS REINFORCED CONCRETE SLAB WITH CAPPED PILE AND REINFORCED CONCRETE SUBSTRUCTURE.
 SPANS: 26'-1/2"±, 2 @ 32'-6"±, 28'-0"±, 9'-0"±, 28'-0"±, 5 @ 32'-6"±, 28'-0"±, 9'-0"±, 28'-0"±, 2 @ 32'-6"±, 27'-2 1/2"±
 ROADWAY: 32'-6" F/F RAILING
 LOADING: HS20-44 AND THE ALTERNATE MILITARY LOADING
 SKEW: NONE
 WEARING SURFACE: 2 1/4"± MICRO-SILICA MODIFIED CONCRETE
 APPROACH SLABS: AS-1-81 (REAR 15'-0" LONG, FWD. 25'-0" LONG)
 ALIGNMENT: 2°30'± CURVE RIGHT
 SUPERELEVATION: 4.0% ±
 STRUCTURAL FILE NUMBER: 3402010
 DATE BUILT: 1958
 DISPOSITION: TO BE REMOVED

PROPOSED STRUCTURE
 TYPE: 3-SPAN CURVED STEEL PLATE GIRDER (ASTM A709, GR 50W) WITH REINFORCED CONCRETE DECK, CAST-IN-PLACE WALL TYPE ABUTMENTS, INTEGRAL POST-TENSIONED STRADDLE PIERS
 SPANS: 90'-0", 111'-3", 90'-0" C/C BEARINGS (ALONG REFERENCE CHORD)
 ROADWAY: 32'-0" TOE/TOE PARAPET
 LOADING: HL-93 FWS LOADING: 60 PSF
 SKEW: NONE (RADIAL)
 APPROACH SLABS: 30'-0" LONG (AS-1-15 MODIFIED) & AS-2-15 INSTALLATION
 WEARING SURFACE: 1" MONOLITHIC CONCRETE
 ALIGNMENT: 2°30'00" RIGHT CURVE
 SUPERELEVATION: 4.6%
 STRUCTURAL FILE NUMBER: 3402011
 COORDINATES: LATITUDE N 40°25'40.2"
 LONGITUDE W 81°11'29.8"

DESIGN AGENCY: **Jacobs**
 2 CROWNE POINT COURT
 CINCINNATI, OHIO 45241

DATE: 04/20
 REVIEWED: DYB
 STRUCTURE FILE NUMBER: 3402011

DRAWN: JTC
 CHECKED: SGW

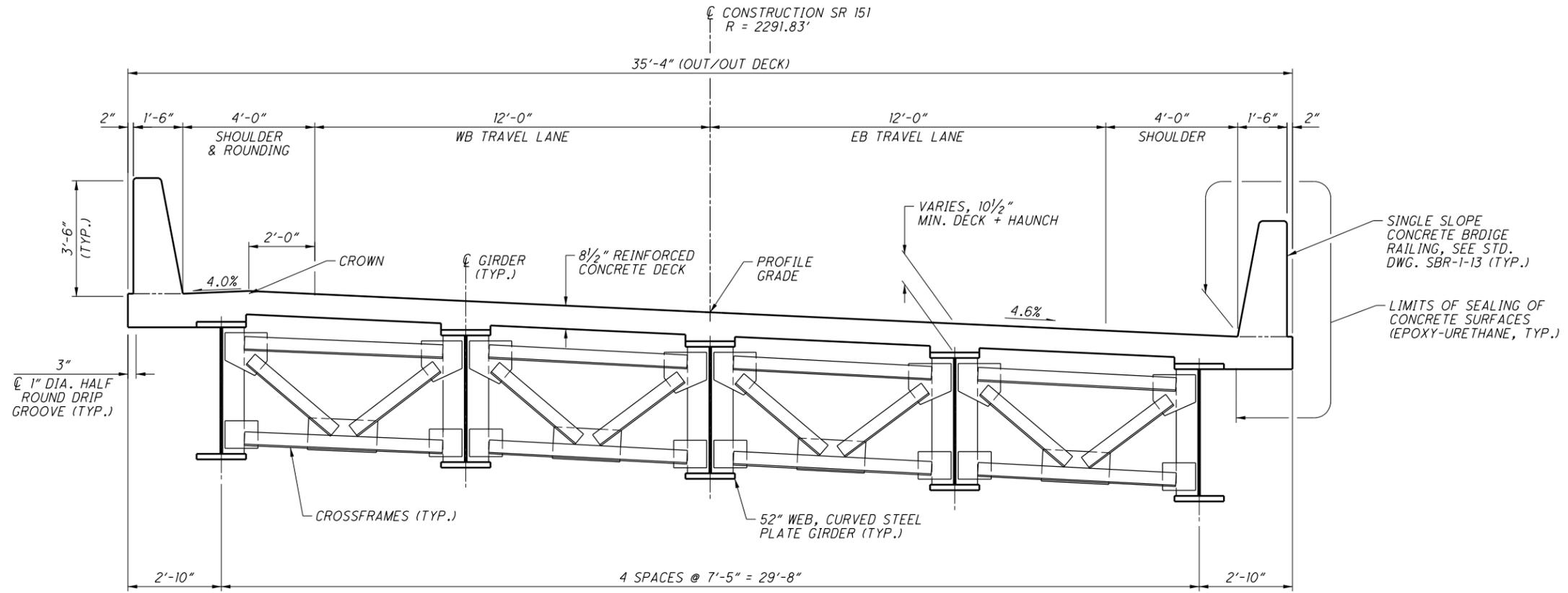
HARRISON COUNTY
 STA. 65+63.25
 STA. 68+60.00

SITE PLAN
 BRIDGE NO. HAS-151-0485
 OVER COLUMBUS & OHIO RIVER RAILROAD

HAS-151-04.63
 PID No. 100038

1 / 4

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TYPICAL TRANSVERSE SECTION
 DIMENSIONS MEASURED RADIAL TO ϕ CONSTRUCTION SR 151

DESIGN AGENCY
Jacobs
 2 CROWNE POINT COURT
 CINCINNATI, OHIO 45241

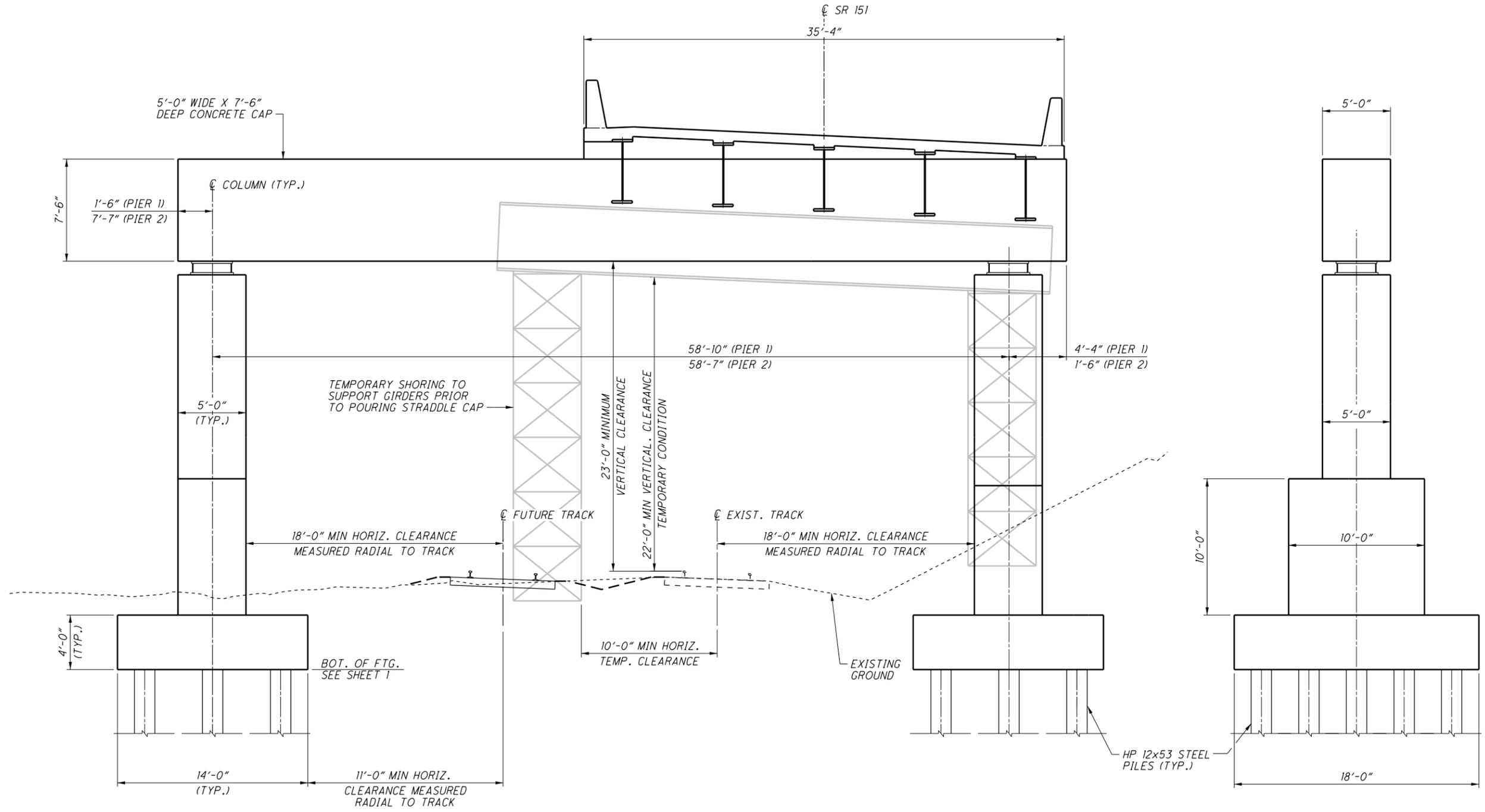
DATE 04/20
 REVIEWED DVB
 STRUCTURE FILE NUMBER 3402011

DRAWN JTC
 JTC REVISOR
 CHECKED SGM

TYPICAL TRANSVERSE SECTION
 BRIDGE NO. HAS-151-0485
 OVER COLUMBUS & OHIO RIVER RAILROAD

HAS-151-04.85
 PID No. 100038

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ELEVATION
(PIER 1 SHOWN, PIER 2 SIMILAR)

PIER SECTION

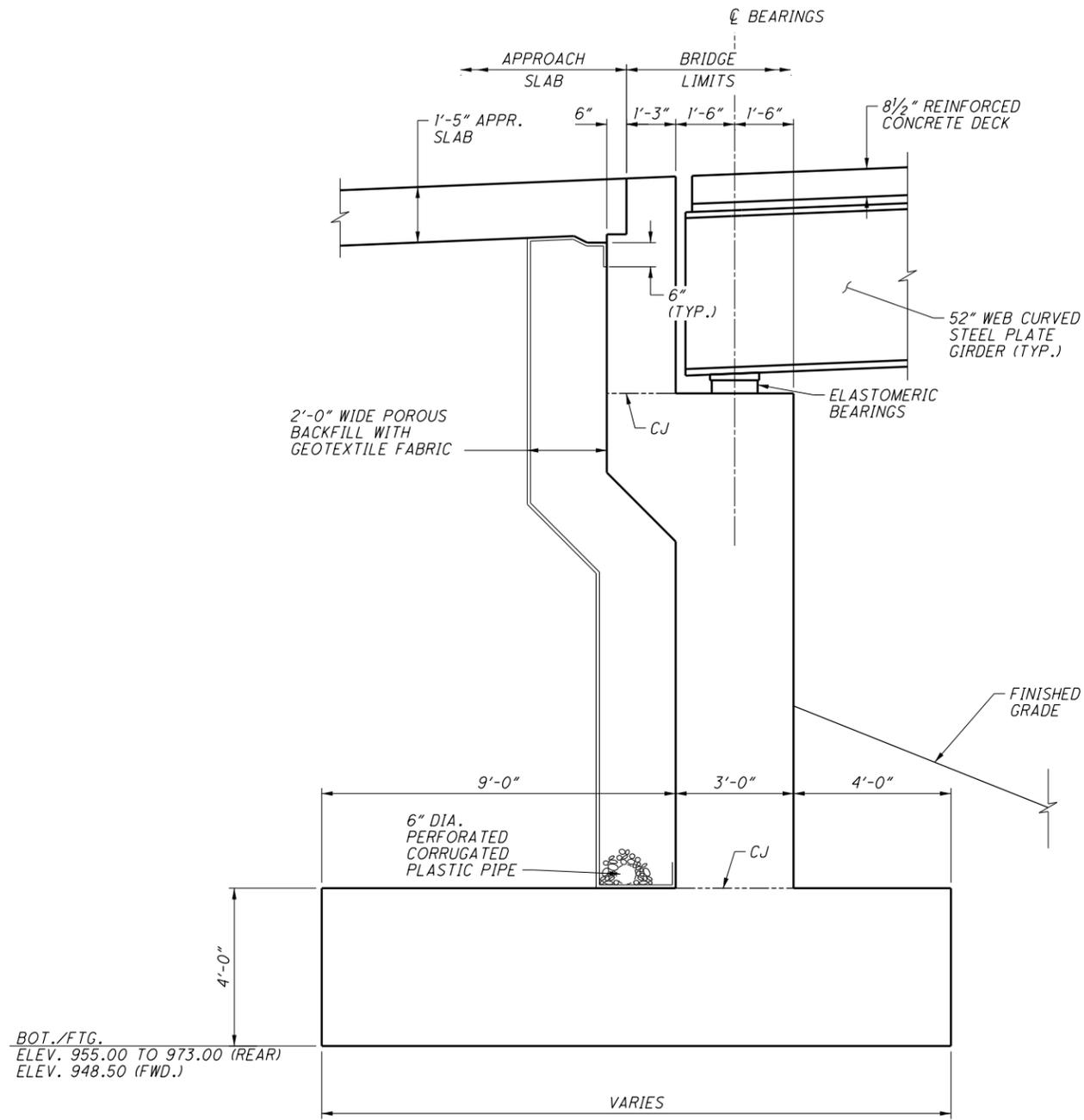
PIER ELEVATION & SECTIONS
BRIDGE NO. HAS-151-0485
OVER COLUMBUS & OHIO RIVER RAILROAD

HAS-151-04.85
PID No. 100038

DESIGN AGENCY
Jacobs
2 CROWNE POINT COURT
CINCINNATI, OHIO 45241

DESIGNED	DRAWN	REVIEWED	DATE
JTC	JTC	DYB	04/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	3402011
SGM			

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BOT./FIG.
ELEV. 955.00 TO 973.00 (REAR)
ELEV. 948.50 (FWD.)

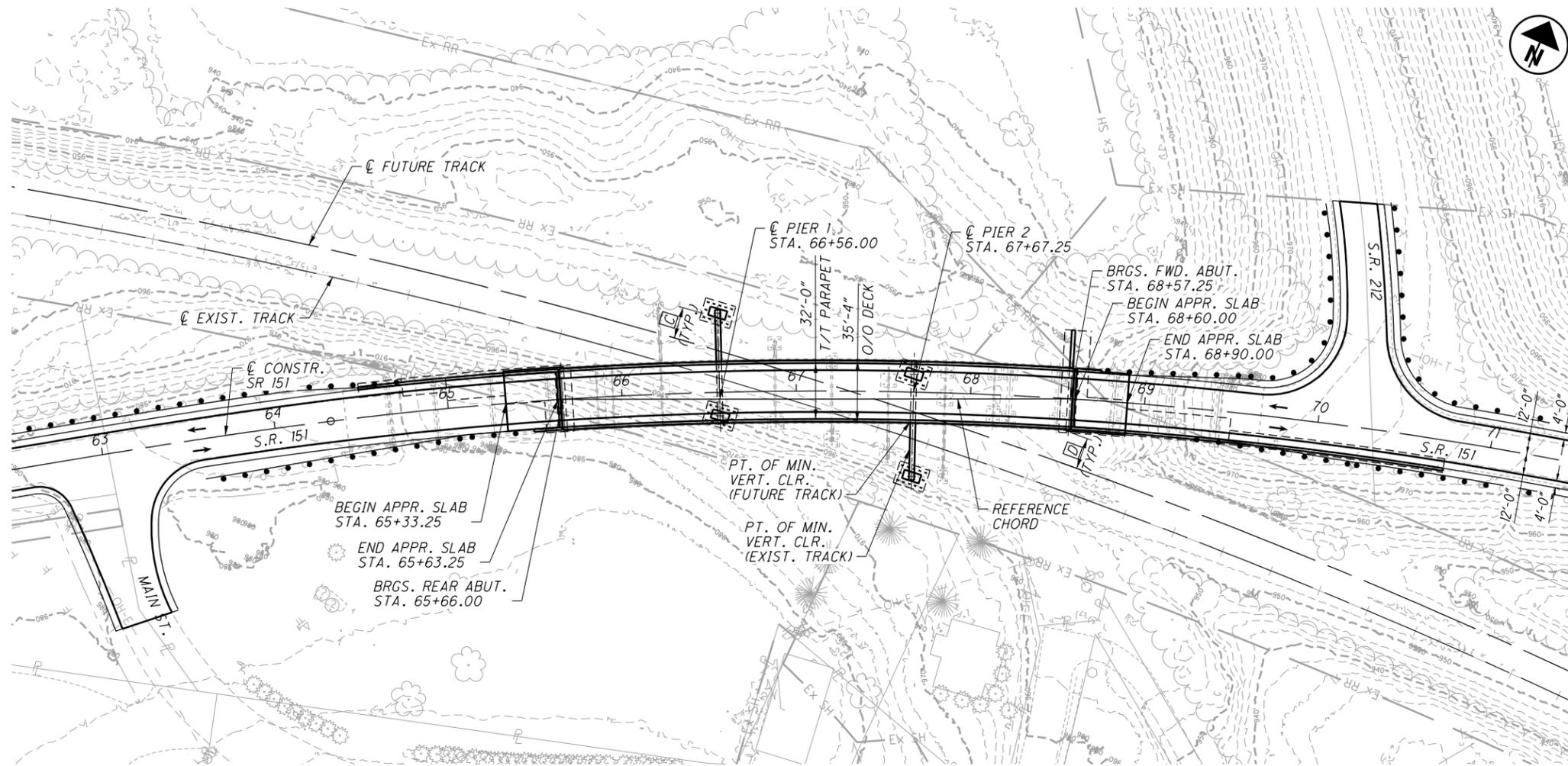
ABUTMENT SECTION
(REAR ABUTMENT SHOWN, FORWARD
ABUTMENT SIMILAR BUT OPPOSITE HAND)

DESIGNED	JTC	CHECKED	SGM
DRAWN	JTC	REVISED	
REVIEWED	DYB	STRUCTURE FILE NUMBER	3402011
DATE	04/20		

ABUTMENT SECTION
BRIDGE NO. HAS-151-0485
OVER COLUMBUS & OHIO RIVER RAILROAD

HAS-151-04.85
PID No. 100038

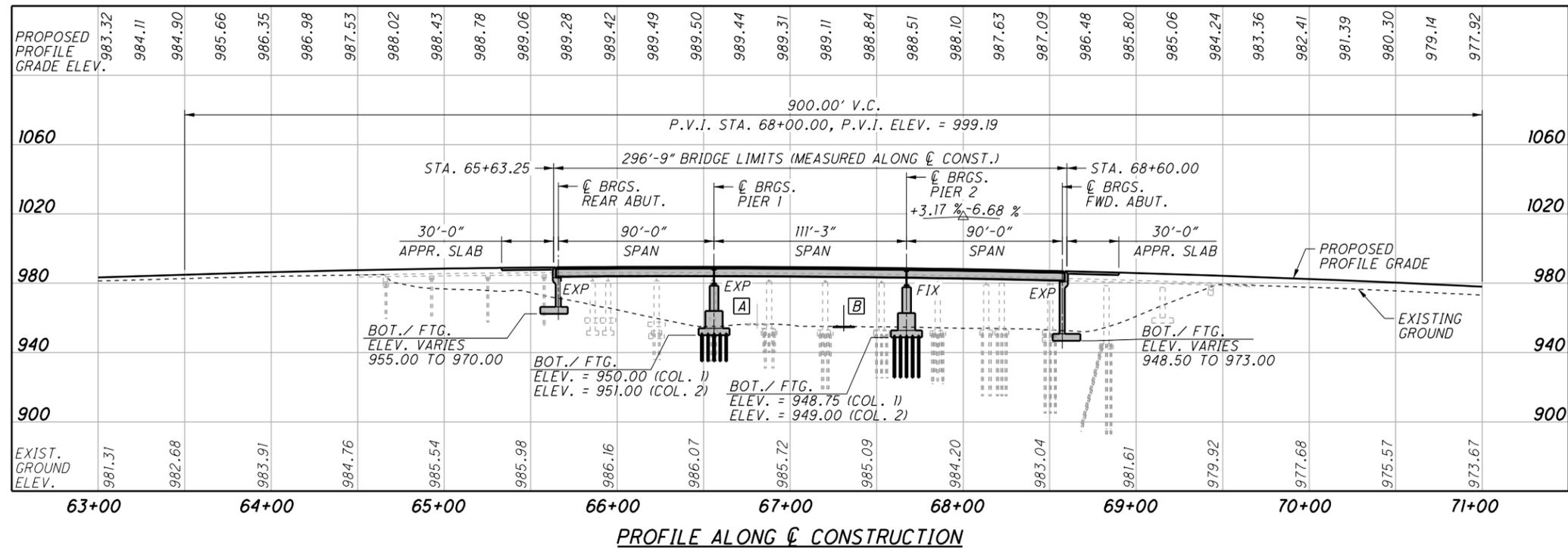
151_0485sp002.dgn Sheet 5/27/2020 9:39:22 AM CH_000Tcadd_PDF.pltcfgr CH_000Tcadd_Pen.tbl jcenters



PLAN

- A** 23'-1" PROVIDED, 23'-0" REQUIRED (EXISTING TRACK)
- B** 23'-5" PROVIDED, 23'-0" REQUIRED (FUTURE TRACK)

- C** 18'-0" MIN. ACTUAL, 18'-0" REQUIRED
- D** 18'-0" MIN. ACTUAL, 18'-0" REQUIRED



PROFILE ALONG C CONSTRUCTION

HAS-151-04.63
BRIDGE NO. HAS-151-0485
OVER COLUMBUS & OHIO RIVER RAILROAD

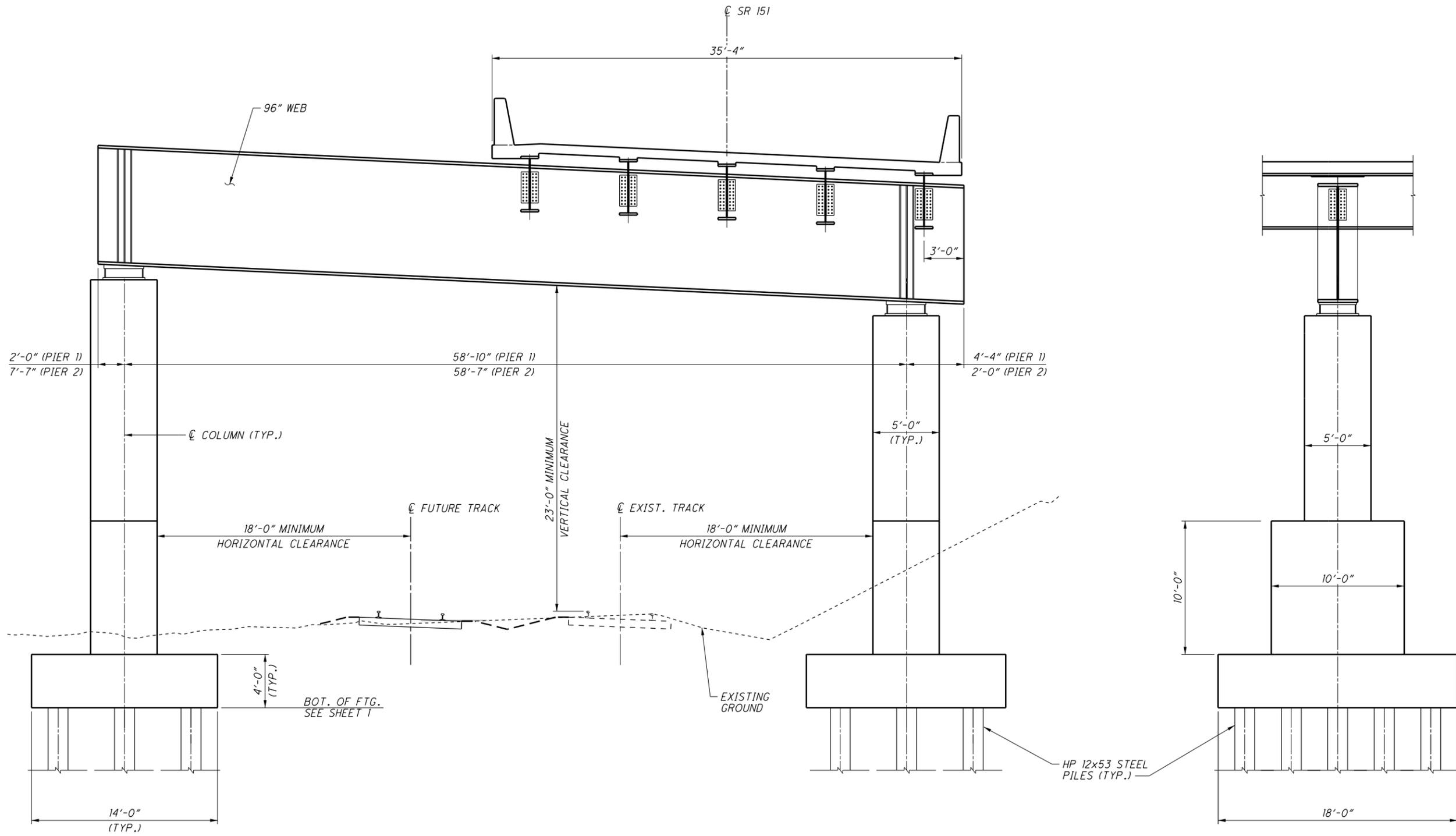
SITE PLAN - ALTERNATIVE 1B

HARRISON COUNTY
STA. 65+63.25
STA. 68+60.00

DESIGNED	JTC	CHECKED	SGM
DRAWN	JTC	REVISED	
REVIEWED	DYB	STRUCTURE FILE NUMBER	3402011
DATE	04/20	DESIGN AGENCY	Jacobs 2 CROWNE POINT COURT CINCINNATI, OHIO 45241

1 / 3

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ELEVATION
(PIER 1 SHOWN, PIER 2 SIMILAR)

PIER SECTION

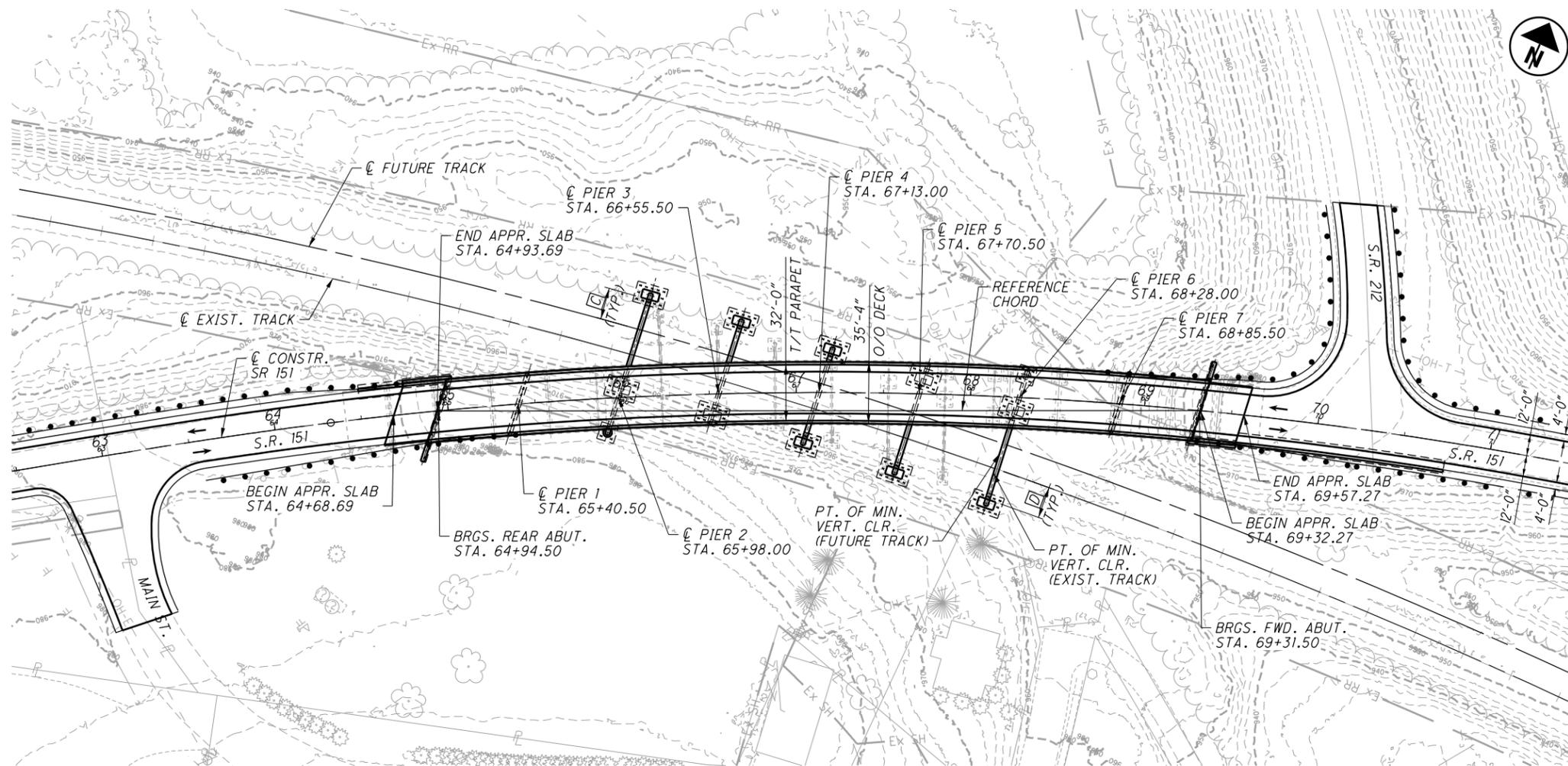
HAS-151-04.85
PID No. 100038

PIER ELEVATION & SECTIONS
BRIDGE NO. HAS-151-0485
OVER COLUMBUS & OHIO RIVER RAILROAD

DESIGNED	JTC	CHECKED	SGM
DRAWN	JTC	REVISER	
REVIEWED	DYB	STRUCTURE FILE NUMBER	3402011
DATE	04/20		

DESIGN AGENCY
Jacobs
2 CROWNE POINT COURT
CINCINNATI, OHIO 45241

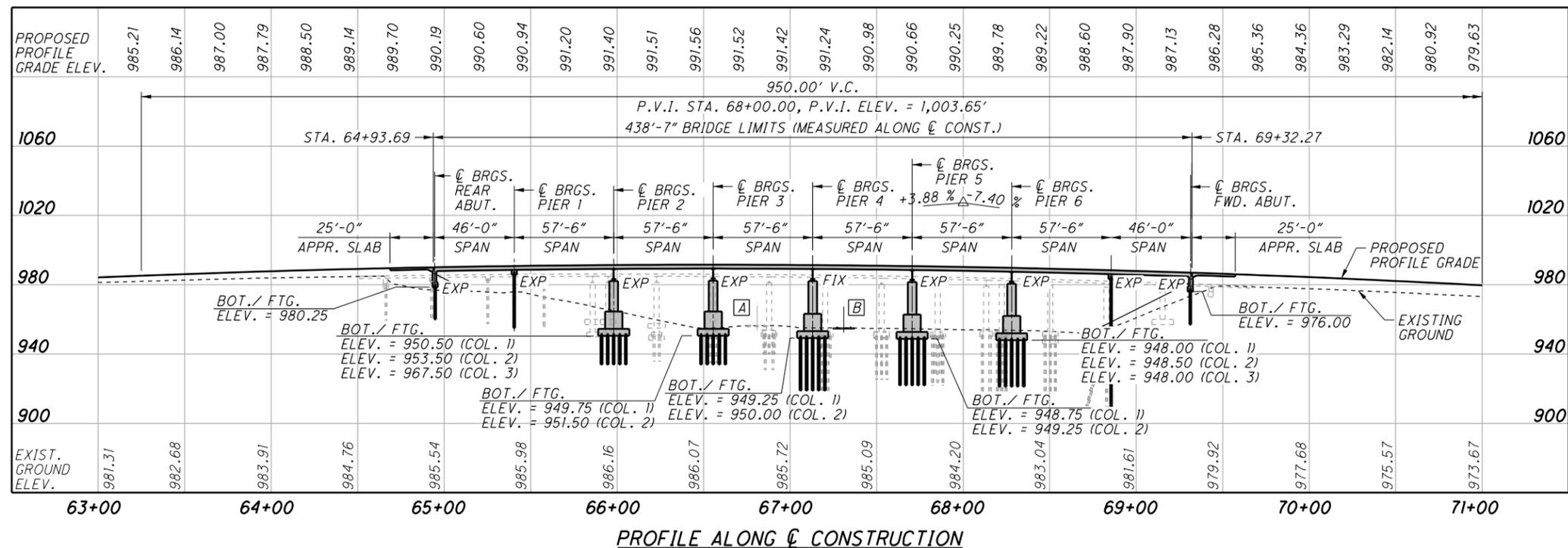
151_0485sp003.dgn Sheet 5/27/2020 11:09:36 AM CH_000Tcadd_PDF.pltcfgr CH_000Tcadd_Pen.tbl jcenters



PLAN

- A 23'-7" PROVIDED, 23'-0" REQUIRED (EXISTING TRACK)
- B 24'-1" PROVIDED, 23'-0" REQUIRED (FUTURE TRACK)

- C 18'-0" MIN. ACTUAL, 18'-0" REQUIRED
- D 18'-0" MIN. ACTUAL, 18'-0" REQUIRED



PROFILE ALONG C CONSTRUCTION

DESIGN AGENCY
Jacobs
2 CROWNE POINT COURT
CINCINNATI, OHIO 45241

DATE 04/20
REVIEWED DYB
STRUCTURE FILE NUMBER 3402011

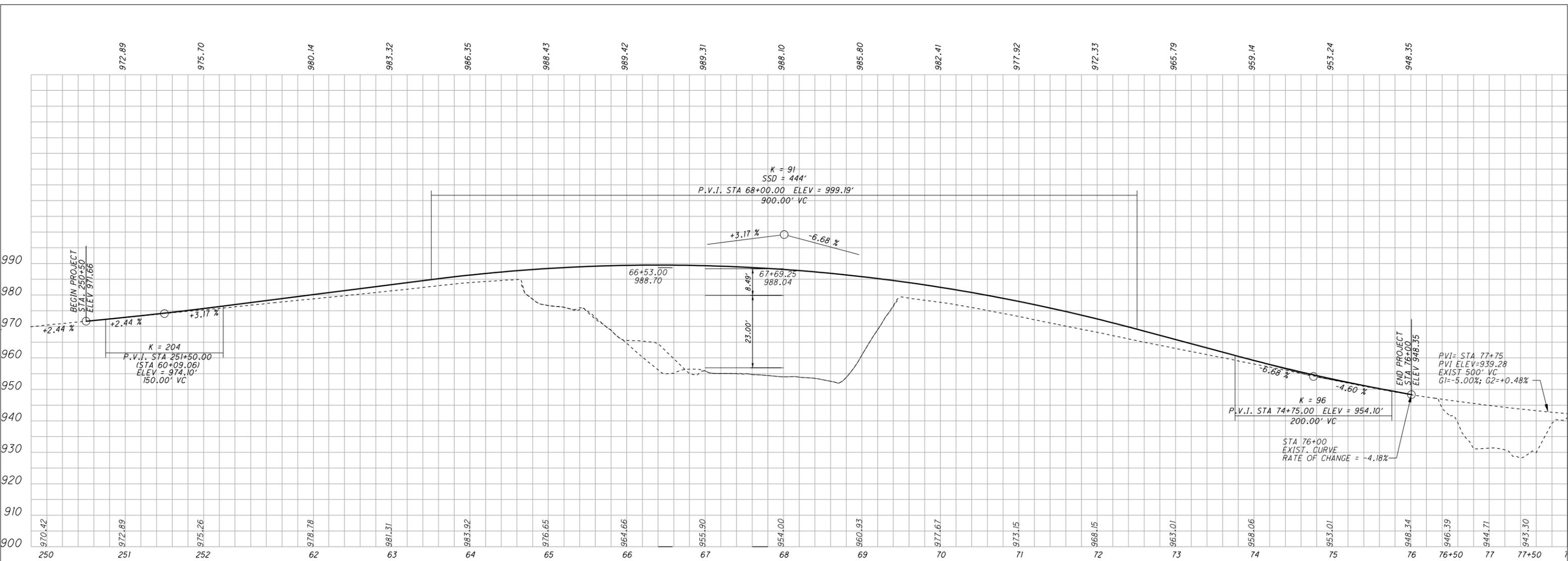
DRAWN JTC
CHECKED JTC
DESIGNED JTC
SGM

HARRISON COUNTY
STA. 64+93.69
STA. 69+32.27

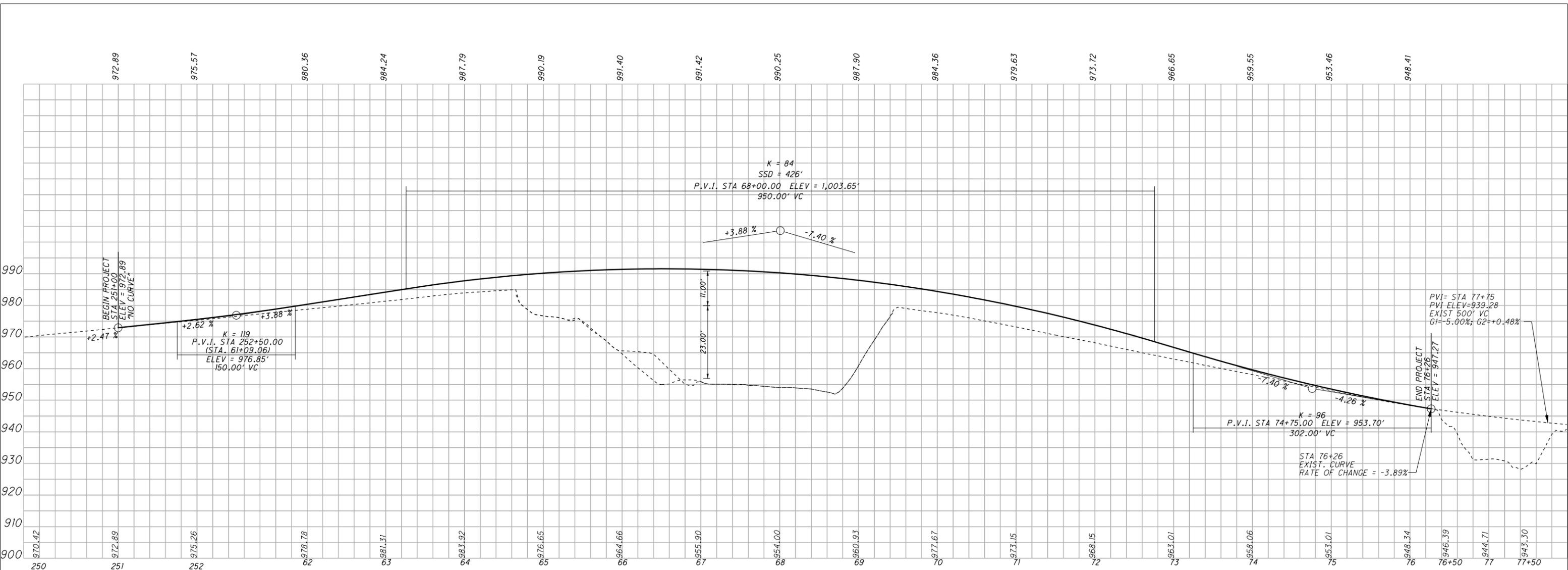
SITE PLAN - ALTERNATIVE 2
BRIDGE NO. HAS-151-0485
OVER COLUMBUS & OHIO RIVER RAILROAD

HAS-151-04.63
PID No. 100038

3/3



STRUCTURE TYPE STUDY - ALT 1



STRUCTURE TYPE STUDY - ALT 2

Bridge Quantities - Alternative 1A

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ITEM NO. 202E11002 STRUCTURE REMOVED, OVER 20 FOOT SPAN LS

TOTAL	LS
-------	----

Existing Bridge Width = 36.83 ft
 Existing Bridge Length = 447.25 ft
 Area = 16472.2 sq ft
 Unit Cost = \$20.00 /sq ft
 Total Cost = \$330,000

ITEM NO. 507E00200 STEEL PILES HP12X53, FURNISHED FT

Pier 1:

Estimated Length = 20.00 ft
 Furnished Length = 25.00 ft (Estimated Length + 5 ft)
 No. Piles = 28
 Total Length (Pier 1) = 700.00 ft

Pier 2:

Estimated Length = 25.00 ft
 Furnished Length = 30.00 ft (Estimated Length + 5 ft)
 No. Piles = 28
 Total Length (Pier 2) = 840.00 ft

TOTAL	1540 FT
-------	---------

ITEM NO. 507E00250 STEEL PILES HP12X53, DRIVEN FT

Pier 1:

Ave. Bot/Ftg. Elev. = 950.50
 Tip Elev. = 935.00
 Estimated Length = 20.00 ft (Rounded up to the nearest 5 ft)
 No. Piles = 28
 Total Length (Pier 1) = 560.00 ft

Pier 2:

Ave. Bot/Ftg. Elev. = 948.88
 Tip Elev. = 925.50
 Estimated Length = 25.00 ft (Rounded up to the nearest 5 ft)
 No. Piles = 28
 Total Length (Pier 2) = 700.00 ft

TOTAL	1260 FT
-------	---------

ITEM NO. 509E10000 EPOXY COATED REINFORCING STEEL LB

Use the following reinforcing steel densities

	Vol. (cy)	Den.(lb/cy)	Weight (lb)	
Deck =	299	245	73255	(Reflects the SBR-1-20 Std. Dwg)
Parapet =	174	330	57420	
Abutment =	704	175	123138	
Pier =	470	235	110447	
			364260	

TOTAL =	364260 POUNDS
---------	---------------

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ESTIMATED QUANTITIES

ITEM NO. 511E34446 CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK

CY

Deck:

Plan Area = 10367.3 sq ft (CAD Flood)
 Deck Thickness = 8.50 in

Volume (Deck) = 7343.5 cu ft

Haunch:

Chamfer Depth = 3.38 in (Bottom of Deck to Bottom of Top Flange)
 Chamfer Width = 0.00 in

Overhang Length = 34.00 in (CL Girder to E/Deck)
 Overhang Depth = 12.00 in

Girder	Average Top Flange		Ave. Haunch Thick.	Area above Girder (sq in)	No. Chamfers	Chamfer Area (sq in)	Overhang Area (sq in)	Girder Length	Volume (cu ft)
	Thick.	Width							
G1	0.98"	14.00"	2.39"	33.5	0	0.0	92.8	293.13'	257.1
G2	0.98"	14.00"	2.39"	33.5	0	0.0		292.19'	68.0
G3	0.98"	14.00"	2.39"	33.5	0	0.0		291.25'	67.8
G4	0.98"	14.00"	2.39"	33.5	0	0.0		290.31'	67.5
G5	0.98"	14.00"	2.39"	33.5	0	0.0	92.8	289.37'	253.8

Volume (Haunch) = 714

Vol (Total) = 8057.8 cu ft

TOTAL = 299 CY

ITEM NO. 511E34450 CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)

CY

Parapet Area = 588.0 sq in (ODOT Std. Dwg. SBR-1-13)

Left Parapet:

Length (Rear Appr.) = 31.50 ft
 Length (Deck) = 295.64 ft
 Length (Fwd. Backwall) = 1.25 ft
 Length (Fwd Appr.) = 14.00 ft
 Length (Total) = 342.39 ft

Volume (Left) = 1398.1 cu ft

Right Parapet:

Length (Rear Appr.) = 16.00 ft
 Length (Deck) = 291.19 ft
 Length (Fwd Appr.) = 31.00 ft
 Length (Total) = 338.19 ft

Volume (Right) = 3283.5 cu ft

Volume (Parapet) = 4681.6 cu ft

TOTAL = 174 CY

ITEM NO. 511E41012 CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS

CY

See Bottom of Footing tab for Pier Above Footing concrete quantity calculations

TOTAL = 321 CY

ITEM NO. 511E44112 CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING

CY

See Bottom of Footing tab for Abutment Including Footing concrete quantity calculations

TOTAL = 345 CY

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ESTIMATED QUANTITIES

ITEM NO. 511E46512 CLASS QC1 CONCRETE WITH QC/QA, FOOTING CY

See Bottom of Footing tab for Footing concrete quantity calculations

TOTAL =	508 CY
---------	--------

ITEM NO. 512E10100 SEALING OF CONCRETE SURFACES (EPOXY-URETHANE) SY

Parapet:

Perimeter = 9.56 ft (includes 12" deep deck edge and 6" of deck underside)
 Total Length = 680.58 ft
 Area (Parapet) = 6508.2 sq ft

Rear Abutment

Body:
 Perimeter = 24.20 ft (includes f/backwall, abut. Seat, f/stem)
 Length = 35.33 ft
 Area (Rear Body) = 855.2 sq ft

Wingwall:
 Perimeter = 16.34 ft (includes f/wingwall)
 Length = 50.51 ft

Area (Rear Wing) = 825.4 sq ft
 Area (Rear) = 1680.6 sq ft

Forward Abutment

Body:
 Perimeter = 25.17 ft (includes f/backwall, abut. Seat, f/stem)
 Length = 35.33 ft
 Area (Fwd Body) = 889.4 sq ft

Wingwall:
 Perimeter = 19.59 ft (includes f/wingwall)
 Length = 52.67 ft

Area (Fwd Wing) = 1031.7 sq ft
 Area (Fwd) = 1921.1 sq ft

Pier 1:

Crashwalls:
 Perimeter = 30.00 ft
 Height = 10.00 ft
 No. Columns = 2
 Area (Crashwalls) = 600.0 sq ft

Columns:
 Perimeter = 20.00 ft
 Ave. Height = 14.83 ft
 No. Columns = 2
 Area (Columns) = 593.2 sq ft

Cap Face:
 Length = 63.90 ft
 Ave. Height = 7.50 ft
 No. Faces = 2
 Area (Cap Face) = 958.5 sq ft

Cap Ends:
 Width = 5.00 ft
 Ave. Height = 7.50 ft
 No. Faces = 2
 Area (Cap Ends) = 75.0 sq ft

Area (Pier 1) = 2226.7 sq ft

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ESTIMATED QUANTITIES

Pier 2:

Crashwalls:

Perimeter = 30.00 ft
 Height = 10.00 ft
 No. Columns = 2

Area (Crashwalls) = 600.0 sq ft

Columns:

Perimeter = 20.00 ft
 Ave. Height = 15.58 ft
 No. Columns = 2

Area (Columns) = 623.1 sq ft

Cap Face:

Length = 66.90 ft
 Ave. Height = 7.50 ft
 No. Faces = 2

Area (Cap Face) = 1003.5 sq ft

Cap Ends:

Width = 5.00 ft
 Ave. Height = 7.50 ft
 No. Faces = 2

Area (Cap Ends) = 75.0 sq ft

Area (Pier 2) = 2301.6 sq ft

TOTAL = 1627 SY

ITEM NO. 513E10300 STRUCTURAL STEEL MEMBERS, LEVEL 5 LB

Weight of Steel = 0.490 k/cu ft

Girders:

Web Thickness = 0.563 in
 Web Depth = 52.00 in

Section	Top Flange		Bottom Flange		Girder Area (in ²)	Section Length	Girder Vol. (cf)		
	Thick.	Width	Thick.	Width					
G1	1	.75"	14.00"	.75"	18.00"	53.25	63.41'	23.4	
	2	1.38"	14.00"	1.50"	18.00"	75.50	54.35'	28.5	90.58' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	57.62'	21.3	111.97' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	54.35'	28.5	90.58' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	63.41'	23.4	293.13' 293.13'
G2	1	.75"	14.00"	.75"	18.00"	53.25	63.20'	23.4	
	2	1.38"	14.00"	1.50"	18.00"	75.50	54.17'	28.4	90.29' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	57.44'	21.2	111.61' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	54.17'	28.4	90.29' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	63.20'	23.4	292.19' 292.19'
G3	1	.75"	14.00"	.75"	18.00"	53.25	63.00'	23.3	
	2	1.38"	14.00"	1.50"	18.00"	75.50	54.00'	28.3	90.00' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	57.25'	21.2	111.25' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	54.00'	28.3	90.00' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	63.00'	23.3	291.25' 291.25'
G4	1	.75"	14.00"	.75"	18.00"	53.25	62.80'	23.2	
	2	1.38"	14.00"	1.50"	18.00"	75.50	53.83'	28.2	89.71' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	57.06'	21.1	110.89' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	53.83'	28.2	89.71' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	62.80'	23.2	290.31' 290.31'
G5	1	.75"	14.00"	.75"	18.00"	53.25	62.59'	23.1	
	2	1.38"	14.00"	1.50"	18.00"	75.50	53.65'	28.1	89.42' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	56.88'	21.0	110.53' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	53.65'	28.1	89.42' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	62.59'	23.1	289.37' 289.37'

Volume (Girders) = 622 cu ft
 Weight (Girders) = 304754 pounds

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

* Assume weight of additional steel components (stiffeners, crossframes, splices, etc.) are approximately 25% of the Girder Only weight.

Bearing Stiffeners	1.0%	3047.5 lb
Splices	5.0%	15237.7 lb
End Crossframes	4.0%	12190.2 lb
Crossframes Members	15.0%	45713.1 lb
	25.0%	76188.5 lb

TOTAL = 380950 LB

ITEM NO. 513E15001 STRUCTURAL STEEL MEMBERS, SPECIALIZED MULTI ROTATIONAL BEARING (SMR), LEVEL UF, AS PER PLAN EACH

Pier No. 1

No. Bearings = 2 Each

Pier No. 2

No. Bearings = 2 Each

TOTAL = 4 EACH

ITEM NO. 514E00060 FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT SF
 ITEM NO. 514E00066 FIELD PAINTING STRUCTURAL STEEL, FINISH COAT SF

Field Paint Last 10' of each Girder, including all end crossframes and intermediate crossframes

Web Thickness = 0.5625 in
 Web Depth = 52 in

Section	Top Flange		Bottom Flange		Perimeter	Section Length	Surface Area (sq ft)	
	Thick.	Width	Thick.	Width				
G1	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
G2	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
G3	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
G4	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
G5	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6

Area (Girders) = 1286.5 sq ft

Assume end crossframe surface area is approx. 50% of the surface area of girders only

Area (End Crossframes) = 643.2 sq ft

Assume intermediate crossframe surface area is approx. 30% of the surface area of girders only

Area (Int. Crossframes) = 385.9 sq ft

TOTAL = 2316 SF

ITEM NO. 516E11210 STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL FT

Rear Abutment:

Length = 35.33 ft

Fwd. Abutment:

Length = 35.33 ft

TOTAL = 71 FT

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ESTIMATED QUANTITIES

Footing:

Footing Area = 1889.3 sq ft
 Footing Depth = 3.00 ft

Vol. (Ftg.) = 5667.9 cu ft

Total (Fwd.) = 384 cu yd

TOTAL = 546 CY

Unit Cost = \$415.00 /cu yd

Total Cost = \$227,000

Retaining Wall Parapet:

Parapet Area = 588.0 sq in (ODOT Std. Dwg. SBR-1-13)

Left Parapet:

Length (Rear Wall) = 82.70 ft

Right Parapet:

Length (Fwd. Wall) = 183.54 ft

Total Length = 266.24 ft

Area = 1087.1 cu ft

TOTAL = 41 CY

Unit Cost = \$640.00 /cu yd

Total Cost = \$27,000

Reinforcing Steel:

Use the following reinforcing steel densities

	Vol. (cy)	Den. (lb/cy)	Weight (lb)
Parapet =	41	330	13530
Retaining Wall =	546	175	95550
			<u>109080</u>

TOTAL = 109080 POUND

Unit Cost = \$1.77 /lb

Total Cost = \$194,000

Concrete Sealing:

Parapet:

Perimeter = 8.06 ft
 Total Length = 266.24 ft

Area (Parapet) = 2146.6 sq ft

Rear Retaining Wall:

Wall Length = 82.70 ft
 Ave. Height = 12.00 ft
 Area = 992.4 sq ft

Fwd. Wall Length = 183.54 ft
 Ave. Height = 17.00 ft
 Area = 3120.2 sq ft

Area (Walls) = 4112.6 sq ft

TOTAL = 696 SY

Unit Cost = \$31.90 /lb

Total Cost = \$23,000

TOTAL WALL COST = \$471,000

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS

Designed By: JTC
Checked By:

Date: 5-Apr-20
Date:

ESTIMATED QUANTITIES

ITEM NO. ROADWAY

SR 151:

Begin Pavement Sta. = 60+10.00
End Pavement Sta. = 65+33.25 (Begin Appr. Slab)
Length = 523.25 ft

Begin Pavement Sta. = 68+90.00 (End Appr. Slab)
End Pavement Sta. = 76+00.00
Length = 710 ft

TOTAL	0.23 MILE
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SR 212:

Length = 110 ft

TOTAL	0.02 MILE
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HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS

Designed By: JTC
Checked By:

Date: 13-Apr-20

BOTTOM OF FOOTING ELEVATIONS/SUBSTRUCTURE QUANTITIES

Depths:

Superstructure (Abut.):

Deck = 8.50 in
Haunch = 2.63 in
Top Flange = 0.75 in
Web = 52.00 in
Bot. Flange = 0.75 in
Steel Plate = 0.00 in
HP Pedestal = 0.00 in
Load Plate = 2.00 in
Bearing Pad = 4.00 in
TOTAL = 5.89 ft

Superstructure (Pier):

Deck = 8.50 in
Haunch = 2.00 in
Top Flange = 1.38 in
Web = 52.00 in
Bot. Flange = 1.50 in
65.38 in
Total (Super) = 5.45 ft
TOTAL = 8.49 ft*

* Total Depth includes cap, top flange, haunch & deck

Load Plate = 2.00 in
Bearing Pad = 10.00 in

Abutment:

Cover (min.) = 1.00 ft
Footing Depth = 4.00 ft
TOTAL = 5.00 ft

Pier:

Cap Height = 7.50 ft (Integral Pier Cap)
Cover (min.) = 1.00 ft
Footing Depth = 4.00 ft
Total (Cap) = 5.00 ft

SR 151 Vertical Alignment

Segment 1	Define Type of Vertical Alignment -->> Vertical Curve											
	Enter the Following Required Geometry Information:											
	<p>PVI Sta. = 68+00.00 PVI Elev. = 999.19 LVC = 900 g1 = 3.17% g2 = -6.68%</p>											
	<p>Summary of Segment 1 Vertical Alignment</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">PVC Sta. = 63+50.00</td> <td style="width: 33%;">PVT Sta. = 72+50.00</td> <td style="width: 33%;">PVI Sta. = 68+00.00</td> </tr> <tr> <td>PVC Elev. = 984.93</td> <td>PVT Elev. = 969.13</td> <td>PVI Elev. = 999.19</td> </tr> <tr> <td>g1 = 3.17%</td> <td>LVC = 900.00</td> <td></td> </tr> <tr> <td>g2 = -6.68%</td> <td>Rate of Change of Grade, r = -0.000109</td> <td></td> </tr> </table>	PVC Sta. = 63+50.00	PVT Sta. = 72+50.00	PVI Sta. = 68+00.00	PVC Elev. = 984.93	PVT Elev. = 969.13	PVI Elev. = 999.19	g1 = 3.17%	LVC = 900.00		g2 = -6.68%	Rate of Change of Grade, r = -0.000109
PVC Sta. = 63+50.00	PVT Sta. = 72+50.00	PVI Sta. = 68+00.00										
PVC Elev. = 984.93	PVT Elev. = 969.13	PVI Elev. = 999.19										
g1 = 3.17%	LVC = 900.00											
g2 = -6.68%	Rate of Change of Grade, r = -0.000109											

SR 151 Cross Slopes

										PGL
Left Shoulder				WB Lane		EB Lane		Right Shoulder		Station
X-Slope	Width	X-Slope	Rounding	X-Slope	Width	X-Slope	Width	X-Slope	Width	
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	64+32.29
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	77+09.62

Substructure Locations and Skew Angles

Substructure Unit: Rear Abutment

CL Brg Sta. = 65+66.00

Skew Angle (DMS) = No Skew 0°

Skew Angle = 0.00000 degrees 0.00000 radians

Substructure Unit: Pier 1

CL Pier 1 Sta. = 66+56.00

Skew Angle (DMS) = No Skew 0°

Skew Angle = 0.00000 degrees 0.00000 radians

Substructure Unit:

Pier 2

CL Pier 2 Sta. = 67+67.25

Skew Angle (DMS) = No Skew 0°
 Skew Angle = 0.00000 degrees 0.0000 radians

Substructure Unit:

Forward Abutment

CL Brg Sta. = 68+57.25

Skew Angle (DMS) = No Skew 0°
 Skew Angle = 0.00000 degrees 0.0000 radians

Rear Abutment

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	Seat Elevation
G1	-14.83'	65+66.00	989.22	989.83	983.94
G2	-7.42'	65+66.00	989.22	989.56	983.67
G3	0.00'	65+66.00	989.22	989.22	983.33
G4	7.42'	65+66.00	989.22	988.88	982.99
G5	14.83'	65+66.00	989.22	988.54	982.65

C	Offset From PGL	Station	Ground Elev.	B/Footing Elevation
1	-19.50'	65+71.46	960.00	955.00
2	18.50'	65+71.55	978.00	973.00

Step Footing, Average Bot/Ftg = 964.00

Pier 1

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	T/Cap Elev.
G1	-14.83'	66+56.00	989.50	990.11	989.12
G2	-7.42'	66+56.00	989.50	989.84	988.85
G3	0.00'	66+56.00	989.50	989.50	988.51
G4	7.42'	66+56.00	989.50	989.16	988.17
G5	14.83'	66+56.00	989.50	988.82	987.83

Top of Columns = 979.33

987.83 (Controls)

B/Cap Elevation
981.62
981.35
981.01
980.67
980.33

980.33 (Controls)

Column 1

Point	Offset From PGL	Station	Exist. Ground Elev.	B/Footing Elevation
1	-54.26'	66+49.57	955.27	950.27
2	-48.78'	66+66.34	955.06	950.06
3	-41.90'	66+45.64	955.69	950.69
4	-36.39'	66+62.49	955.36	955.46
1	4.58'	66+49.41	956.58	951.58
2	10.06'	66+66.61	956.12	951.12
3	16.95'	66+45.30	963.56	958.56
4	22.46'	66+62.65	963.19	958.19

950.00 (Controls)

Column 2

951.00 (Controls)

Pier 2

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	T/Cap Elev.
G1	-14.83'	67+67.25	988.62	989.24	988.25
G2	-7.42'	67+67.25	988.62	988.97	987.98
G3	0.00'	67+67.25	988.62	988.62	987.64
G4	7.42'	67+67.25	988.62	988.28	987.29
G5	14.83'	67+67.25	988.62	987.94	986.95

Top of Columns = 978.45

986.95 (Controls)

B/Cap Elevation
980.75
980.48
980.14
979.79
979.45

979.45 (Controls)

Column 1

Point	Offset From PGL	Station	Bot/Ditch Elev.*	B/Footing Elevation
1	-19.08'	67+60.58	954.03	949.03
2	-13.88'	67+77.69	953.86	948.86
3	-6.65'	67+56.78	954.62	949.62
4	-1.43'	67+73.98	954.51	949.51
1	39.47'	67+60.40	954.97	949.97
2	44.67'	67+77.96	954.14	949.14
3	51.90'	67+56.51	961.67	956.67
4	57.13'	67+74.16	959.28	954.28

948.75 (Controls)

Column 2

949.00 (Controls)

Forward Abutment

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	Seat Elevation
G1	-14.83'	68+57.25	986.92	987.61	981.72
G2	-7.42'	68+57.25	986.92	987.27	981.38
G3	0.00'	68+57.25	986.92	986.92	981.04
G4	7.42'	68+57.25	986.92	986.58	980.70
G5	14.83'	68+57.25	986.92	986.24	980.36

C	Offset From PGL	Station	Ground Elev.	B/Footing Elevation
1			978.00	973.00
2	19.50'	68+51.70	953.50	948.50

Bot/Ftg. Elev. = 960.75

CONCRETE QUANTITIES

Rear Abutment:

Abutment Footing (including Wingwall Footing):

Footing Area = 1055.7 sq ft
 Footing Depth = 4.00 ft
 Ave. Bot./Ftg Elev. = 964.00

Footing Volume = 156 cy

Point	Rdwy Elev. at Point	Seat Elevation
G1	989.83	983.94
G2	989.56	983.67
G3	989.22	983.33
G4	988.88	982.99
G5	988.54	982.65

Average = 989.20 983.32

Left Wingwall

Wall Width = 2.50 ft
 Wall Height @ Abut. = 30.83 ft
 Wall Height @ End = 20.00 ft
 Total Wall Length = 34.51 ft

Left Wall Volume = 81.2 cy

Right Wingwall

Wall Width = 1.50 ft
 Wall Height @ Abut. = 11.54 ft
 Wall Height @ End = 3.00 ft
 Total Wall Length = 16.00 ft

Right Wall Volume = 6.5 cy

Abutment Stem

Stem Width = 3.00 ft
 Ave. Stem Height = 15.32 ft
 Stem Length = 35.33 ft (o/o deck along Abut.)

Stem Volume = 60 cy

Abutment Backwall

Backwall Width = 1.75 ft
 Ave. Backwall Height = 5.89 ft
 Backwall Length = 35.33 ft (o/o deck along Abut.)

Backwall Volume = 13 cy

Abutment Corbel

Corbel Width = 1.75 ft
 Corbel Height = 1.75 ft
 Corbel Length = 35.33 ft

Stem Volume = 4 cy

Rear Abutment, not including Footing = 165 cy

Pier 1:

Pier Footing

Number of Footings = 2
 Footing Length = 18.00 ft
 Footing Width = 14.00 ft
 Footing Depth = 4.00 ft

Footing Volume = 75 cy

Pier Cap

Cap

Cap Length = 63.90 ft
 Cap Width = 5.00 ft
 Cap Height = 7.50 ft
 Vol. (Cap) = 2396 cu ft

Deck Build-up on T/Cap

Point	B/Deck Elev.
G1	981.61
G2	981.34
G3	981.00
G4	980.66
G5	980.32

Average = 980.99

Pier Column

Crashwall

Width = 5.00 ft
 Length = 10.00 ft
 Height = 10.00 ft
 Vol. (Crashwall) = 1000.0 cu ft

Column

Width = 5.00 ft
 Length = 5.00 ft
 Area = 25.00 sq ft
 T/Column Elev. = 979.33
 Ave. B/Footing Elev. = 950.50
 Ave. Column Height = 14.83 ft (minus crashwall)
 Vol. (Column) = 741.5 cu ft

Column Volume = 64 cy

B/Cap Elev. = 980.33
 Ave. Height = 0.66 ft
 Length = 35.33 ft
 Width = 5.00 ft
 Vol. (Build-up) = 116.2 cu ft

Column Volume = 93 cy

Pier Above Footing = 158 cy

Pier 2:

Pier Footing

Number of Footings = 2
 Footing Length = 18.00 ft
 Footing Width = 14.00 ft
 Footing Depth = 4.00 ft
 Footing Volume = 75 cy

Pier Column

Crashwall

Width = 5.00 ft
 Length = 10.00 ft
 Height = 10.00 ft
 Vol. (Crashwall) = 1000.0 cu ft

Column

Width = 5.00 ft
 Length = 5.00 ft
 Area = 25.00 sq ft
 T/Column Elev. = 978.45
 Ave. B/Footing Elev. = 948.88
 Ave. Column Height = 15.58 ft (minus crashwall)
 Vol. (Column) = 778.9 cu ft
 Column Volume = 66 cy
 Pier Above Footing = 163 cy

Forward Abutment

Abutment Footing (including Wingwall Footing):

Footing Area = 1368.1 sq ft
 Footing Depth = 4.00 ft
 Ave. Bot./Ftg Elev. = 960.75
 Footing Volume = 203 cy

Point	Rdwy Elev. at Point	Seat Elevation
G1	987.61	981.72
G2	987.27	981.38
G3	986.92	981.04
G4	986.58	980.70
G5	986.24	980.36
Average =	986.92	981.04

Abutment Stem

Stem Width = 3.00 ft
 Ave. Stem Height = 16.29 ft
 Stem Length = 35.33 ft (o/o deck along Abut.)
 Stem Volume = 64 cy

Abutment Corbel

Corbel Width = 1.75 ft
 Corbel Height = 1.75 ft
 Corbel Length = 35.33 ft
 Stem Volume = 4 cy

Fwd. Abutment, not including Footing = 179 cy

Pier Cap

Cap

Cap Length = 66.90 ft
 Cap Width = 5.00 ft
 Cap Height = 7.50 ft
 Vol. (Cap) = 2509 cu ft

Deck Build-up on T/Cap

Point	B/Deck Elev.
G1	980.74
G2	980.47
G3	980.12
G4	979.78
G5	979.44

Average = 980.11
 B/Cap Elev. = 979.45
 Ave. Height = 0.66 ft
 Length = 35.33 ft
 Width = 5.00 ft
 Vol. (Build-up) = 116.2 cu ft
 Column Volume = 97 cy

Left Wingwall

Ave. Wall Width = 2.00 ft
 Wall Height @ Abut. = 10.61 ft
 Wall Height @ End = 4.00 ft
 Total Wall Length = 21.67 ft
 Left Wall Volume = 11.7 cy

Right Wingwall

Wall Width = 2.50 ft
 Wall Height @ Abut. = 33.74 ft
 Wall Height @ End = 30.00 ft
 Total Wall Length = 31.00 ft
 Right Wall Volume = 86.1 cy

Abutment Backwall

Backwall Width = 1.75 ft
 Ave. Backwall Height = 5.89 ft
 Backwall Length = 35.33 ft (o/o deck along Abut.)
 Backwall Volume = 13 cy

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS
 LIFE CYCLE QUANTITIES

Date	Year	Repair Work	Est. Cost
2033	10, 30, 50, 70	Patching & maintenance of deck	\$42,613.31
2043	20, 60	Deck overlay, patching of concrete substructures	\$132,033.27
2048	25, 50	Painting of steel girders	\$109,048.53
2063	40	Deck replacement (including approach slabs), patching of concrete substructures	\$1,067,300.00

Patching & maintenance of deck & approach slabs

Deck Patching

Assumed Cost (\$/SY):	\$624.00	Item 519E12220
Deck & approach slab area (SY):	1366	
Patch area (SY)	68.3	Use 5% of area
Cost (\$):	\$42,613	

Deck overlay, patching of concrete substructures

Deck Overlay (microsilica w/hydro)

Assumed Cost (\$/SY):	\$78.00	Item 848E10000
Deck & approach slab Overlay area (SY):	1366	
Cost (\$):	\$106,533	

Patching of concrete substructures

Assumed Cost (\$/SF):	\$174.00	Item 519E11100
Assumed Area (SF):	146	Use 1% of Sealing Area
Cost (\$):	\$25,500	
Total Deck overlay, patching of concrete substructures	\$132,033	

Painting end of steel girders at bearings

Surface preparation steel girders

Steel girder area (SF):	1930	
Assumed Cost (\$/SF):	\$31.30	Item 514E00050
Cost (\$):	\$60,411	

Painting steel girders (prime, intermediate & finish coats)

Steel girder area (SF):	1930	
Assumed Cost (\$/SF):	\$25.20	Item 514E00056, 514E00060, & 514E00066
Cost (\$):	\$48,638	
Total Painting end of steel girders at bearings	\$109,049	

Deck replacement (including approach slabs), patching of concrete substructures

Deck Concrete

Assumed Cost (\$/CY):	\$790.00	Item 511E34446
Volume (CY):	299	
Cost (\$):	\$236,300	

Deck Removal

Assumed Cost (\$/SF):	\$25.00	
Deck Area (SF): Includes Approach Slabs	12292	
Cost (\$):	\$307,400	

Parapet Concrete

Assumed Cost: (\$/CY)	\$730.00	Item 511E34450
Volume (CY):	174	
Cost (\$):	\$127,100	

Deck/Parapet Reinforcing

Superstructure Rebar (LBS):	130,675	
Cost (\$/LB):	\$2.02	Item 509E10000
Cost (\$):	\$264,000	

Approach Slabs

Area (SY)	214	
Cost (\$/SY):	\$310.00	Item 526E30010
Cost (\$):	\$66,400	

Patching of concrete substructures (see calcs above)

Cost (\$):	\$25,500	
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Elastomeric bearings

Total (each)	14	
Cost (\$/Each):	\$2,895.00	Average b/w Elastomeric & Multi-Rotational
Cost (\$):	\$40,600	

Total cost for deck replacement (including bearings and approach slabs) and patching of concrete substructures	\$1,067,300	
--	--------------------	--

Bridge Quantities - Alternative 1B

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1B - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ITEM NO. 202E11002 STRUCTURE REMOVED, OVER 20 FOOT SPAN LS

TOTAL	LS
-------	----

Existing Bridge Width = 36.83 ft
 Existing Bridge Length = 447.25 ft
 Area = 16472.2 sq ft

 Unit Cost = \$20.00 /sq ft
 Total Cost = \$330,000

ITEM NO. 507E00200 STEEL PILES HP12X53, FURNISHED FT

Pier 1:

Estimated Length = 20.00 ft
 Furnished Length = 25.00 ft (Estimated Length + 5 ft)

 No. Piles = 24
 Total Length (Pier 1) = 600.00 ft

Pier 2:

Estimated Length = 40.00 ft
 Furnished Length = 45.00 ft (Estimated Length + 5 ft)

 No. Piles = 24
 Total Length (Pier 2) = 1080.00 ft

TOTAL	1680 FT
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ITEM NO. 507E00250 STEEL PILES HP12X53, DRIVEN FT

Pier 1:

Bot/Ftg. Elev. = 950.50
 Tip Elev. = 935.00
 Estimated Length = 20.00 ft (Rounded up to the nearest 5 ft)

 No. Piles = 24
 Total Length (Pier 1) = 480.00 ft

Pier 2:

Bot/Ftg. Elev. = 948.88
 Tip Elev. = 910.00
 Estimated Length = 40.00 ft (Rounded up to the nearest 5 ft)

 No. Piles = 24
 Total Length (Pier 2) = 960.00 ft

TOTAL	1440 FT
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ITEM NO. 509E10000 EPOXY COATED REINFORCING STEEL LB

Use the following reinforcing steel densities

	Vol. (cy)	Den.(lb/cy)	Weight (lb)	
Deck =	299	240	71760	(Reflects the SBR-1-20 Std. Dwg)
Parapet =	174	330	57420	
Abutment =	704	175	123136	
Pier =	279	235	65648	
			317965	

TOTAL =	317965 POUNDS
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HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1B - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ESTIMATED QUANTITIES

ITEM NO. 511E34446 CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK

CY

Deck:

Plan Area = 10367.3 sq ft (CAD Flood)
 Deck Thickness = 8.50 in

Volume (Deck) = 7343.5 cu ft

Haunch:

Chamfer Depth = 3.38 in (Bottom of Deck to Bottom of Top Flange)
 Chamfer Width = 0.00 in

Overhang Length = 34.00 in (CL Girder to E/Deck)
 Overhang Depth = 12.00 in

Girder	Average Top Flange		Ave. Haunch Thick.	Area above Girder (sq in)	No. Chamfers	Chamfer Area (sq in)	Overhang Area (sq in)	Girder Length	Volume (cu ft)
	Thick.	Width							
G1	0.98"	14.00"	2.39"	33.5	0	0.0	92.8	293.13'	257.1
G2	0.98"	14.00"	2.39"	33.5	0	0.0		292.19'	68.0
G3	0.98"	14.00"	2.39"	33.5	0	0.0		291.25'	67.8
G4	0.98"	14.00"	2.39"	33.5	0	0.0		290.31'	67.5
G5	0.98"	14.00"	2.39"	33.5	0	0.0	92.8	289.37'	253.8

Volume (Haunch) = 714

Vol (Total) = 8057.8 cu ft

TOTAL = 299 CY

ITEM NO. 511E34450 CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)

CY

Parapet Area = 588.0 sq in (ODOT Std. Dwg. SBR-1-13)

Left Parapet:

Length (Rear Appr.) = 31.50 ft
 Length (Deck) = 295.64 ft
 Length (Fwd. Backwall) = 1.25 ft
 Length (Fwd Appr.) = 14.00 ft
 Length (Total) = 342.39 ft

Volume (Left) = 1398.1 cu ft

Right Parapet:

Length (Rear Appr.) = 16.00 ft
 Length (Deck) = 291.19 ft
 Length (Fwd Appr.) = 31.00 ft
 Length (Total) = 338.19 ft

Volume (Right) = 3283.5 cu ft

Volume (Parapet) = 4681.6 cu ft

TOTAL = 174 CY

ITEM NO. 511E41012 CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS

CY

See Bottom of Footing tab for Pier Above Footing concrete quantity calculations

TOTAL = 130 CY

ITEM NO. 511E44112 CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING

CY

See Bottom of Footing tab for Abutment Including Footing concrete quantity calculations

TOTAL = 345 CY

ITEM NO. 511E46512 CLASS QC1 CONCRETE WITH QC/QA, FOOTING

CY

See Bottom of Footing tab for Footing concrete quantity calculations

TOTAL = 508 CY

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 1B - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
Checked By:

Date: 5-Apr-20
Date:

ITEM NO. 512E10100 SEALING OF CONCRETE SURFACES (EPOXY-URETHANE) SY

Parapet:

Perimeter = 9.56 ft (includes 12" deep deck edge and 6" of deck underside)
Total Length = 680.58 ft
Area (Parapet) = 6508.2 sq ft

Rear Abutment

Body:

Perimeter = 24.20 ft (includes f/backwall, abut. Seat, f/stem)
Length = 35.33 ft

Area (Rear Body) = 855.2 sq ft

Wingwall:

Perimeter = 16.34 ft (includes f/wingwall)
Length = 50.51 ft

Area (Rear Wing) = 825.4 sq ft

Area (Rear) = 1680.6 sq ft

Forward Abutment

Body:

Perimeter = 25.17 ft (includes f/backwall, abut. Seat, f/stem)
Length = 35.33 ft

Area (Fwd Body) = 889.4 sq ft

Wingwall:

Perimeter = 19.59 ft (includes f/wingwall)
Length = 52.67 ft

Area (Fwd Wing) = 1031.7 sq ft

Area (Fwd) = 1921.1 sq ft

Pier 1:

Columns:

Perimeter = 30.00 ft
Height = 10.00 ft
No. Columns = 2

Area (Crashwalls) = 600.0 sq ft

Columns:

Perimeter = 20.00 ft
Ave. Height = 14.73 ft
No. Columns = 3

Area (Columns) = 858.4 sq ft

Area (Pier 1) = 1458.4 sq ft

Pier 2:

Columns:

Perimeter = 30.00 ft
Height = 10.00 ft
No. Columns = 2

Area (Crashwalls) = 600.0 sq ft

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1B - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

Columns:
 Perimeter = 20.00 ft
 Ave. Height = 15.48 ft
 No. Columns = 2
 Area (Columns) = 619.2 sq ft
 Area (Pier 2) = 1219.2 sq ft

TOTAL = 1421 SY

ITEM NO. 513E10300 STRUCTURAL STEEL MEMBERS, LEVEL 5 LB

Weight of Steel = 0.490 k/cu ft

Girders:

Web Thickness = 0.563 in
 Web Depth = 52.00 in

Section	Top Flange		Bottom Flange		Girder Area (in2)	Section Length	Girder Vol. (cf)		
	Thick.	Width	Thick.	Width					
G1	1	.75"	14.00"	.75"	18.00"	53.25	63.41'	23.4	
	2	1.38"	14.00"	1.50"	18.00"	75.50	54.35'	28.5	90.58' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	57.62'	21.3	111.97' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	54.35'	28.5	90.58' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	63.41'	23.4	293.13' 293.13'
G2	1	.75"	14.00"	.75"	18.00"	53.25	63.20'	23.4	
	2	1.38"	14.00"	1.50"	18.00"	75.50	54.17'	28.4	90.29' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	57.44'	21.2	111.61' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	54.17'	28.4	90.29' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	63.20'	23.4	292.19' 292.19'
G3	1	.75"	14.00"	.75"	18.00"	53.25	63.00'	23.3	
	2	1.38"	14.00"	1.50"	18.00"	75.50	54.00'	28.3	90.00' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	57.25'	21.2	111.25' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	54.00'	28.3	90.00' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	63.00'	23.3	291.25' 291.25'
G4	1	.75"	14.00"	.75"	18.00"	53.25	62.80'	23.2	
	2	1.38"	14.00"	1.50"	18.00"	75.50	53.83'	28.2	89.71' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	57.06'	21.1	110.89' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	53.83'	28.2	89.71' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	62.80'	23.2	290.31' 290.31'
G5	1	.75"	14.00"	.75"	18.00"	53.25	62.59'	23.1	
	2	1.38"	14.00"	1.50"	18.00"	75.50	53.65'	28.1	89.42' Span 1
	3	.75"	14.00"	.75"	18.00"	53.25	56.88'	21.0	110.53' Span 2
	4	1.38"	14.00"	1.50"	18.00"	75.50	53.65'	28.1	89.42' Span 3
	5	.75"	14.00"	.75"	18.00"	53.25	62.59'	23.1	289.37' 289.37'

Volume (Girders) = 622 cu ft
 Weight (Girders) = 304754 pounds

* Assume weight of additional steel components (stiffeners, crossframes, splices, etc.) are approximately 25% of the Girder Only weight.

Bearing Stiffeners	1.0%	3047.5 lb
Splices	5.0%	15237.7 lb
End Crossframes	4.0%	12190.2 lb
Crossframes Members	15.0%	45713.1 lb
	25.0%	76188.5 lb

TOTAL = 380950 LB

ITEM NO. 513E10301 STRUCTURAL STEEL MEMBERS, LEVEL 5, AS PER PLAN LB

Steel Pier Straddle Bent:

Web Thickness = 1.25 in
 Web Depth = 96.00 in
 Flange Width = 30 in
 Flange Thick. = 2.75 in
 Area = 1.98 sq ft

Pier 1 Length = 65.15 ft
 Pier 2 Length = 68.14 ft

Volume (Bent) = 264 cu ft
 Weight (Bent) = 129264 pounds (Stiffeners included with Girders)

TOTAL = 129270 LB

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1B - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ITEM NO. 513E15001 STRUCTURAL STEEL MEMBERS, SPECIALIZED MULTI ROTATIONAL BEARING (SMR), LEVEL UF, AS PER PLAN EACH

Pier No. 1
 No. Bearings = 2 Each

Pier No. 2
 No. Bearings = 2 Each

TOTAL = 4 EACH

ITEM NO. 514E00060 FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT SF
 ITEM NO. 514E00066 FIELD PAINTING STRUCTURAL STEEL, FINISH COAT SF

Field Paint Last 10' of each Girder, including all end crossframes and intermediate crossframes

Web Thickness = 0.5625 in
 Web Depth = 52 in

Section	Top Flange		Bottom Flange		Perimeter	Section Length	Surface Area (sq ft)	
	Thick.	Width	Thick.	Width				
G1	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
G2	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
G3	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
G4	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
G5	1	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6
	2	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	3	0.75"	14.00"	0.75"	18.00"	154.38"	0.00'	0.0
	4	1.38"	14.00"	1.50"	18.00"	155.88"	0.00'	0.0
	5	0.75"	14.00"	0.75"	18.00"	154.38"	10.00'	128.6

Area (Girders) = 1286.5 sq ft

Assume end crossframe surface area is approx. 50% of the surface area of girders only

Area (End Crossframes) = 643.2 sq ft

Assume intermediate crossframe surface area is approx. 30% of the surface area of girders only

Area (Int. Crossframes) = 385.9 sq ft

TOTAL = 2316 SF

ITEM NO. 516E11210 STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL FT

Rear Abutment:
 Length = 35.33 ft

Fwd. Abutment:
 Length = 35.33 ft

TOTAL = 71 FT

ITEM NO. 516E44100 ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE) EACH

Rear Abutment:
 No. Bearings = 5 Each

Fwd. Abutment:
 No. Bearings = 5 Each

TOTAL = 10 EACH

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1B - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ITEM NO. 518E21200 POROUS BACKFILL WITH GEOTEXTILE FABRIC CY

Backfill Width = 2.00 ft
 Appr. Slab Thick. = 1.42 ft

Rear Abutment:

Ave. Height = 23.79 ft (Bot./Appr. Slab to Bot/Ftg.)
 Length = 85.84 ft (Include wingwall)
 Vol. (Rear) = 4083.9 cu ft

Fwd. Abutment:

Ave. Height = 24.76 ft (Bot./Appr. Slab to Bot/Ftg.)
 Length = 88.00 ft (Include wingwall)
 Vol. (Rear) = 4357.4 cu ft

TOTAL = 313 CY

ITEM NO. 526E30010 REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=17") SY

Rear Abutment:

Plan Area = 962.5 sq ft (CAD Flood)

Fwd. Abutment:

Plan Area = 962.5 sq ft (CAD Flood)

TOTAL = 214 SY

ITEM NO. RETAINING WALL INCLUDING PARAPET

Left Retaining Wall - Rear:

Stem:

Width = 1.50 ft
 Length = 82.70 ft

Begin Height = 4.00 ft
 End Height = 20.00 ft
 Ave. Height = 12.00 ft

Vol. (Stem) = 1488.6 cu ft

Footing:

Footing Area = 954.4 sq ft
 Footing Depth = 3.00 ft

Vol. (Ftg.) = 2863.2 cu ft

Total (Rear) = 162 cu yd

Right Retaining Wall - Fwd:

Stem:

Width = 1.50 ft
 Length = 183.54 ft

Begin Height = 4.00 ft
 End Height = 30.00 ft
 Ave. Height = 17.00 ft

Vol. (Stem) = 4680.3 cu ft

Footing:

Footing Area = 1889.3 sq ft
 Footing Depth = 3.00 ft

Vol. (Ftg.) = 5667.9 cu ft

Total (Fwd.) = 384 cu yd

TOTAL = 546 CY

Unit Cost = \$415.00 /cu yd

Total Cost = \$227,000

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1B - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

Retaining Wall Parapet:

Parapet Area = 588.0 sq in (ODOT Std. Dwg. SBR-1-13)

Left Parapet:

Length (Rear Wall) = 82.70 ft

Right Parapet:

Length (Fwd. Wall) = 183.54 ft

Total Length = 266.24 ft
 Area = 1087.1 cu ft

TOTAL = 41 CY

Unit Cost = \$640.00 /cu yd

Total Cost = \$27,000

Reinforcing Steel:

Use the following reinforcing steel densities

	Vol. (cy)	Den. (lb/cy)	Weight (lb)
Parapet =	41	330	13530
Retaining Wall =	546	175	95550
			<u>109080</u>

TOTAL = 109080 POUND

Unit Cost = \$1.77 /lb

Total Cost = \$194,000

Concrete Sealing:

Parapet:

Perimeter = 8.06 ft
 Total Length = 266.24 ft

Area (Parapet) = 2146.6 sq ft

Rear Retaining Wall:

Wall Length = 82.70 ft
 Ave. Height = 12.00 ft
 Area = 992.4 sq ft

Fwd. Wall Length = 183.54 ft
 Ave. Height = 17.00 ft
 Area = 3120.2 sq ft

Area (Walls) = 4112.6 sq ft

TOTAL = 696 SY

Unit Cost = \$31.90 /lb

Total Cost = \$23,000

TOTAL WALL COST = \$471,000

ITEM NO. ROADWAY

SR 151:

Begin Pavement Sta. = 60+10.00
 End Pavement Sta. = 65+33.25 (Begin Appr. Slab)
 Length = 523.25 ft

Begin Pavement Sta. = 68+90.00 (End Appr. Slab)
 End Pavement Sta. = 76+00.00
 Length = 710 ft

TOTAL 0.23 MILE

SR 212:

Length = 110 ft

TOTAL 0.02 MILE

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 1B - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS

Designed By: JTC
Checked By:

Date: 13-Apr-20
Date:

BOTTOM OF FOOTING ELEVATIONS/SUBSTRUCTURE QUANTITIES

Depths:

Superstructure (Abut.):

Deck = 8.50 in
Haunch = 2.63 in
Top Flange = 0.75 in
Web = 52.00 in
Bot. Flange = 0.75 in
Steel Plate = 0.00 in
HP Pedestal = 0.00 in
Load Plate = 2.00 in
Bearing Pad = 4.00 in
TOTAL = 70.63 in
TOTAL = 5.89 ft

Superstructure (Pier):

Deck = 8.50 in
Haunch = 2.00 in
Top Flange = 1.38 in
Web = 52.00 in
Bot. Flange = 1.50 in
Load Plate = 0.00 in
Bearing Pad = 0.00 in
65.38 in
Total (Super) = 5.45 ft
TOTAL = 9.95 ft*

* Total Depth includes cap, 6" Gap, top flange, haunch & deck

Load Plate = 2.00 in
Bearing Pad = 10.00 in

Abutment:

Cover (min.) = 1.00 ft
Footing Depth = 4.00 ft
TOTAL = 5.00 ft

Integral Steel Bent Pier:

Top Flange = 2.75 in
Web = 96.00 in
Bot. Flange = 2.75 in
Total (Cap) = 8.46 ft

Cover (min.) = 1.00 ft
Footing Depth = 4.00 ft
TOTAL = 5.00 ft

SR 151 Vertical Alignment

Segment 1	Define Type of Vertical Alignment -->>	Vertical Curve
	Enter the Following Required Geometry Information:	
	PVI Sta. = 68+00.00 PVI Elev. = 999.19 LVC = 900 g1 = 3.17% g2 = -6.68%	
	Summary of Segment 1 Vertical Alignment	
	PVC Sta. = 63+50.00 PVC Elev. = 984.93 g1 = 3.17% g2 = -6.68%	PVT Sta. = 72+50.00 PVT Elev. = 969.13 LVC = 900.00 Rate of Change of Grade, r = -0.000109
	PVI Sta. = 68+00.00 PVI Elev. = 999.19	

SR 151 Cross Slopes

										PGL
Left Shoulder				WB Lane		EB Lane		Right Shoulder		
X-Slope	Width	X-Slope	Rounding	X-Slope	Width	X-Slope	Width	X-Slope	Width	Station
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	64+32.29
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	77+09.62

Substructure Locations and Skew Angles

Substructure Unit: **Rear Abutment**
 CL Brg Sta. = 65+66.00
 Skew Angle (DMS) = No Skew 0°
 Skew Angle = 0.00000 degrees 0.0000 radians

Substructure Unit: **Pier 1**
 CL Pier 1 Sta. = 66+56.00
 Skew Angle (DMS) = No Skew 0°
 Skew Angle = 0.00000 degrees 0.0000 radians

Substructure Unit:

Pier 2

CL Pier 2 Sta. = 67+67.25

Skew Angle (DMS) = No Skew 0°
 Skew Angle = 0.00000 degrees 0.0000 radians

Substructure Unit:

Forward Abutment

CL Brg Sta. = 68+57.25

Skew Angle (DMS) = No Skew 0°
 Skew Angle = 0.00000 degrees 0.0000 radians

Rear Abutment

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	Seat Elevation
G1	-14.83'	65+66.00	989.22	989.83	983.94
G2	-7.42'	65+66.00	989.22	989.56	983.67
G3	0.00'	65+66.00	989.22	989.22	983.33
G4	7.42'	65+66.00	989.22	988.88	982.99
G5	14.83'	65+66.00	989.22	988.54	982.65

C	Offset From PGL	Station	Ground Elev.	B/Footing Elevation
1	-19.50'	65+71.46	960.00	955.00
2	18.50'	65+71.55	978.00	973.00

Step Footing, Average Bot/Ftg = 964.00

Pier 1

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	B/Cap Elevation
G1	-14.83'	66+56.00	989.50	990.11	980.16
G2	-7.42'	66+56.00	989.50	989.84	979.89
G3	0.00'	66+56.00	989.50	989.50	979.55
G4	7.42'	66+56.00	989.50	989.16	979.21
G5	14.83'	66+56.00	989.50	988.82	978.87

Steel Bent Slope = -4.60%

Length from G1 to Col 1. = 32.48 ft Bot/ Cap Elev. Col. 1 = 981.73
 Length from G1 to Col 2. = 3.00 ft Bot/ Cap Elev. Col. 2 = 978.73

Column 1

Point	Offset From PGL	Station	Exist. Ground Elev.	B/Footing Elevation
1	-54.26'	66+49.57	955.27	950.27
2	-48.78'	66+66.34	955.06	950.06
3	-41.90'	66+45.64	955.69	950.69
4	-36.39'	66+62.49	955.36	950.36

950.00 (Controls)

Column 2

1	4.58'	66+49.41	956.58	951.58
2	10.06'	66+66.61	956.12	951.12
3	16.95'	66+45.30	963.56	958.56
4	22.46'	66+62.65	963.19	958.19

951.00 (Controls)

Pier 2

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	B/Cap Elevation
G1	-14.83'	67+67.25	988.62	989.24	979.29
G2	-7.42'	67+67.25	988.62	988.97	979.02
G3	0.00'	67+67.25	988.62	988.62	978.68
G4	7.42'	67+67.25	988.62	988.28	978.34
G5	14.83'	67+67.25	988.62	987.94	977.99

Steel Bent Slope = -4.60%

Length from G1 to Col 1. = 32.48 ft Bot/ Cap Elev. Col. 1 = 980.85
 Length from G1 to Col 2. = 3.00 ft Bot/ Cap Elev. Col. 2 = 977.86

	Point	Offset From PGL	Station	Bot/Ditch Elev.*	B/Footing Elevation	
Column 1	1	-19.08'	67+60.58	954.03	949.03	
	2	-13.88'	67+77.69	953.86	948.86	948.75 (Controls)
	3	-6.65'	67+56.78	954.62	949.62	
	4	-1.43'	67+73.98	954.51	949.51	
1	39.47'	67+60.40	954.97	949.97		
Column 2	2	44.67'	67+77.96	954.14	949.14	949.00 (Controls)
	3	51.90'	67+56.51	961.67	956.67	
	4	57.13'	67+74.16	959.28	954.28	

Forward Abutment

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	Seat Elevation
G1	-14.83'	68+57.25	986.92	987.61	981.72
G2	-7.42'	68+57.25	986.92	987.27	981.38
G3	0.00'	68+57.25	986.92	986.92	981.04
G4	7.42'	68+57.25	986.92	986.58	980.70
G5	14.83'	68+57.25	986.92	986.24	980.36

C	Offset From PGL	Station	Ground Elev.	B/Footing Elevation
1			978.00	973.00
2	19.50'	68+51.70	953.50	948.50

Bot/Ftg. Elev. = 960.75

CONCRETE QUANTITIES

Rear Abutment:

Abutment Footing (including Wingwall Footing):

Footing Area = 1055.7 sq ft
 Footing Depth = 4.00 ft
 Ave. Bot./Ftg Elev. = 964.00

Footing Volume = 156 cy

Point	Rdwy Elev. at Point	Seat Elevation
G1	989.83	983.94
G2	989.56	983.67
G3	989.22	983.33
G4	988.88	982.99
G5	988.54	982.65

Average = 989.20 983.32

Left Wingwall

Wall Width = 2.50 ft
 Wall Height @ Abut. = 30.83 ft
 Wall Height @ End = 20.00 ft
 Total Wall Length = 34.51 ft

Left Wall Volume = 81.2 cy

Right Wingwall

Wall Width = 1.50 ft
 Wall Height @ Abut. = 11.54 ft
 Wall Height @ End = 3.00 ft
 Total Wall Length = 16.00 ft

Right Wall Volume = 6.5 cy

Abutment Stem

Stem Width = 3.00 ft
 Ave. Stem Height = 15.32 ft
 Stem Length = 35.33 ft (o/o deck along Abut.)

Stem Volume = 60 cy

Abutment Backwall

Backwall Width = 1.75 ft
 Ave. Backwall Height = 5.89 ft
 Backwall Length = 35.33 ft (o/o deck along Abut.)

Backwall Volume = 13 cy

Abutment Corbel

Corbel Width = 1.75 ft
 Corbel Height = 1.75 ft
 Corbel Length = 35.33 ft

Stem Volume = 4 cy

Rear Abutment, not including Footing = 165 cy

Pier 1:

Pier Footing

Number of Footings = 2
Footing Length = 18.00 ft
Footing Width = 14.00 ft
Footing Depth = 4.00 ft

Footing Volume = 75 cy

Pier Column

Crashwall

Width = 5.00 ft
Length = 10.00 ft
Height = 10.00 ft
Vol. (Crashwall) = 1000.0 cu ft

Column Volume = 64 cy

Pier Above Footing = 64 cy

Pier 2:

Pier Footing

Number of Footings = 2
Footing Length = 18.00 ft
Footing Width = 14.00 ft
Footing Depth = 4.00 ft

Footing Volume = 75 cy

Pier Column

Crashwall

Width = 5.00 ft
Length = 10.00 ft
Height = 10.00 ft
Vol. (Crashwall) = 1000.0 cu ft

Column Volume = 66 cy

Pier Above Footing = 66 cy

Forward Abutment

Abutment Footing (including Wingwall Footing):

Footing Area = 1368.1 sq ft
Footing Depth = 4.00 ft
Ave. Bot./Ftg Elev. = 960.75

Footing Volume = 203 cy

Point	Rdwy Elev. at Point	Seat Elevation
G1	987.61	981.72
G2	987.27	981.38
G3	986.92	981.04
G4	986.58	980.70
G5	986.24	980.36

Average = 986.92 981.04

Abutment Stem

Stem Width = 3.00 ft
Ave. Stem Height = 16.29 ft
Stem Length = 35.33 ft (o/o deck along Abut.)

Stem Volume = 64 cy

Abutment Corbel

Corbel Width = 1.75 ft
Corbel Height = 1.75 ft
Corbel Length = 35.33 ft

Stem Volume = 4 cy

Fwd. Abutment, not including Footing = 179 cy

Column

Width = 5.00 ft
Length = 5.00 ft
Area = 25.00 sq ft

Column 1:

T/Column Elev. = 980.73
B/Footing Elev. = 950.00
Column Height = 16.73 ft (minus crashwall)

Column 2:

T/Column Elev. = 977.73
B/Footing Elev. = 951.00
Column Height = 12.73 ft (minus crashwall)

Vol. (Column) = 736.6 cu ft

Column

Width = 5.00 ft
Length = 5.00 ft
Area = 25.00 sq ft

Column 1:

T/Column Elev. = 979.85
B/Footing Elev. = 948.75
Column Height = 17.10 ft (minus crashwall)

Column 2:

T/Column Elev. = 976.86
B/Footing Elev. = 949.00
Column Height = 13.86 ft (minus crashwall)

Vol. (Column) = 774.0 cu ft

Left Wingwall

Ave. Wall Width = 2.00 ft
Wall Height @ Abut. = 10.61 ft
Wall Height @ End = 4.00 ft
Total Wall Length = 21.67 ft

Left Wall Volume = 11.7 cy

Right Wingwall

Wall Width = 2.50 ft
Wall Height @ Abut. = 33.74 ft
Wall Height @ End = 30.00 ft
Total Wall Length = 31.00 ft

Right Wall Volume = 86.1 cy

Abutment Backwall

Backwall Width = 1.75 ft
Ave. Backwall Height = 5.89 ft
Backwall Length = 35.33 ft (o/o deck along Abut.)

Backwall Volume = 13 cy

Bridge Quantities - Alternative 2

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1B - 3-SPAN 52" WEB DEPTH PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS
 LIFE CYCLE QUANTITIES

Date	Year	Repair Work	Est. Cost
2033	10, 30, 50, 70	Patching & maintenance of deck	\$42,613.31
2043	20, 60	Deck overlay, patching of concrete substructures	\$128,833.27
2048	25, 50	Painting of steel girders	\$109,048.53
2063	40	Deck replacement (including approach slabs), patching of concrete substructures	\$1,061,100.00

Patching & maintenance of deck & approach slabs

Deck Patching

Assumed Cost (\$/SY):	\$624.00	Item 519E12220
Deck & approach slab area (SY):	1366	
Patch area (SY)	68.3	Use 5% of area
Cost (\$):	\$42,613	

Deck overlay, patching of concrete substructures

Deck Overlay (microsilica w/hydro)

Assumed Cost (\$/SY):	\$78.00	Item 848E10000
Deck & approach slab Overlay area (SY):	1366	
Cost (\$):	\$106,533	

Patching of concrete substructures

Assumed Cost (\$/SF):	\$174.00	Item 519E11100
Assumed Area (SF):	128	Use 1% of Sealing Area
Cost (\$):	\$22,300	
Total Deck overlay, patching of concrete substructures	\$128,833	

Painting end of steel girders at bearings

Surface preparation steel girders

Steel girder area (SF):	1930	
Assumed Cost (\$/SF):	\$31.30	Item 514E00050
Cost (\$):	\$60,411	

Painting steel girders (prime, intermediate & finish coats)

Steel girder area (SF):	1930	
Assumed Cost (\$/SF):	\$25.20	Item 514E00056, 514E00060, & 514E00066
Cost (\$):	\$48,638	
Total Painting end of steel girders at bearings	\$109,049	

Deck replacement (including approach slabs), patching of concrete substructures

Deck Concrete

Assumed Cost (\$/CY):	\$790.00	Item 511E34446
Volume (CY):	299	
Cost (\$):	\$236,300	

Deck Removal

Assumed Cost (\$/SF):	\$25.00	
Deck Area (SF): Includes Approach Slabs	12292	
Cost (\$):	\$307,400	

Parapet Concrete

Assumed Cost: (\$/CY)	\$730.00	Item 511E34450
Volume (CY):	174	
Cost (\$):	\$127,100	

Deck/Parapet Reinforcing

Superstructure Rebar (LBS):	129,180	
Cost (\$/LB):	\$2.02	Item 509E10000
Cost (\$):	\$261,000	

Approach Slabs

Area (SY)	214	
Cost (\$/SY):	\$310.00	Item 526E30010
Cost (\$):	\$66,400	

Patching of concrete substructures (see calcs above)

Cost (\$):	\$22,300	
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Elastomeric bearings

Total (each)	14	
Cost (\$/Each):	\$2,895.00	Average b/w Elastomeric & Multi-Rotational
Cost (\$):	\$40,600	

Total cost for deck replacement (including bearings and approach slabs) and patching of concrete substructures	\$1,061,100	
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HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ITEM NO. 202E11002 STRUCTURE REMOVED, OVER 20 FOOT SPAN LS

TOTAL	LS
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Existing Bridge Width = 36.83 ft
 Existing Bridge Length = 447.25 ft
 Area = 16472.2 sq ft
 Unit Cost = \$20.00 /sq ft
 Total Cost = \$330,000

ITEM NO. 507E00200 STEEL PILES HP12X53, FURNISHED FT

Rear Abutment:

Estimated Length = 25.00 ft
 Furnished Length = 30.00 ft (Estimated Length + 5 ft)
 No. Piles = 11
 Total Length (Rear) = 330.00 ft

Pier 1:

Estimated Length = 35.00 ft
 Furnished Length = 40.00 ft (Estimated Length + 5 ft)
 No. Piles = 10
 Total Length (Pier 1) = 400.00 ft

Pier 2:

Estimated Length = 25.00 ft
 Furnished Length = 30.00 ft (Estimated Length + 5 ft)
 No. Piles = 28
 Total Length (Pier 2) = 840.00 ft

Pier 3:

Estimated Length = 20.00 ft
 Furnished Length = 25.00 ft (Estimated Length + 5 ft)
 No. Piles = 24
 Total Length (Pier 3) = 600.00 ft

Pier 4:

Estimated Length = 35.00 ft
 Furnished Length = 40.00 ft (Estimated Length + 5 ft)
 No. Piles = 24
 Total Length (Pier 4) = 960.00 ft

Pier 5:

Estimated Length = 30.00 ft
 Furnished Length = 35.00 ft (Estimated Length + 5 ft)
 No. Piles = 24
 Total Length (Pier 5) = 840.00 ft

Pier 6:

Estimated Length = 35.00 ft
 Furnished Length = 40.00 ft (Estimated Length + 5 ft)
 No. Piles = 24
 Total Length (Pier 6) = 960.00 ft

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

Pier 7:

Estimated Length = 95.00 ft
 Furnished Length = 100.00 ft (Estimated Length + 5 ft)

No. Piles = 10
 Total Length (Pier 7) = 1000.00 ft

Forward Abutment:

Estimated Length = 25.00 ft
 Furnished Length = 30.00 ft (Estimated Length + 5 ft)

No. Piles = 10
 Total Length (Fwd) = 300.00 ft

TOTAL	6230 FT
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ITEM NO. 507E00250 STEEL PILES HP12X53, DRIVEN FT

Rear Abutment:

Bot/Ftg. Elev. = 980.25
 Exist. Ground Elev. = 960.00
 Estimated Length = 25.00 ft (Rounded up to the nearest 5 ft)

No. Piles = 11
 Total Length (Rear) = 275.00 ft

Pier 1:

Bot/Cap Elev. = 985.66
 Tip Elev. = 955.00
 Estimated Length = 35.00 ft (Rounded up to the nearest 5 ft)

No. Piles = 10
 Total Length (Pier 1) = 350.00 ft

Pier 2:

Ave. Bot/Ftg. Elev. = 957.17
 Tip Elev. = 934.00
 Estimated Length = 25.00 ft (Rounded up to the nearest 5 ft)

No. Piles = 28
 Total Length (Pier 2) = 700.00 ft

Pier 3:

Ave. Bot/Ftg. Elev. = 950.63
 Tip Elev. = 934.00
 Estimated Length = 20.00 ft (Rounded up to the nearest 5 ft)

No. Piles = 24
 Total Length (Pier 3) = 480.00 ft

Pier 4:

Ave. Bot/Ftg. Elev. = 949.63
 Tip Elev. = 919.00
 Estimated Length = 35.00 ft (Rounded up to the nearest 5 ft)

No. Piles = 24
 Total Length (Pier 4) = 840.00 ft

Pier 5:

Ave. Bot/Ftg. Elev. = 949.00
 Tip Elev. = 922.00
 Estimated Length = 30.00 ft (Rounded up to the nearest 5 ft)

No. Piles = 24
 Total Length (Pier 5) = 720.00 ft

Pier 6:

Ave. Bot/Ftg. Elev. = 948.17
 Tip Elev. = 915.00
 Estimated Length = 35.00 ft (Rounded up to the nearest 5 ft)

No. Piles = 24
 Total Length (Pier 6) = 840.00 ft

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

Pier 7:

Bot/Cap Elev. = 983.37
 Tip Elev. = 893.00
 Estimated Length = 95.00 ft (Rounded up to the nearest 5 ft)
 No. Piles = 10
 Total Length (Pier 7) = 950.00 ft

Forward Abutment:

Bot/Ftg. Elev. = 976.00
 Exist. Ground Elev. = 957.00
 Estimated Length = 25.00 ft (Rounded up to the nearest 5 ft)
 No. Piles = 10
 Total Length (Fwd) = 250.00 ft

TOTAL	3615 FT
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ITEM NO. 509E10000 EPOXY COATED REINFORCING STEEL LB

Use the following reinforcing steel densities

	Vol. (cy)	Den. (lb/cy)	Weight (lb)
Deck =	1292	240	310080
Parapet =	297	330	98010
Abutment =	206	175	36038
Pier =	1048	235	246359
			690487

(Reflects the SBR-1-20 Std. Dwg)

TOTAL =	690487 POUNDS
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ITEM NO. 511E32210 CLASS QC2 CONCRETE, SUPERSTRUCTURE CY

Deck:

Plan Area = 15497.5 sq ft (CAD Flood)
 Deck Thickness = 27.00 in
 Volume (Deck) = 34869.4 cu ft

TOTAL =	1292 CY
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ITEM NO. 511E34450 CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET) CY

Parapet Area = 588.0 sq in (ODOT Std. Dwg. SBR-1-13)

Left Parapet:

Length (Rear Appr.) = 24.90 ft
 Length (Deck) = 438.87 ft
 Length (Fwd Appr.) = 0.00 ft
 Length (Total) = 463.77 ft
 Volume (Left) = 1893.7 cu ft

Right Parapet:

Length (Rear Appr.) = 0.00 ft
 Length (Deck) = 438.90 ft
 Length (Fwd Appr.) = 24.92 ft
 Length (Total) = 463.82 ft
 Volume (Right) = 6099.6 cu ft

Volume (Parapet) = 7993.4 cu ft

TOTAL	297 CY
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ITEM NO. 511E41012 CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS CY

See Bottom of Footing tab for Pier Above Footing concrete quantity calculations

TOTAL =	556 CY
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HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
Checked By:

Date: 5-Apr-20
Date:

ITEM NO. 511E43512 CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT INCLUDING FOOTING

CY

See Bottom of Footing tab for Abutment Including Footing concrete quantity calculations

TOTAL = 142 CY

ITEM NO. 511E46512 CLASS QC1 CONCRETE WITH QC/QA, FOOTING CY

See Bottom of Footing tab for Footing concrete quantity calculations

TOTAL = 492 CY

ITEM NO. 512E10100 SEALING OF CONCRETE SURFACES (EPOXY-URETHANE) SY

Parapet:

Perimeter = 9.56 ft (includes 12" deep deck edge and 6" of deck underside)
Total Length = 927.59 ft
Area (Parapet) = 8870.3 sq ft

Rear Abutment

Body:
Perimeter = 2.00 ft (includes f/diaphragm plus 6")
Length = 35.33 ft

Area (Rear Body) = 70.7 sq ft

Left Wingwall:
Perimeter = 7.84 ft (includes f/wingwall, t/wingwall, plus 6")
Length = 28.30 ft

Area (Left Wing) = 222.0 sq ft

Right Wingwall:
Perimeter = 7.40 ft (includes f/wingwall, t/wingwall, plus 6")
Length = 10.00 ft

Area (Right Wing) = 74.0 sq ft

Area (Rear) = 366.7 sq ft

Forward Abutment

Body:
Perimeter = 2.00 ft (includes f/diaphragm plus 6")
Length = 35.33 ft

Area (Fwd Body) = 70.7 sq ft

Left Wingwall:
Perimeter = 12.82 ft (includes f/wingwall, t/wingwall, plus 6")
Length = 10.00 ft

Area (Left Wing) = 128.2 sq ft

Left Wingwall:
Perimeter = 11.10 ft (includes f/wingwall, t/wingwall, plus 6")
Length = 27.47 ft

Area (Left Wing) = 304.9 sq ft

Area (Fwd) = 503.8 sq ft

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
Checked By:

Date: 5-Apr-20
Date:

Pier 1:

Cap Face:

Length = 36.70 ft
Height = 2.75 ft
No. Faces = 2

Area (Cap Face) = 201.7 sq ft

Cap Ends:

Width = 3.00 ft
Height = 2.75 ft
No. Faces = 2

Area (Cap Ends) = 16.5 sq ft

Area (Pier 1) = 218.2 sq ft

Pier 2:

Crashwalls:

Perimeter = 30.00 ft
Height = 10.00 ft
No. Columns = 3

Area (Crashwalls) = 900.0 sq ft

Columns 1 & 2:

Perimeter = 20.00 ft
Ave. Height = 17.41 ft
No. Columns = 2

Area (Columns) = 696.4 sq ft

Column 3:

Perimeter = 15.71 ft
Height = 9.33 ft
No. Columns = 1

Area (Columns) = 146.5 sq ft

Area (Pier 2) = 1743.0 sq ft

Pier 3:

Crashwalls:

Perimeter = 30.00 ft
Height = 10.00 ft
No. Columns = 2

Area (Crashwalls) = 600.0 sq ft

Columns 1 & 2:

Perimeter = 20.00 ft
Ave. Height = 17.97 ft
No. Columns = 2

Area (Columns) = 719.0 sq ft

Area (Pier 3) = 1319.0 sq ft

Pier 4:

Crashwalls:

Perimeter = 30.00 ft
Height = 10.00 ft
No. Columns = 2

Area (Crashwalls) = 600.0 sq ft

Columns 1 & 2:

Perimeter = 20.00 ft
Ave. Height = 18.01 ft
No. Columns = 2

Area (Columns) = 720.3 sq ft

Area (Pier 4) = 1320.3 sq ft

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
Checked By:

Date: 5-Apr-20
Date:

Pier 5:

Crashwalls:

Perimeter = 30.00 ft
Height = 10.00 ft
No. Columns = 2

Area (Crashwalls) = 600.0 sq ft

Columns 1 & 2:

Perimeter = 20.00 ft
Ave. Height = 17.39 ft
No. Columns = 2

Area (Columns) = 695.5 sq ft

Area (Pier 5) = 1295.5 sq ft

Pier 6:

Crashwalls:

Perimeter = 30.00 ft
Height = 10.00 ft
No. Columns = 3

Area (Crashwalls) = 900.0 sq ft

Column 1:

Perimeter = 15.71 ft
Height = 28.68 ft
No. Columns = 1

Area (Columns) = 450.6 sq ft

Columns 2 & 3:

Perimeter = 20.00 ft
Ave. Height = 16.16 ft
No. Columns = 2

Area (Columns) = 646.3 sq ft

Area (Pier 6) = 1996.9 sq ft

Pier 7:

Cap Face:

Length = 34.95 ft
Height = 2.54 ft
No. Faces = 2

Area (Cap Face) = 177.6 sq ft

Cap Ends:

Width = 3.00 ft
Height = 2.54 ft
No. Faces = 2

Area (Cap Ends) = 15.2 sq ft

Area (Pier 7) = 192.9 sq ft

TOTAL =	1981 SY
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HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ESTIMATED QUANTITIES

ITEM NO. 513E10301 STRUCTURAL STEEL MEMBERS, LEVEL 5, AS PER PLAN LB

Weight of Steel = 0.490 k/cu ft

Steel Pier Straddle Bent:

Web Thickness = 1.00 in
 Web Depth = 66.00 in
 Flange Width = 30 in
 Flange Thick. = 2.75 in
 Area = 1.60 sq ft

Pier 2 Length = 84.78 ft
 Pier 3 Length = 62.34 ft
 Pier 4 Length = 58.50 ft
 Pier 5 Length = 66.07 ft
 Pier 6 Length = 82.23 ft

Volume (Bent) = 568 cu ft
 Weight (Bent) = 278196 pounds

* Assume weight of additional steel components (stiffeners, etc.)
 2.0% 5564 lb

TOTAL = 283760 LB

ITEM NO. 513E15001 STRUCTURAL STEEL MEMBERS, SPECIALIZED MULTI ROTATIONAL BEARING (SMR), LEVEL UF, AS PER PLAN EACH

Pier No. 2

No. Bearings = 3 Each

Pier No. 3

No. Bearings = 2 Each

Pier No. 4

No. Bearings = 2 Each

Pier No. 5

No. Bearings = 2 Each

Pier No. 6

No. Bearings = 3 Each

TOTAL = 12 EACH

ITEM NO. 518E21200 POROUS BACKFILL WITH GEOTEXTILE FABRIC CY

Backfill Width = 2.00 ft
 Appr. Slab Thick. = 1.25 ft

Rear Abutment:

Ave. Height = 8.41 ft (Bot./Appr. Slab to Bot/Ftg.)
 Length = 73.63 ft (Include wingwall)

Vol. (Rear) = 1239.0 cu ft

Fwd. Abutment:

Ave. Height = 14.20 ft (Bot./Appr. Slab to Bot/Ftg.)
 Length = 72.80 ft (Include wingwall)

Vol. (Rear) = 2066.9 cu ft

TOTAL = 123 CY

ITEM NO. 526E25010 REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=15") SY

Rear Abutment:

Plan Area = 798.2 sq ft (CAD Flood)

Fwd. Abutment:

Plan Area = 800.1 sq ft (CAD Flood)

TOTAL = 178 SY

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

ITEM NO. RETAINING WALL INCLUDING PARAPET

Left Retaining Wall - Rear:

Stem:

Width = 1.50 ft
 Length = 25.63 ft

Begin Height = 4.00 ft
 End Height = 4.23 ft
 Ave. Height = 4.11 ft

Vol. (Stem) = 158.2 cu ft

Footing:

Footing Area = 200.4 sq ft
 Footing Depth = 3.00 ft

Vol. (Ftg.) = 601.2 cu ft

Total (Rear) = 29 cu yd

Right Retaining Wall - Fwd:

Stem:

Width = 1.50 ft
 Length = 119.94 ft

Begin Height = 4.00 ft
 End Height = 6.40 ft
 Ave. Height = 5.20 ft

Vol. (Stem) = 935.5 cu ft

Footing:

Footing Area = 957.1 sq ft
 Footing Depth = 3.00 ft

Vol. (Ftg.) = 2871.3 cu ft

Total (Fwd.) = 141 cu yd

TOTAL = 170 CY

Unit Cost = \$415.00 /cu yd

Total Cost = \$71,000

Retaining Wall Parapet:

Parapet Area = 588.0 sq in (ODOT Std. Dwg. SBR-1-13)

Left Parapet:

Length (Rear Wall) = 25.63 ft

Right Parapet:

Length (Fwd. Wall) = 119.94 ft

Total Length = 145.57 ft
 Area = 594.4 cu ft

TOTAL = 23 CY

Unit Cost = \$640.00 /cu yd

Total Cost = \$15,000

Reinforcing Steel:

Use the following reinforcing steel densities

	Vol. (cy)	Den.(lb/cy)	Weight (lb)
Parapet =	23	330	7590
Retaining Wall =	170	175	29750
			37340

TOTAL = 37340 POUND

Unit Cost = \$1.77 /lb

Total Cost = \$67,000

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
ESTIMATED QUANTITIES

Designed By: JTC
Checked By:

Date: 5-Apr-20
Date:

Concrete Sealing:

Parapet:

Perimeter = 8.06 ft
Total Length = 145.57 ft

Area (Parapet) = 1173.7 sq ft

Rear Retaining Wall:

Wall Length = 25.63 ft
Ave. Height = 4.11 ft
Area = 105.5 sq ft

Fwd. Wall Length = 119.94 ft
Ave. Height = 5.20 ft
Area = 623.7 sq ft

Area (Walls) = 729.1 sq ft

TOTAL = 212 SY

Unit Cost = \$31.90 /lb

Total Cost = \$7,000

TOTAL WALL COST = \$160,000

ITEM NO. ROADWAY

SR 151:

Begin Pavement Sta. = 59+90.00
End Pavement Sta. = 64+68.69 (Begin Appr. Slab)
Length = 478.69 ft

Begin Pavement Sta. = 69+57.27 (End Appr. Slab)
End Pavement Sta. = 76+00.00
Length = 642.73 ft

TOTAL 0.21 MILE

SR 212:

Length = 110 ft

TOTAL 0.02 MILE

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS

Designed By: JTC
Checked By:

Date: 5-Apr-20
Date:

BOTTOM OF FOOTING ELEVATIONS/SUBSTRUCTURE QUANTITIES

Depths:

Superstructure (Abut.):

Deck = 27.00 in
Haunch = 0.00 in
Top Flange = 0.00 in
Web = 0.00 in
Diaphragm = 18.00 in
Bot. Flange = 0.00 in
Steel Plate = 0.00 in
HP Pedestal = 0.00 in
Load Plate = 0.00 in
Bearing Pad = 0.00 in
TOTAL = 45.00 in
TOTAL = 3.75 ft

Superstructure (Pier):

Deck = 27.00 in
Haunch = 0.00 in
Top Flange = 0.00 in
Web = 0.00 in
Bot. Flange = 0.00 in
Load Plate = 0.00 in
Bearing Pad = 0.00 in
27.00 in
Total (Super) = 2.25 ft
TOTAL = 8.71 ft
Load Plate = 2.00 in
Bearing Pad = 10.00 in

Abutment:

Stem = 2.00 ft
Footing Depth = 3.00 ft
TOTAL = 5.00 ft

Piers 1 & 7:

Cap (min.) = 2.00 ft

Integral Steel Bent Piers 2 - 6:

Top Flange = 2.75 in
Web = 66.00 in
Bot. Flange = 2.75 in
Total (Cap) = 5.96 ft

Cover (min.) = 1.00 ft
Footing Depth = 4.00 ft
TOTAL = 5.00 ft

SR 151 Vertical Alignment

Segment 1	Define Type of Vertical Alignment -->>	Vertical Curve
	Enter the Following Required Geometry Information:	
	PVI Sta. = 68+00.00	
	PVI Elev. = 1003.65	
	LVC = 950	
	g1 = 3.88%	
	g2 = -7.40%	
Summary of Segment 1 Vertical Alignment		
PVC Sta. = 63+25.00	PVT Sta. = 72+75.00	PVI Sta. = 68+00.00
PVC Elev. = 985.22	PVT Elev. = 968.50	PVI Elev. = 1003.65
g1 = 3.88%	LVC = 950.00	
g2 = -7.40%	Rate of Change of Grade, r = -0.000119	

SR 151 Cross Slopes

										PGL
Left Shoulder			WB Lane			EB Lane		Right Shoulder		Station
X-Slope	Width	X-Slope	Rounding	X-Slope	Width	X-Slope	Width	X-Slope	Width	
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	64+32.29
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	77+09.62

Substructure Locations and Skew Angles

Substructure Unit: **Rear Abutment**
CL Brg Sta. = 64+94.50
Skew Angle (DMS) = LF 21^ 53'-
Skew Angle = LF 21.88333 degrees 0.3819 radians

Substructure Unit: **Pier 1**
CL Pier 1 Sta. = 65+40.50
Skew Angle (DMS) = LF 21^ 44'-
Skew Angle = LF 21.73333 degrees 0.3793 radians

Substructure Unit: **Pier 2**
CL Pier 2 Sta. = 65+98.00
Skew Angle (DMS) = LF 20^ 17'- 46"
Skew Angle = LF 20.29611 degrees 0.3542 radians

Substructure Unit: **Pier 3**
 CL Pier 2 Sta. = **66+55.50**
 Skew Angle (DMS) = **LF 18^ 51'- 30"**
 Skew Angle = LF 18.85833 degrees 0.3291 radians

Substructure Unit: **Pier 4**
 CL Pier 2 Sta. = **67+13.00**
 Skew Angle (DMS) = **LF 17^ 25'- 15"**
 Skew Angle = LF 17.42083 degrees 0.3041 radians

Substructure Unit: **Pier 5**
 CL Pier 2 Sta. = **67+70.50**
 Skew Angle (DMS) = **LF 15^ 59'- "**
 Skew Angle = LF 15.98333 degrees 0.2790 radians

Substructure Unit: **Pier 6**
 CL Pier 2 Sta. = **68+28.00**
 Skew Angle (DMS) = **LF 14^ 32'- 45"**
 Skew Angle = LF 14.54583 degrees 0.2539 radians

Substructure Unit: **Pier 7**
 CL Pier 2 Sta. = **68+85.50**
 Skew Angle (DMS) = **LF 13^ 6'- 30"**
 Skew Angle = LF 13.10830 degrees 0.2288 radians

Substructure Unit: **Forward Abutment**
 CL Brg Sta. = **66+88.00**
 Skew Angle (DMS) = **LF 11^ 58'- 30"**
 Skew Angle = LF 11.97500 degrees 0.2090 radians

Rear Abutment

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	Seat Elevation	Bot/Ftg. Elev.
L/Edge	-17.67'	65+01.09	990.21	990.71	986.96	981.96
R/Edge	17.67'	64+86.16	989.93	989.12	985.37	980.37

980.25 (Controls)

Pier 1

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	B/Cap Elevation
L/Edge	-17.67'	65+47.49	990.91	991.41	987.16
R/Edge	17.67'	65+33.40	990.73	989.91	985.66

985.66 (Controls)

Pier 2

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	B/Cap Elevation
L/Edge	-17.67'	66+04.48	991.43	991.92	983.72
R/Edge	17.67'	65+91.41	991.34	990.53	982.32

Steel Bent Slope = -4.60%
 Length from E/Deck Lt. to Col 1. = 43.75 ft Bot/ Cap Elev. Col. 1 = 985.73
 Length from E/Deck Lt. to Col 2. = -13.53 ft Bot/ Cap Elev. Col. 2 = 983.09
 Length from E/Deck Lt. to Col 3. = -41.03 ft Bot/ Cap Elev. Col. 3 = 981.83

	Point	Offset From PGL	Station	Exist. Ground Elev.	B/Footing Elevation		
Column 1	1	-66.14'	66+12.17	955.72	950.72	950.50	(Controls)
	2	-60.57'	66+28.82	955.70	950.70		
	3	-54.74'	66+08.50	956.45	951.45		
	4	-49.15'	66+25.23	955.77	950.77		
Column 2	1	-13.50'	65+93.32	960.81	955.81	953.50	(Controls)
	2	-7.80'	66+10.31	958.52	953.52		
	3	-2.14'	65+89.47	965.61	960.61		
	4	3.59'	66+06.54	964.93	959.93		
Column 3	1	13.21'	65+87.71	972.60	967.60	967.50	(Controls)
	2	16.70'	65+97.14	972.74	967.74		
	3	22.57'	65+84.17	977.22	972.22		
	4	26.08'	65+93.63	977.96	972.96		

Pier 3

	Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	B/Cap Elevation
	Lt	-17.67'	66+61.48	991.55	992.05	983.84
	Rt	17.67'	66+49.41	991.56	990.75	982.54

Steel Bent Slope = -4.60%
 Length from E/Deck Lt. to Col 1. = 25.88 ft Bot/ Cap Elev. Col. 1 = 985.03
 Length from E/Deck Lt. to Col 2. = -36.46 ft Bot/ Cap Elev. Col. 2 = 982.17

	Point	Offset From PGL	Station	Exist. Ground Elev.	B/Footing Elevation		
Column 1	1	-49.48'	66+62.60	955.10	950.10	949.75	(Controls)
	2	-44.03'	66+79.41	954.95	949.95		
	3	-38.06'	66+58.98	955.27	950.27		
	4	-32.58'	66+75.87	955.51	950.51		
Column 2	1	3.53'	66+44.70	957.00	952.00	951.50	(Controls)
	2	9.11'	66+61.86	956.50	951.50		
	3	14.92'	66+40.91	963.36	958.36		
	4	20.53'	66+58.15	963.02	958.02		

Pier 4

	Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	B/Cap Elevation
	Lt	-17.67'	67+18.50	991.30	991.79	983.58
	Rt	17.67'	67+07.41	991.38	990.56	982.35

Steel Bent Slope = -4.60%
 Length from E/Deck Lt. to Col 1. = 8.55 ft Bot/ Cap Elev. Col. 1 = 983.98
 Length from E/Deck Lt. to Col 2. = -49.95 ft Bot/ Cap Elev. Col. 2 = 981.29

	Point	Offset From PGL	Station	Exist. Ground Elev.	B/Footing Elevation		
Column 1	1	-33.05'	67+13.92	955.20	950.20	949.25	(Controls)
	2	-27.73'	67+30.89	954.37	949.37		
	3	-21.60'	67+10.37	954.62	949.62		
	4	-16.25'	67+27.41	954.85	949.85		
Column 2	1	20.33'	66+97.03	955.07	950.07	950.00	(Controls)
	2	25.77'	67+14.36	955.55	950.55		
	3	31.75'	66+93.30	961.15	956.15		
	4	37.22'	67+10.71	964.09	959.09		

Pier 5

	Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	B/Cap Elevation
	Lt	-17.67'	67+75.52	990.65	991.15	982.94
	Rt	17.67'	67+65.40	990.79	989.98	981.77

Steel Bent Slope = -4.60%
 Length from E/Deck Lt. to Col 1. = -0.69 ft Bot/ Cap Elev. Col. 1 = 982.91
 Length from E/Deck Lt. to Col 2. = -66.77 ft Bot/ Cap Elev. Col. 2 = 979.87

	Point	Offset From PGL	Station	Exist. Ground Elev.	B/Footing Elevation		
Column 1	1	-16.87'	67+66.14	953.87	948.87	948.75	(Controls)
	2	-11.67'	67+83.70	953.98	948.98		
	3	-5.40'	67+62.64	954.42	949.42		
	4	-0.17'	67+79.84	954.40	949.40		
Column 2	1	36.87'	67+50.29	954.55	949.55	949.25	(Controls)
	2	42.19'	67+67.79	954.31	949.31		
	3	48.32'	67+46.62	962.06	957.06		
	4	53.67'	67+64.20	959.59	954.59		

Pier 6

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	B/Cap Elevation
Lt	-17.67'	68+32.55	989.62	990.12	981.91
Rt	17.67'	68+23.38	989.81	989.00	980.79

Steel Bent Slope = -4.60%
 Length from E/Deck Lt. to Col 1. = -4.86 ft Bot/ Cap Elev. Col. 1 = 981.68
 Length from E/Deck Lt. to Col 2. = -25.64 ft Bot/ Cap Elev. Col. 2 = 980.73
 Length from E/Deck Lt. to Col 3. = -83.09 ft Bot/ Cap Elev. Col. 3 = 978.09

Point	Offset From PGL	Station	Exist. Ground Elev.	B/Footing Elevation		
Column 1	1	-19.05'	68+27.78	953.55	948.55	948.00 (Controls)
	2	-16.56'	68+37.39	953.06	948.06	
	3	-9.38'	68+25.28	953.75	948.75	
Column 2	1	-6.87'	68+34.93	953.56	948.56	948.50 (Controls)
	2	-0.97'	68+19.24	953.94	948.94	
	3	4.10'	68+36.52	953.70	948.70	
Column 3	1	10.54'	68+15.80	954.01	949.01	948.00 (Controls)
	2	15.63'	68+33.16	953.90	948.90	
	3	53.12'	68+04.46	953.26	948.26	
	4	58.30'	68+22.13	953.23	948.23	
		64.60'	68+00.86	957.81	952.81	
		69.81'	68+18.61	956.81	951.81	

Pier 7

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	B/Cap Elevation
Lt	-17.67'	68+89.58	988.20	988.70	984.45
Rt	17.67'	68+81.36	988.43	987.62	983.37

983.37 (Controls)

Forward Abutment

Point	Offset From PGL	Station	PGL Elev.	Rdwy Elev. at Point	Seat Elevation	Bot/Ftg. Elev.
Lt	-14.83'	66+88.00	991.48	992.09	988.34	983.34
Rt	14.83'	66+88.00	991.48	990.80	987.05	982.05

976.00 976.00 (Controls)
 Lower to 2:1 Slope

CONCRETE QUANTITIES

Rear Abutment:

Abutment Footing (including Wingwall Footing):

Footing Area = 291.6 sq ft
 Footing Depth = 3.00 ft

Footing Volume = 32 cy

Point	Rdwy Elev. at Point	Seat Elevation
Lt.	990.71	986.96
Rt.	989.12	985.37
Average =	989.91	986.16

Left Wingwall

Wall Width = 1.50 ft
 Wall Height @ Abut. = 7.46 ft
 Elev. @ End = 987.48
 Wall Height @ End = 4.23 ft
 Total Wall Length = 28.30 ft

Left Wall Volume = 9.2 cy

Right Wingwall

Wall Width = 2.25 ft
 Wall Height @ Abut. = 5.87 ft
 Elev. @ End = 986.68
 Wall Height @ End = 3.43 ft
 Total Wall Length = 10.00 ft

Right Wall Volume = 3.9 cy

Diaphragm

Diaphragm Width = 2.25 ft
 Height = 1.50 ft
 Diaphragm Length = 35.33 ft (o/o deck along Abut.)

Diaphragm Volume = 4 cy

Abutment Stem

Stem Width = 2.25 ft
 Ave. Stem Height = 2.91 ft
 Stem Length = 35.33 ft (o/o deck along Abut.)

Stem Volume = 9 cy

Rear Abutment, including Footing = 58 cy

Pier 1:

Pier Footing

Number of Footings = 0
Footing Length = 0.00 ft
Footing Width = 0.00 ft
Footing Depth = 0.00 ft

Footing Volume = 0 cy

Pier Above Footing = 11 cy

Pier 2:

Pier Footing

Columns 1 & 2

Number of Footings = 2
Footing Length = 18.00 ft
Footing Width = 14.00 ft
Footing Depth = 4.00 ft
Footing Volume = 2016 cu ft

Column 3

Number of Footings = 1
Footing Length = 10.00 ft
Footing Width = 10.00 ft
Footing Depth = 4.00 ft
Footing Volume = 400 cu ft

Footing Volume = 89 cy

Pier Column

Crashwall

Width = 5.00 ft
Length = 10.00 ft
Height = 10.00 ft
Vol. (Crashwall) = 1000.0 cu ft

Column Volume = 69 cy

Pier Above Footing = 108 cy

Pier 3:

Pier Footing

Columns 1 & 2

Number of Footings = 2
Footing Length = 18.00 ft
Footing Width = 14.00 ft
Footing Depth = 4.00 ft
Footing Volume = 2016 cu ft

Footing Volume = 75 cy

Pier Column

Crashwall

Width = 5.00 ft
Length = 10.00 ft
Height = 10.00 ft
Vol. (Crashwall) = 1000.0 cu ft

Column Volume = 70 cy

Pier Above Footing = 104 cy

Pier 4:

Pier Footing

Columns 1 & 2

Number of Footings = 2
Footing Length = 18.00 ft
Footing Width = 14.00 ft
Footing Depth = 4.00 ft
Footing Volume = 2016 cu ft

Footing Volume = 75 cy

Pier Cap

Width = 3.00 ft
Length = 36.70 ft
Ave. Depth = 2.75 ft
Volume = 302.6 cu ft

Columns 1 & 2

Width = 5.00 ft
Length = 5.00 ft
Area = 25.00 sq ft

Column 1:

T/Column Elev. = 984.73
B/Footing Elev. = 950.50
Column Height = 20.23 ft (minus crashwall)

Column 2:

T/Column Elev. = 982.09
B/Footing Elev. = 953.50
Column Height = 14.59 ft (minus crashwall)

Vol. (Column) = 870.5 cu ft

Column 3:

Diameter = 5.00 ft
Area = 19.63 sq ft

T/Column Elev. = 980.83
B/Footing Elev. = 967.50
Column Height = 9.33 ft

Vol. (Column) = 183.16 cy

Column Volume = 39 cy

Columns 1 & 2

Width = 5.00 ft
Length = 5.00 ft
Area = 25.00 sq ft

Column 1:

T/Column Elev. = 984.03
B/Footing Elev. = 949.75
Column Height = 20.28 ft (minus crashwall)

Column 2:

T/Column Elev. = 981.17
B/Footing Elev. = 951.50
Column Height = 15.67 ft (minus crashwall)

Vol. (Column) = 898.7 cu ft

Column Volume = 33 cy

Columns 1 & 2

Width = 5.00 ft
Length = 5.00 ft
Area = 25.00 sq ft

Column 1:

T/Column Elev. = 982.98
B/Footing Elev. = 949.25
Column Height = 19.73 ft (minus crashwall)

Pier Column

Crashwall

Width = 5.00 ft
Length = 10.00 ft
Height = 10.00 ft
Vol. (Crashwall) = 1000.0 cu ft

Column Volume = 70 cy

Pier Above Footing = 104 cy

Pier 5:

Pier Footing

Columns 1 & 2

Number of Footings = 2
Footing Length = 18.00 ft
Footing Width = 14.00 ft
Footing Depth = 4.00 ft
Footing Volume = 2016 cu ft

Footing Volume = 75 cy

Pier Column

Crashwall

Width = 5.00 ft
Length = 10.00 ft
Height = 10.00 ft
Vol. (Crashwall) = 1000.0 cu ft

Column Volume = 69 cy

Pier Above Footing = 101 cy

Pier 6:

Pier Footing

Column 1

Number of Footings = 1
Footing Length = 10.00 ft
Footing Width = 10.00 ft
Footing Depth = 4.00 ft
Footing Volume = 400 cu ft

Columns 2 & 3

Number of Footings = 2
Footing Length = 18.00 ft
Footing Width = 14.00 ft
Footing Depth = 4.00 ft
Footing Volume = 2016 cu ft

Footing Volume = 89 cy

Pier Column

Crashwall

Width = 5.00 ft
Length = 10.00 ft
Height = 10.00 ft
Vol. (Crashwall) = 1000.0 cu ft

Column Volume = 67 cy

Pier Above Footing = 118 cy

Pier 7:

Pier Footing

Number of Footings = 0
Footing Length = 0.00 ft
Footing Width = 0.00 ft
Footing Depth = 0.00 ft

Footing Volume = 0 cy

Pier Above Footing = 10 cy

Column 2:

T/Column Elev. = 980.29
B/Footing Elev. = 950.00
Column Height = 16.29 ft (minus crashwall)

Vol. (Column) = 900.3 cu ft

Column Volume = 33 cy

Columns 1 & 2

Width = 5.00 ft
Length = 5.00 ft
Area = 25.00 sq ft

Column 1:

T/Column Elev. = 981.91
B/Footing Elev. = 948.75
Column Height = 19.16 ft (minus crashwall)

Column 2:

T/Column Elev. = 978.87
B/Footing Elev. = 949.25
Column Height = 15.62 ft (minus crashwall)

Vol. (Column) = 869.4 cu ft

Column Volume = 32 cy

Column 1:

Diameter = 5.00 ft
Area = 19.63 sq ft

T/Column Elev. = 980.68
B/Footing Elev. = 948.00
Column Height = 28.68 ft

Vol. (Column) = 563.22 cy

Columns 2 & 3

Width = 5.00 ft
Length = 5.00 ft
Area = 25.00 sq ft

Column 2:

T/Column Elev. = 979.73
B/Footing Elev. = 948.50
Column Height = 17.23 ft (minus crashwall)

Column 3:

T/Column Elev. = 977.09
B/Footing Elev. = 948.00
Column Height = 15.09 ft (minus crashwall)

Vol. (Column) = 807.9 cu ft

Column Volume = 51 cy

Pier Cap

Width = 3.00 ft
Length = 34.95 ft
Ave. Depth = 2.54 ft
Volume = 266.4 cu ft

Forward Abutment

Abutment Footing (including Wingwall Footing):

Footing Area = 282.5 sq ft
Footing Depth = 3.00 ft

Footing Volume = 31 cy

Point	Rdwy Elev. at Point	Seat Elevation
G1	992.09	988.34
G5	990.80	987.05
Average =	991.45	987.70

Diaphragm

Diaphragm Width = 2.25 ft
Height = 1.50 ft
Diaphragm Length = 35.33 ft (o/o deck along Abut.)

Diaphragm Volume = 4 cy

Abutment Stem

Stem Width = 2.25 ft
Ave. Stem Height = 8.70 ft
Stem Length = 35.33 ft (o/o deck along Abut.)

Stem Volume = 26 cy

Fwd. Abutment, including Footing = 84 cy

Left Wingwall

Wall Width = 2.25 ft
Wall Height @ Abut. = 13.09 ft
Elev. @ End = 986.05
Wall Height @ End = 7.05 ft
Total Wall Length = 10.00 ft (assume level wingwall)

Left Wall Volume = 8.4 cy

Right Wingwall

Wall Width = 1.50 ft
Wall Height @ Abut. = 11.80
Elev. @ End = 985.40 ft
Wall Height @ End = 6.40 ft
Total Wall Length = 27.47 ft

Right Wall Volume = 13.9 cy

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS
 LIFE CYCLE QUANTITIES

Date	Year	Repair Work	Est. Cost
2033	10, 30, 50, 70	Patching & maintenance of deck	\$52,142.19
2043	20, 60	Deck overlay, patching of concrete substructures	\$158,367.80
2048	25, 50	Painting of steel girders	\$0.00
2063	40	Deck replacement (including approach slabs), patching of concrete substructures	\$2,882,000.00

Patching & maintenance of deck & approach slabs

Deck Patching

Assumed Cost (\$/SY):	\$549.00	Item 519E12220
Deck & approach slab area (SY):	1900	
Patch area (SY)	95.0	Use 5% of area
Cost (\$):	\$52,142	

Deck overlay, patching of concrete substructures

Deck Overlay (microsilica w/hydro)

Assumed Cost (\$/SY):	\$69.00	Item 848E10000
Deck & approach slab Overlay area (SY):	1900	
Cost (\$):	\$131,068	

Patching of concrete substructures

Assumed Cost (\$/SF):	\$153.00	Item 519E11100
Assumed Area (SF):	178	Use 1% of Sealing Area
Cost (\$):	\$27,300	
Total Deck overlay, patching of concrete substructures	\$158,368	

Painting end of steel girders at bearings

Surface preparation steel girders

Steel girder area (SF):	0
Assumed Cost (\$/SF):	\$0.00
Cost (\$):	\$0

Painting steel girders (prime, intermediate & finish coats)

Steel girder area (SF):	0
Assumed Cost (\$/SF):	\$0.00
Cost (\$):	\$0
Total Painting end of steel girders at bearings	\$0

Deck replacement (including approach slabs), patching of concrete substructures

Deck Concrete

Assumed Cost (\$/CY):	\$1,030.00	Item 511E34446
Volume (CY):	1292	
Cost (\$):	\$1,330,800	

Deck Removal

Assumed Cost (\$/SF):	\$25.00
Deck Area (SF): Includes Approach Slabs	17096
Cost (\$):	\$427,400

Parapet Concrete

Assumed Cost: (\$/CY)	\$730.00	Item 511E34450
Volume (CY):	297	
Cost (\$):	\$216,900	

Deck/Parapet Reinforcing

Superstructure Rebar (LBS):	408,090	
Cost (\$/LB):	\$2.02	Item 509E10000
Cost (\$):	\$824,400	

Approach Slabs

Area (SY)	178	
Cost (\$/SY):	\$310.00	Item 526E30010
Cost (\$):	\$55,200	

Patching of concrete substructures (see calcs above)

Cost (\$):	\$27,300
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Elastomeric bearings

Total (each)	0	
Cost (\$/Each):	\$0.00	Average b/w Elastomeric & Multi-Rotational
Cost (\$):	\$0	

Total cost for deck replacement (including bearings and approach slabs) and patching of concrete substructures	\$2,882,000
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Vertical Clearances

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
ALTERNATIVE 1A - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUT. WALLS & INTEGRAL CONCRETE PIER CAPS

Designed By: JTC
Checked By:

Date: 13-Apr-20
Date:

VERTICAL CLEARANCE

Superstructure Depth:

See Bottom of Cap Elevation calculation (Bottom of Ftg tab)

Pier No. 1 B/Cap Elev. = 980.33
Pier No. 2 B/Cap Elev. = 979.45

CORR Vertical Alignment

Use existing top of rail survey shots. See Alternative 1 sketch for location of top of rail elevations

Point	Exist. T/Rail Elev.	
1	956.79	(Pier 1, Future)
2	956.76	(Pier 1, Existing)
3	955.75	(Pier 2, Future)
4	955.71	(Pier 2, Existing)

SR 151 Vertical Alignment

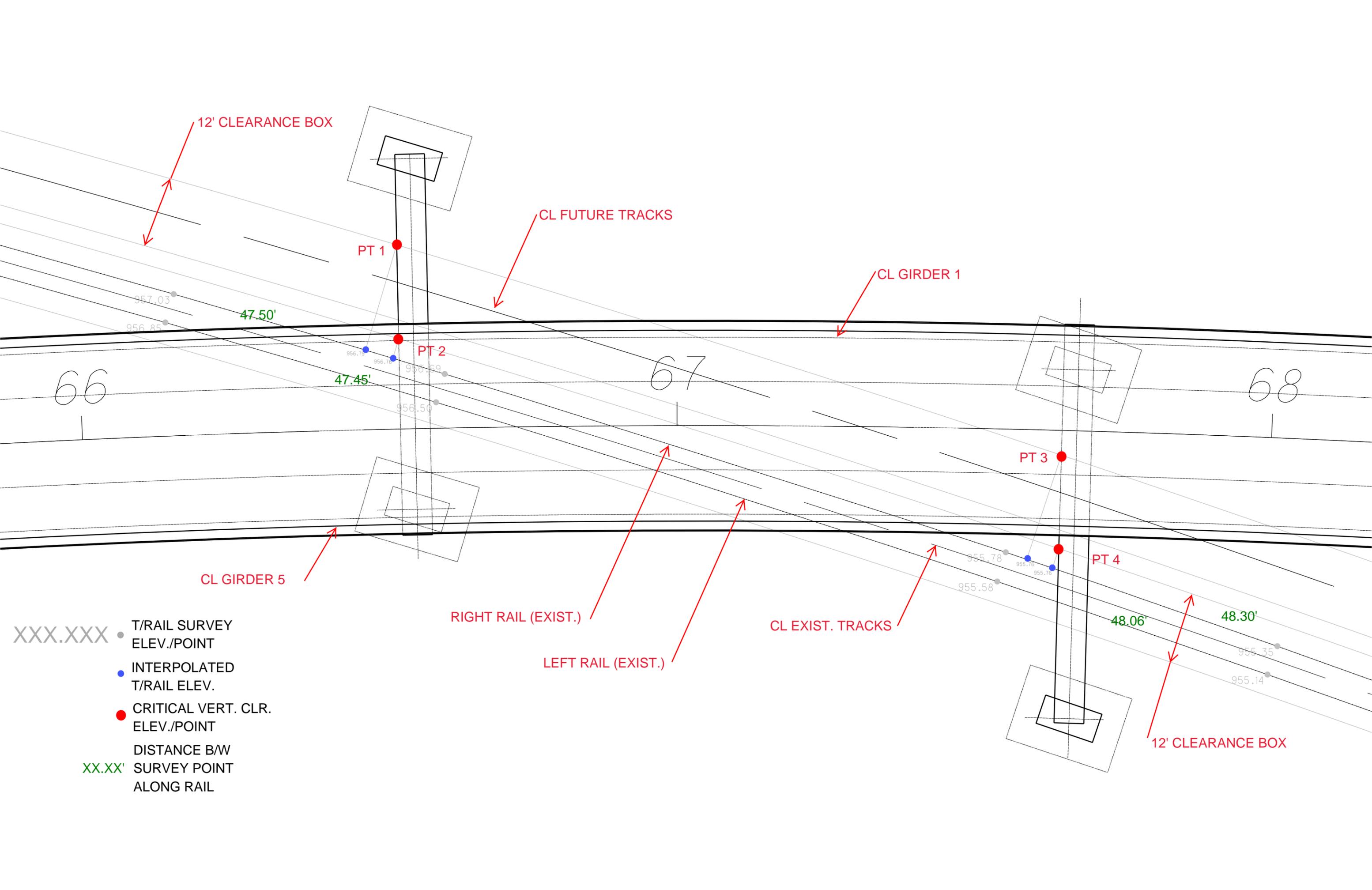
Segment 1	Define Type of Vertical Alignment -->> Vertical Curve											
	Enter the Following Required Geometry Information:											
	PVI Sta. = 68+00.00 PVI Elev. = 999.19 LVC = 900 g1 = 3.17% g2 = -6.68%											
	Summary of Segment 1 Vertical Alignment <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">PVC Sta. = 63+50.00</td> <td style="width: 33%;">PVT Sta. = 72+50.00</td> <td style="width: 33%;">PVI Sta. = 68+00.00</td> </tr> <tr> <td>PVC Elev. = 984.93</td> <td>PVT Elev. = 969.13</td> <td>PVI Elev. = 999.19</td> </tr> <tr> <td>g1 = 3.17%</td> <td>LVC = 900.00</td> <td></td> </tr> <tr> <td>g2 = -6.68%</td> <td>Rate of Change of Grade, r = -0.000109</td> <td></td> </tr> </table>	PVC Sta. = 63+50.00	PVT Sta. = 72+50.00	PVI Sta. = 68+00.00	PVC Elev. = 984.93	PVT Elev. = 969.13	PVI Elev. = 999.19	g1 = 3.17%	LVC = 900.00		g2 = -6.68%	Rate of Change of Grade, r = -0.000109
PVC Sta. = 63+50.00	PVT Sta. = 72+50.00	PVI Sta. = 68+00.00										
PVC Elev. = 984.93	PVT Elev. = 969.13	PVI Elev. = 999.19										
g1 = 3.17%	LVC = 900.00											
g2 = -6.68%	Rate of Change of Grade, r = -0.000109											

SR 151 Cross Slopes

										PGL
Left Shoulder				WB Lane		EB Lane		Right Shoulder		Station
X-Slope	Width	X-Slope	Rounding	X-Slope	Width	X-Slope	Width	X-Slope	Width	
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	77+09.62

Vertical Clearance

Point	Offset From PGL	Station	B/Conc. Bent Elev.	Vertical Clearance	
1	-30.89'	66+53.54	980.33	23.54	OK - VC > 23'-0"
2	-15.14'	66+53.52	980.33	23.57	OK - VC > 23'-0"
3	4.15'	67+64.75	979.45	23.70	OK - VC > 23'-0"
4	19.83'	67+64.73	979.45	23.74	OK - VC > 23'-0"



12' CLEARANCE BOX

CL FUTURE TRACKS

CL GIRDER 1

PT 1

PT 2

PT 3

PT 4

47.50'

47.45'

48.06'

48.30'

CL GIRDER 5

RIGHT RAIL (EXIST.)

LEFT RAIL (EXIST.)

CL EXIST. TRACKS

12' CLEARANCE BOX

66

67

68

- XXX.XXX ● T/RAIL SURVEY ELEV./POINT
- INTERPOLATED T/RAIL ELEV.
- CRITICAL VERT. CLR. ELEV./POINT
- XX.XX' DISTANCE B/W SURVEY POINT ALONG RAIL

957.03

956.85

956.73

956.70

956.69

956.50

955.78

955.76

955.76

955.58

955.35

955.14

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 1B - 3-SPAN 52" WEB PLATE GIRDERS WITH TALL ABUTMENT WALLS & INTEGRAL STEEL PIER CAPS

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

VERTICAL CLEARANCE

Superstructure Depth:

See Bottom of Cap Elevation calculation (Bottom of Ftg tab)

Pier No. 1 Length = 65.15 ft
 Bent Slope = -4.60%
 B/Cap Elev. Col. 1 = 981.73

Pier No. 2 Length = 68.14 ft
 Bent Slope = -4.60%
 B/Cap Elev. Col. 1 = 980.85

CORR Vertical Alignment

Use existing top of rail survey shots. See Alternative 1A sketch for location of top of rail elevations

Point	Exist. T/Rail Elev.	
1	956.78	(Pier 1, Future)
2	956.75	(Pier 1, Future)
3	956.75	(Pier 1, Existing)
4	956.53	(Pier 1, Existing)
5	955.74	(Pier 2, Future)
6	955.71	(Pier 2, Future)
7	955.70	(Pier 2, Existing)
8	955.46	(Pier 2, Existing)

SR 151 Vertical Alignment

Segment 1	Define Type of Vertical Alignment -->>	Vertical Curve	
	Enter the Following Required Geometry Information:		
	PVI Sta. = 68+00.00		
	PVI Elev. = 999.19		
	LVC = 900.00		
	g1 = 3.17%		
	g2 = -6.68%		
	Summary of Segment 1 Vertical Alignment		
	PVC Sta. = 63+50.00	PVT Sta. = 72+50.00	PVI Sta. = 68+00.00
	PVC Elev. = 984.93	PVT Elev. = 969.13	PVI Elev. = 999.19
g1 = 3.17%	LVC = 900.00		
g2 = -6.68%	Rate of Change of Grade, r = -0.000109		

SR 151 Cross Slopes

PGL										
Left Shoulder				WB Lane		EB Lane		Right Shoulder		Station
X-Slope	Width	X-Slope	Rounding	X-Slope	Width	X-Slope	Width	X-Slope	Width	
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	64+32.29
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	77+09.62

Vertical Clearance

Point	Offset From PGL	Station	Distance from Column 1	B/Steel Bent Elev.	Vertical Clearance	
1	-30.57'	66+54.52	16.75'	980.96	24.18	OK - VC > 23'-0"
2	-17.97'	66+54.52	29.35'	980.38	23.63	OK - VC > 23'-0"
3	-14.18'	66+54.51	32.50'	980.23	23.48	OK - VC > 23'-0"
4	-2.20'	66+54.51	45.11'	979.65	23.12	OK - VC > 23'-0"
5	4.45'	67+65.75	22.29'	979.83	24.09	OK - VC > 23'-0"
6	32.68'	67+65.73	34.83'	979.25	23.54	OK - VC > 23'-0"
7	32.68'	67+65.73	37.97'	979.11	23.41	OK - VC > 23'-0"
8	32.68'	67+65.73	50.50'	978.53	23.07	OK - VC > 23'-0"

HAS-151-04.85 (PID 100038)

BRIDGE NO. HAS-151-0485 (SR 151 OVER COLUMBUS & OHIO RIVER RAILROAD)
 ALTERNATIVE 2 - 8-SPAN CONTINUOUS SLAB BRIDGE WITH STUB ABUTMENTS & INTEGRAL STEEL PIER CAPS

Designed By: JTC
 Checked By:

Date: 5-Apr-20
 Date:

VERTICAL CLEARANCE

Superstructure Depth:

See Bottom of Cap Elevation calculation (Bottom of Ftg tab)

Pier No. 2 Length = 84.78 ft
 Bent Slope = -4.60%
 B/Cap Elev. Col. 1 = 985.73

Pier No. 6 Length = 82.23 ft
 Bent Slope = -4.60%
 B/Cap Elev. Col. 1 = 981.68

CORR Vertical Alignment

Use existing top of rail survey shots. See Alternative 2 sketch for location of top of rail elevations

Point	Exist. T/Rail Elev.	
1	957.11	(Pier 2, Existing)
2	956.93	(Pier 2, Existing)
3	955.21	(Pier 6, Existing)
4	955.00	(Pier 6, Existing)

SR 151 Vertical Alignment

Segment 1	Define Type of Vertical Alignment -->>	Vertical Curve
	Enter the Following Required Geometry Information:	
	PVI Sta. =	68+00.00
	PVI Elev. =	1003.65
	LVC =	950.00
	g1 =	3.88%
	g2 =	-7.40%
Summary of Segment 1 Vertical Alignment		
	PVC Sta. =	63+25.00
	PVC Elev. =	985.22
	PVT Sta. =	72+75.00
	PVT Elev. =	968.50
	PVI Sta. =	68+00.00
	PVI Elev. =	1003.65
	g1 =	3.88%
	g2 =	-7.40%
	LVC =	950.00
	Rate of Change of Grade, r =	-0.000119

SR 151 Cross Slopes

PGL										
Left Shoulder				WB Lane		EB Lane		Right Shoulder		Station
X-Slope	Width	X-Slope	Rounding	X-Slope	Width	X-Slope	Width	X-Slope	Width	
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	64+32.29
-4.00%	2.00'	4.60%	2.00'	4.60%	12.00'	-4.60%	12.00'	-4.60%	4.00'	77+09.62

Vertical Clearance

Point	Offset From PGL	Station	Distance from Column 1	B/Steel Bent Elev.	Vertical Clearance	
1	-30.25'	66+07.72	30.80'	984.31	27.20	OK - VC > 23'-0"
2	-17.97'	66+54.52	42.81'	983.76	26.83	OK - VC > 23'-0"
3	35.51'	68+17.32	54.43'	979.18	23.97	OK - VC > 23'-0"
4	47.12'	68+14.19	66.43'	978.63	23.63	OK - VC > 23'-0"

Inverted Tees



Conventional



Inverted Tee

When to Use Inverted Tees

Vertical Clearance

