SCI-823-0.00

PID No. 77366

SR 823 over Slocum Ave (TR 248)

Preliminary Design Report Submittal

Prepared for:

Ohio Department of Transportation
District 9
650 Eastern Ave.
Chillicothe, Ohio 45601

January 14, 2008

Prepared by:

TranSystems

TranSystems

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Columbus, Ohio 43017
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January 14, 2008

Mr. Jawdat Siddiqi, PE
Office of Structural Engineering
Ohio Department of Transportation
1980 W. Broad Street
Columbus, Ohio 43223

SUBJECT: **Preliminary Design Report Submittal**
SR 823 over Slocum Ave. (TR 248)
SCI-823-0.00 Portsmouth Bypass
PID#77366

Dear Mr. Siddiqi:

Submitted for review and comment is the Preliminary Design Report for SR 823 over Slocum Avenue (TR 248). Included are The TS&L drawings and the Final Geotechnical Report by DLZ, Ohio, dated September 6, 2007. Please find below our disposition to the November 29, 2006 comments by Jeff Crace, PE regarding the STS submittal.

1. *We agree with the disposition of all comments except for number 5. The span length given in the Proposed structure Block should be measured from centerline to centerline of bearings (example: centerline of bearing at abutment to centerline of bearing pier), see the ODOT Bridge Design Manual, section 201.2.2F.*

   The measurement of the spans has been revised in the proposed structure data block.

Please don't hesitate to call me or Dr. Michael Lenett (513 621 1981) if there are any questions.

Sincerely,

Michael D. Weeks by AP

Michael D. Weeks, P.E., P.S.
Project Manager

Cc: T. Barnitz, P.E.

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APPENDIX A • Site Plan (Sheets 1 & 2 of 7) • General Plan (Sheet 3 of 7) • Transverse Section (Sheet 4 of 7) • Abutment Details (Sheets 5-7 of 7)	7 Sheets
APPENDIX B • Cost Estimate	4 Sheets

TranSystems

PRELIMINARY DESIGN REPORT

1. Introduction

TranSystems is providing engineering services to the Ohio Department of Transportation for the design of new left and right overpass structures that will carry the proposed S.R. 823 bypass over Slocum Avenue. As requested by the Scope of Services, a Preliminary Design Report is to be submitted as part of Step 8 of the Major PDP process. The purpose of this report is to summarize the structure type selected for final design. A revised Type Study was submitted on September 7, 2006 and comments were received on October 2, 2006 by Jeff Crace. The comments were addressed by TranSystems on November 20, 2006 and final comments on the Type Study were received on November 29, 2006. The comments received on 11/29/06 have been incorporated into this submittal.

2. Design Criteria

The proposed structure will be designed according to the most current version of the Ohio Department of Transportation Bridge Design Manual and the 2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition. Horizontal clearances (clear zone width and horizontal sight distance) are based on the Ohio Department of Transportation Location and Design Manual, Volume One – Roadway Design.

3. Subsurface Conditions and Foundation Recommendations

DLZ Ohio, Inc. performed the subsurface exploration for the proposed bridge and prepared the Bridge Foundation Recommendations in their report dated September 6, 2007 and an addendum dated October 5, 2007. Six test borings (TR-36, TR-37, TR-38 TR-38A, B-31 and B-32) were drilled and all encountered bedrock. The SSI found 72 to 81 feet of mostly cohesive soils with intermittent granular soils above bedrock.

DLZ recommends that H-piles bearing on bedrock are the best suited foundation type for support of the proposed substructures. Pile points are recommended to penetrate the sporadic layers of granular materials that were encountered in the test borings.

The stability of the spill through slopes has also been investigated by DLZ. The analysis indicates that 2:1 slopes have adequate factors of safety for stability when using a friction angle of 35° (refer to the 10/5/07 addendum to the 9/6/07 report and DLZ's "Report of Subsurface Investigation for Embankments (Station 416+00 to 509+50), Project SCI-823-6.81, Phase 1 Stage 1", dated 11/29/06). In addition, due to the undrained analyses safety factors less than ODOT minimums of 1.5, the spill through slopes should be built using staged construction in conjunction with wick drains. The analyses also indicate that settlement of the spill through embankments is a concern. The calculations given in DLZ's report indicate that the amount of settlement following a waiting period of 99% primary consolidation reduces the settlement to less than 0.4 inches which prevents mobilization of downdrag on the piles. DLZ recommends that construction of the pier and abutment foundations not proceed until a minimum of 99% of the calculated primary consolidation has occurred. Wick drains are recommended for use at this location to accelerate the consolidation. DLZ presents multiple triangular spacing options for the wick drains and has calculated the time rate of consolidation for each spacing presented (see DLZ's 9/06/07 report). Waiting periods to reach 99% consolidation will therefore be a function of the wick drain spacing. The final design should incorporate requirements or waiting periods associated with the spacing selected if the contractor is allowed to select the wick drain spacing. Additional information regarding embankment construction is available in the DLZ report for the Highland Bend Embankments dated August 2, 2007. DLZ has also prepared plans to indicate the locations of wick drain treatment and settlement monitoring and they are included in this submittal and the 8/2/07 Highland Bend Embankment Report. Shallow foundations bearing in the proposed fill have been investigated for

the proposed abutments. However, the differential settlement exceeded AASHTO allowable values in Section 4.4.7.2.5 on tolerable movements. Due to the differential settlement exceeding allowable values shallow foundations have not been selected as the final foundation type.

MSE wall evaluations were preformed by DLZ as well, and are presented in the 9/06/07 report. The MSE walls were evaluated with respect to bearing capacity, sliding, overturning, global stability and settlement. These wall evaluations reveal that MSE wall can be used at the proposed location between Pershing Ave Stations 30+25.00 and 32+00.00 to retain the embankment off of the Slocum Pershing intersection. The MSE wall evaluations found that a minimum strap length of 1.0H (H= height from top of leveling pad to top of coping) was required to satisfy external stability concerns. Consistent with the embankment construction in this region, the use of wick drains and monitoring of pore water pressures is also recommended. DLZ also recommends the MSE wall be built in stages to maintain stability of the embankment. Differential settlement calculations have also been prepared by DLZ and indicate that the differential settlement will exceed 1%. Slip joints in the facing panels are recommended to accommodate the movement. An effective friction angle of 35° has been assumed for the proposed embankment construction (see earlier comments this section). The final design should incorporate this material requirement into the details and quantities.

4. Roadway

The purpose of this project is to construct a new bypass state route around the town of Portsmouth, Ohio. The proposed alignment will carry two lanes of traffic, 15 plus miles in either direction, from an interchange with US 52 just east of Portsmouth to another interchange with US 23, located north of Portsmouth in Valley Township.

Both the left and right structures are similar and will consist of two 12'-0" travel lanes with 6'-0" median shoulders and 12'-0" outside shoulders. Each bridge deck will be 44'-11½" out-to-out with a 1'-6" outside straight face deflector parapet (SBR-1-99) and a 1'-5 ½" inside straight face deflector parapet (similar to a Type B1 or C1 barrier from Roadway Standard Construction Drawing RM-4.3 but using a base width of 1'-5 ½" and top width of 6 5/8"). The left and right structures will be separated by a 1" longitudinal joint. Horizontal and vertical sight distances are in accordance with the design standards for all alternatives considered. The profile grade line for both bridge sections will be located at the inside edge of pavement which is 7'-6" from the centerline of survey and construction of S.R. 823. Noise Barriers are required on the structures in compliance with the noise analysis and environmental documentation.

Alignment & Profile: The proposed horizontal geometry of SR 823 is along a tangent for the entire length of both the left and right structures. The cross section is a normal crown. The proposed mainline profile grade line is located on the inside edge of pavement for both bridges. A 1700' vertical curve begins at station 122+50 with a PVI = 578.23, G_1= -4.10%, G_2=5.00%. The horizontal and vertical geometry for all alternatives considered are the same. Spill through embankment slopes will be a maximum of 2:1 in order to minimize bridge length and the roadway slopes shall be 2.5:1 to satisfy stability.

Slocum Avenue will remain on its current geometry and Pershing Avenue will be relocated to each side of SR 823 using an offset-t intersection.

Vertical and Horizontal Clearances – The vertical alignment of these mainline structures is dictated by the overall vertical design of the new bypass profile. According to the ODOT Location and Design Manual, Volume One – Roadway Design, Figure 302-1E, a preferred vertical clearance of 15'-0" (minimum of 14'-6") must be provided over Slocum Avenue which is positioned directly below the S.R. 823 mainline structures at this site. Each alternative considered provides more than the preferred 15'-0" clearance. The 15'-0" clear zone

from edge of traveled way is based on Figure 600-1E of the ODOT L&D Manual, Volume One. The information input into Figure 600-1E is as follows:

A. existing Slocum Ave. may be classified as an Urban Local Road and the *posted speed is 50 mph;*
B. from phone conversations with Scioto County Engineers Office the most recent ADT of Slocum Avenue is 1,897 at the Corporation Limits and is similar to the traffic data presented on the plans for existing Slocum Ave. over the Little Scioto River.
C. Slocum Avenue will have open drainage and ditch slopes of 4:1 are assumed

Using the identified parameters of items A) through C) in Figure 600-1E results in the minimum horizontal clear zone width of 15'-0".

Pavement Drainage - The collection of storm water runoff will be addressed off of the bridge, thus scuppers will not be required. Catch Basins have been provided near the rear abutment to direct pavement drainage away from the bridge and near the forward abutment to collect drainage from the bridge.

Utilities - No utilities will be placed on the bridge. However, lighting and ITS conduits will be provided as necessary. Existing utilities along Pershing Avenue will require relocation. The utilities include; water, gas and sanitary lines as well as overhead electric lines.

Maintenance of Traffic – While the new bridges are under construction, traffic will be maintained on both existing Slocum and Pershing Avenues. It is anticipated that there will be limited closures during construction for beam setting.

5. Proposed Structure Configuration

Span configuration: The proposed structure is comprised of a 3-span structure with span lengths of 106'-4", 106'-4" and 106'-4" measured from centerline bearings. The spans measured from the centerlines of the substructures is 107'-6 ½", 108'-9", 107'-6 ½". This span arrangement was selected to make the beams in all three spans equal length. The abutments and piers are oriented parallel to Slocum Avenue with a skew of 38°33'37". Embankment slopes of 2:1 are used for both abutments. A retaining wall is required along Pershing Avenue to prevent the embankment from encroaching upon the road. The maximum height of the wall is approximately 36' and MSE wall construction is proposed due to their use in other areas on the project. The embankments are set to begin at the 15'-0" clear zone allowing for a traversable roadway ditch within that zone.

Substructure:

I. Abutments: Both the forward and rear abutments will be semi-integral supported on H-piles as they are located in new embankment fill. The piles shall be HP14x73 with a design capacity of 95-tons per pile, driven to refusal on bedrock. The details of the abutments will follow ODOT Standard Construction drawings. An integral or fixed abutment was considered due to the 4% (approx.) grade that the structure will be built to except the 38° skew is in excess of the limits set forth in section 205.8 of the BDM.

II. Piers: The piers will consist of T-type piers, each supported on a HP14x73 H-piles, with a design capacity of 95 tons. The wide stem of a T-type pier is useful to minimize/eliminate slenderness effects anticipated for the 50' & 45' tall piers. It is recommended that one of the piers be a fixed design (i.e. fixed bearings) in order to resolve reactions associated with constructing the structure on a 4% (approx.) grade. Discussions with OSE staff indicated that it is also important to check the superstructure to substructure connection and that it may be a weak point. The pier would also need

to be designed for a proportional amount of the thermal movement in accordance with BDM section 205.9.

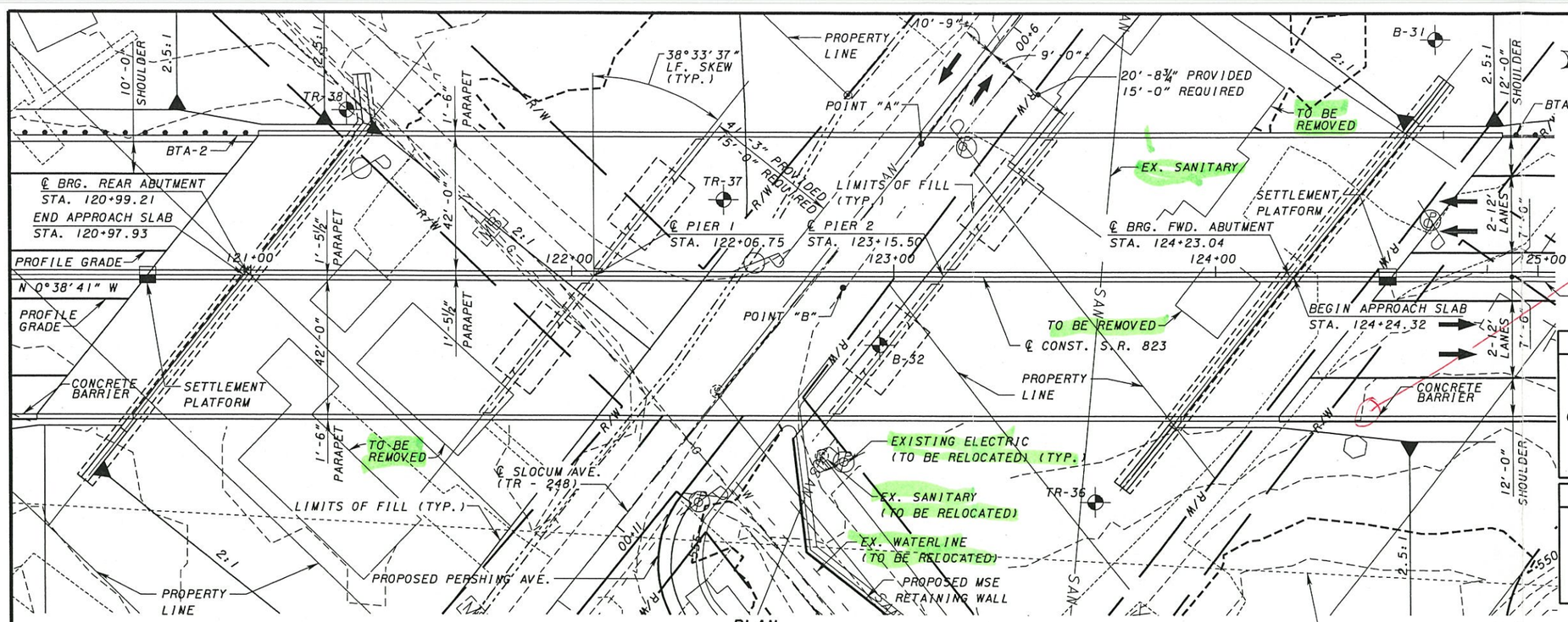
Superstructure:

1. Girders and Deck: The preliminary design of this structure consists of 5- 60" AASHTO Type 4 Modified prestressed beams, spaced at 9'-6" with 3'-5 3/4" overhangs. The design loading applied was HS-25 with Alternate Military Loading and a future wearing surface of 60 psf. The structures will be simple span for non-composite dead loads and continuous for superimposed and live loads. In accordance with the BDM the beams are also checked for a simply supported condition under all loads except the future wearing surface. This analysis indicates that concrete strengths of 6000 psi at release and 8000 psi final are required. Discussions with Ohio Prestressers Association indicate concrete strength and shipping feasibility were not of particular concern or reason for additional cost (please refer to the attached documentation). Both the left and right bridge width will be 42'-0" from toe to toe of parapets with an overall bridge deck width of 44'-11 1/2". Deck thickness, including a 1" monolithic wearing surface, is 8 1/2". Elastomeric bearings are anticipated at the substructures.

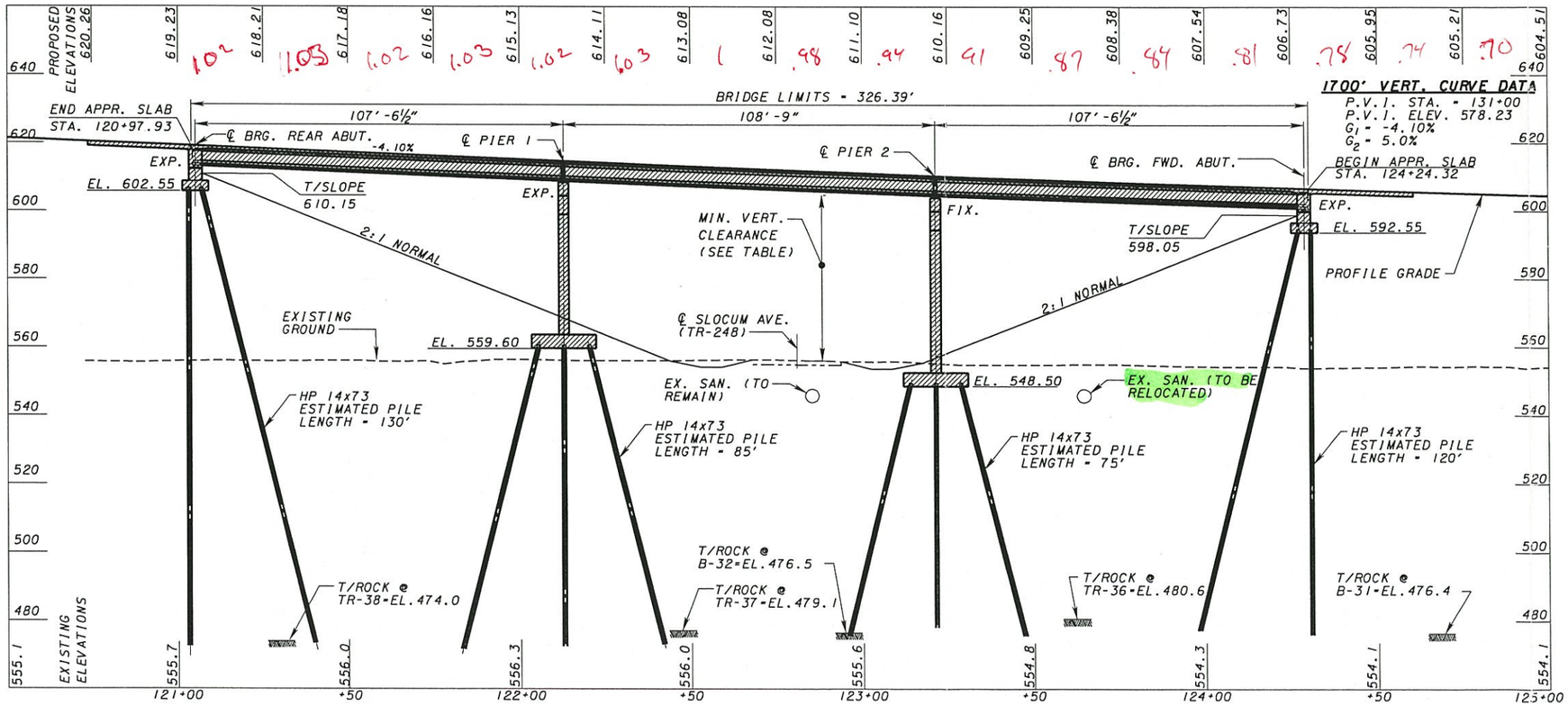
APPENDIX A

Structure Plans

TranSystems



PLAN



PROFILE ALONG PROFILE GRADE S.R. 823 LEFT BRIDGE

1700' VERT. CURVE DATA

P.V.I. STA. = 131+00
P.V.I. ELEV. 578.23
G_1 = -4.10%
G_2 = 5.0%

TABLE OF VERTICAL CLEARANCES

LOCATION	"A"	"B"
PROPOSED	48.35'	49.92'
PREFFERED	15.0'	15.0'

FIRST GUARDRAIL POST OFF BRIDGE LOCATIONS

LOCATION	STATION
REAR ABUT. (SB)	120+98.36
FWD. ABUT. (SB)	124+93.15

BENCHMARK 1	BENCHMARK 2
(TO BE PROVIDED LATER)	(TO BE PROVIDED LATER)

TRAFFIC DATA

S.R. 823
CURRENT YEAR ADT (2010) - 21,200
DESIGN YEAR ADT (2030) - 31,200
CURRENT YEAR ADTT (2010) - 2,968
DESIGN YEAR ADTT (2030) - 4,368

LEGEND

BTA-1 - BRIDGE TERMINAL ASSEMBLY TYPE 1
BTA-2 - BRIDGE TERMINAL ASSEMBLY TYPE 2
⊕ - BORING LOCATION

NOTES:

1. ALL SHEETS WITH PLAN DIMENSIONS ARE SHOWN HORIZONTAL.
2. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS..

PROPOSED STRUCTURE

TYPE: 3 SPAN CONTINUOUS 60" MODIFIED AASHTO TYPE 4 PRESTRESSED CONCRETE I-BEAM WITH COMPOSITE REINFORCED CONCRETE DECK SUPPORTED BY REINFORCED CONCRETE T-TYPE PIERS AND SEMI-INTEGRAL ABUTMENTS.

SPANS: 106'-4", 106'-4", 106'-4" (C/C BRG.)

ROADWAY: 2 - 42'-0" T/T OF PARAPETS

LOADING: HS-25 AND ALTERNATE MILITARY LOADING, FWS-60 PSF

SKEW: 38°33'37" LF

CROWN: 0.016 FT/FT

ALIGNMENT: TANGENT

WEARING SURFACE: MONOLITHIC CONCRETE

APPROACH SLABS: AS-1-81 (30' LONG)

LATITUDE: 38°46'13" N

LONGITUDE: 82°52'36" W

DESIGN AGENCY: TranSystems, 5111 Pinnacle Drive, Suite 410, Dublin, OHIO 43017

DATE REVISED: 11/07/07
STRUCTURE FILE NUMBER: 7306342
DRAWN: AWB
REVISED:
DESIGNED: PJP
CHECKED: MSL

SCIOTO COUNTY
STA. 120+97.93
STA. 124+24.32

SITE PLAN
BRIDGE NO. SCI-823-0229 L
S.R. 823 OVER SLOCUM AVENUE (T.R.248)

SCI-823-0.00
PID 77366

1/7

828/847

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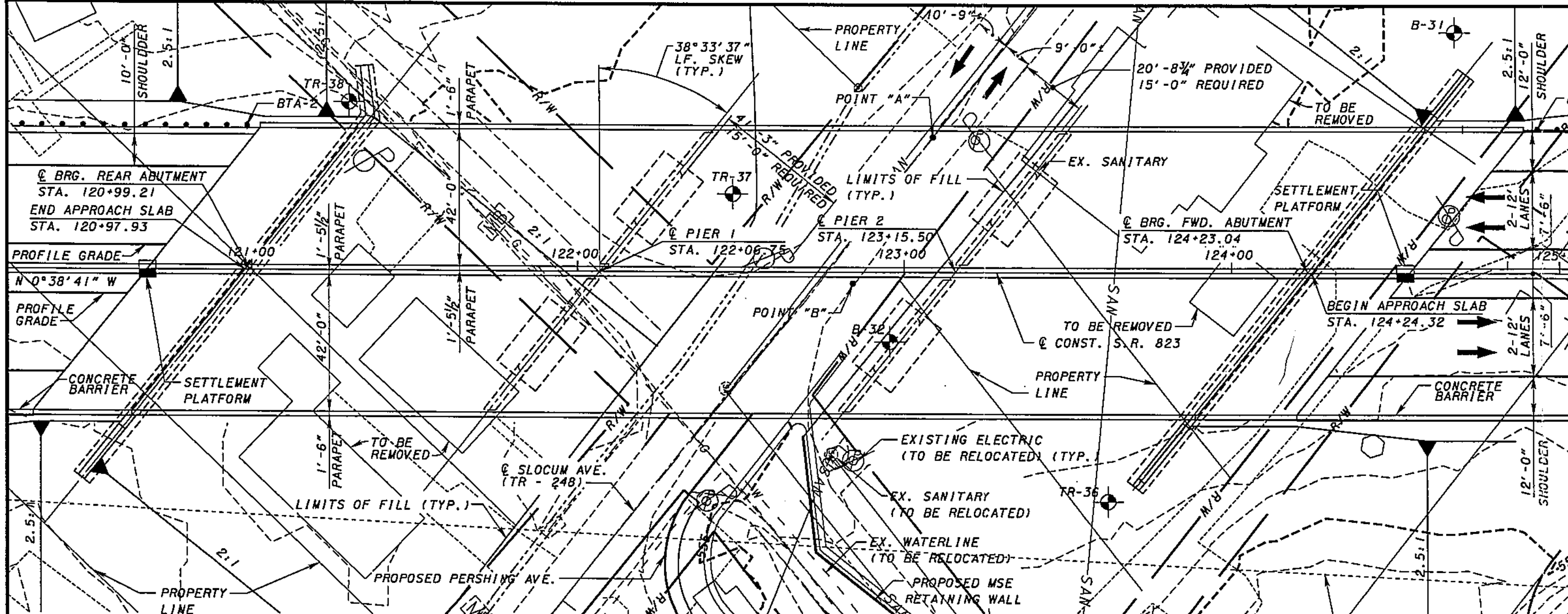
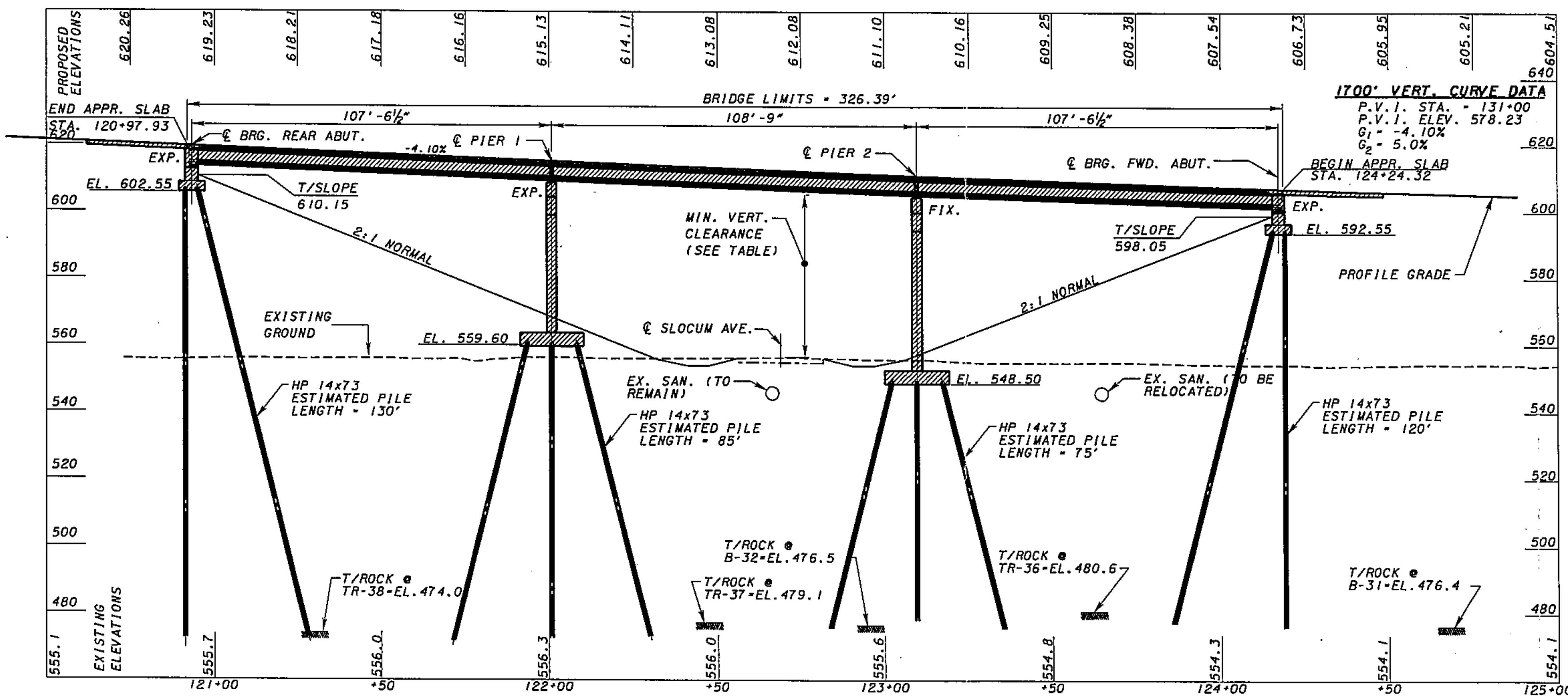


PLAN



PROFILE ALONG PROFILE GRADE S.R. 823 RIGHT BRIDGE

FIRST GUARDRAIL POST OFF BRIDGE LOCATIONS	
LOCATION	STATION
REAR ABUT. (SB)	120+98.36
FWD. ABUT. (SB)	124+93.15

BENCHMARK 1	BENCHMARK 2
(TO BE PROVIDED LATER)	(TO BE PROVIDED LATER)

TRAFFIC DATA

S.R. 823
CURRENT YEAR ADT (2010) = 21,200
DESIGN YEAR ADT (2030) = 31,200
CURRENT YEAR ADTT (2010) = 2,968
DESIGN YEAR ADTT (2030) = 4,368

LEGEND

BTA-1 = BRIDGE TERMINAL ASSEMBLY TYPE 1
BTA-2 = BRIDGE TERMINAL ASSEMBLY TYPE 2
⊕ = BORING LOCATION

NOTES:

1. ALL SHEETS WITH PLAN DIMENSIONS ARE SHOWN HORIZONTAL.
2. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS..

TABLE OF VERTICAL CLEARANCES		
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PROPOSED	48.35'	49.92'
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PROPOSED STRUCTURE

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APPROACH SLABS: AS-1-81 (30' LONG)

LATITUDE: 38°46'13" N

LONGITUDE: 82°52'36" W

DESIGN AGENCY: TranSystems

DESIGNED PJP | CHECKED MSL | DRAWN AWB | REVISED | REVIEWED MSL | DATE 11/07/07 | STRUCTURE FILE NUMBER 7306350

SCIOTO COUNTY
STA. 120+97.93
STA. 124+24.32

SITE PLAN
BRIDGE NO. SCI-823-0229 R
S.R. 823 OVER SLOCUM AVENUE (T.R.248)

SCI-823-0.00
PID 77366

2/7

829/847

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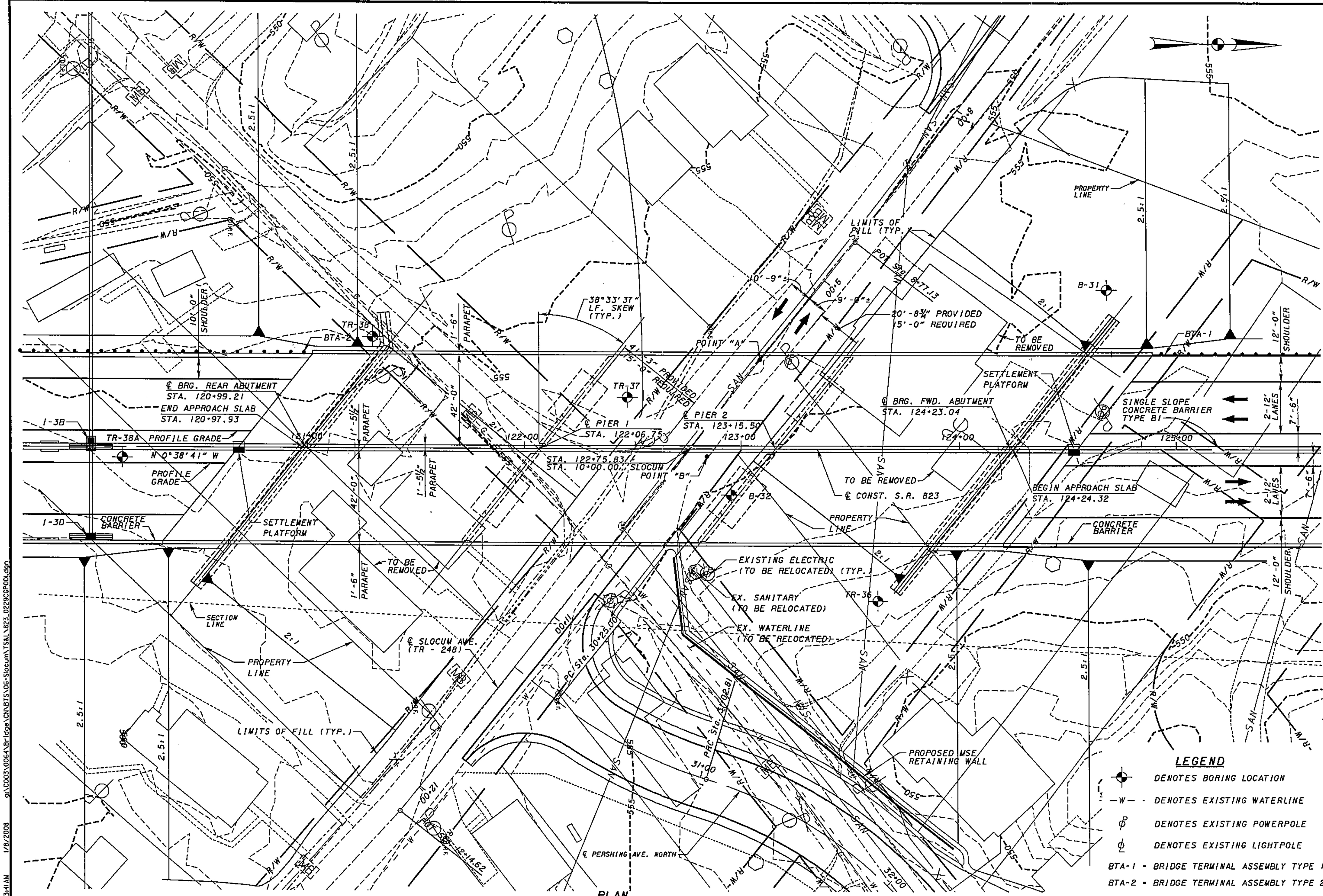

LEGEND

- DENOTES BORING LOCATION
- —W— DENOTES EXISTING WATERLINE
- DENOTES EXISTING POWERPOLE
- DENOTES EXISTING LIGHTPOLE

BTA-1 - BRIDGE TERMINAL ASSEMBLY TYPE 1
BTA-2 - BRIDGE TERMINAL ASSEMBLY TYPE 2

DESIGN AGENCY: TranSystems

DESIGNED	DRAWN	REVIEWED	DATE
PJP	AWB	MSL	11/07/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MSL		7306342L, 7306350R	

GENERAL PLAN

BRIDGE NO. SCI-823-0229 L&R
S.R. 823 OVER SLOCUM AVENUE (T.R. 248)

SCI-823-0.00
PID 77366

3/7

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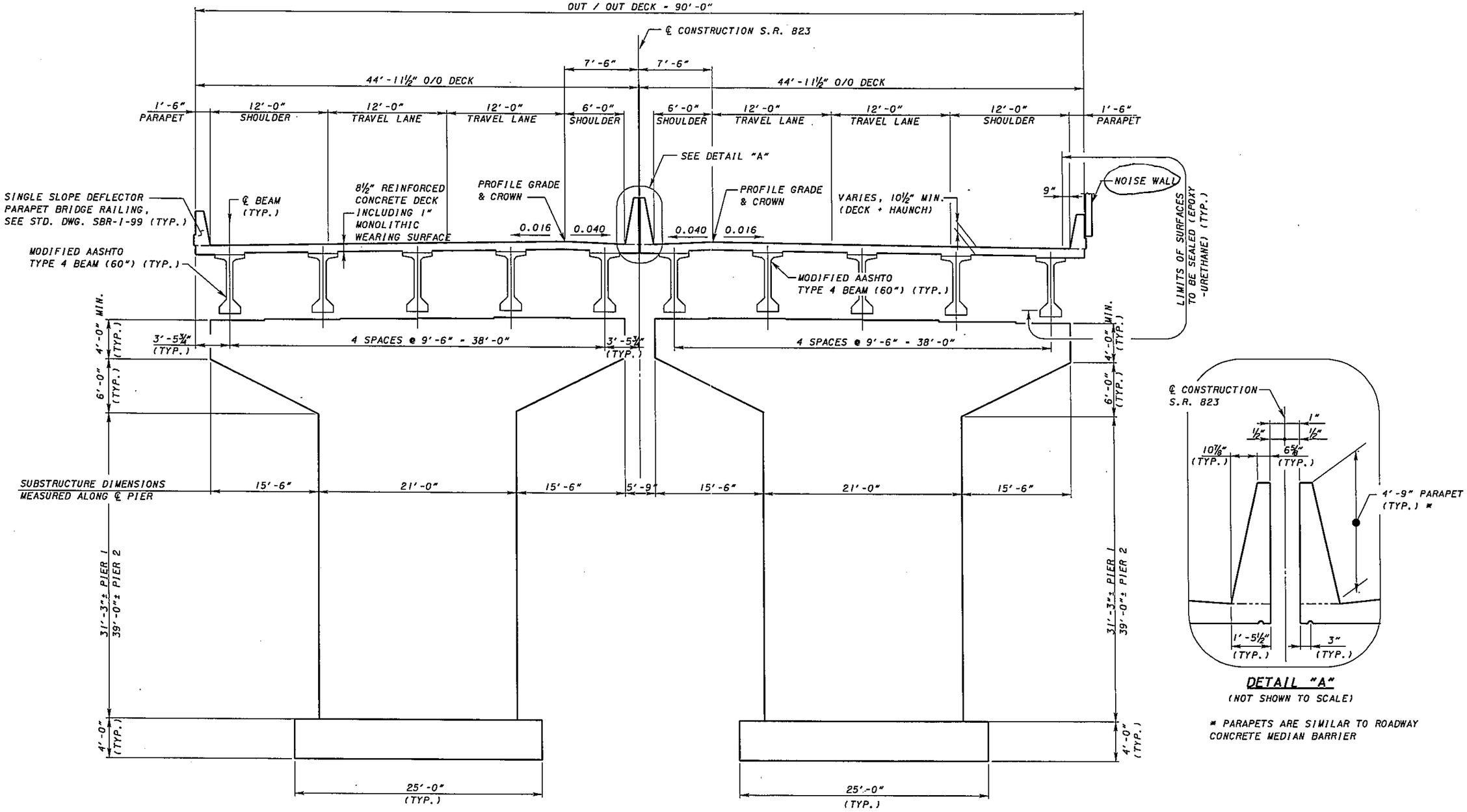


TYPICAL TRANSVERSE SECTION

DETAIL "A"

(NOT SHOWN TO SCALE)

* PARAPETS ARE SIMILAR TO ROADWAY CONCRETE MEDIAN BARRIER

TRANSVERSE SECTION

BRIDGE NO. SCI-823-0229 L&R

S.R. 823 OVER SLOCUM AVENUE (T.R. 248)

DESIGN AGENCY: Strand Systems, 5151 PFEIFFER DRIVE, SUITE 240, DUBLIN, OHIO 43017

DESIGNED PJP | DRAWN CAS | REVIEWED MSL | DATE 11/07/07

CHECKED MSL | REVISED | STRUCTURE FILE NUMBER 73063421., 73063508

SCI-823-0.00

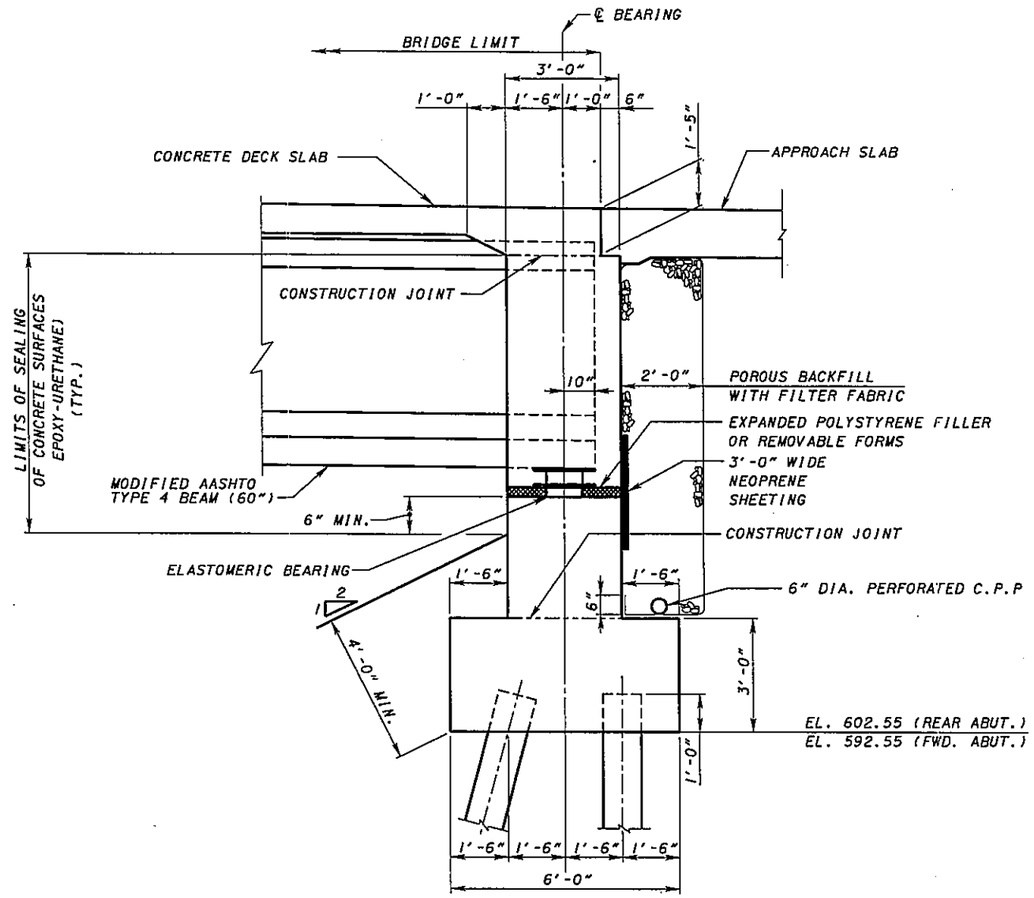
PID 77366

4 / 7

831 / 847

$FILE$ $DATE$ $TIME$

SUPERSTRUCTURE DEPTH	
ITEM	60" MODIFIED AASHTO TYPE 4 BEAM
SLAB (INCLUDING WEARING SURFACE)	8.5"
HAUNCH (BOTTOM OF SLAB TO TOP OF FLANGE)	2"
GIRDER DEPTH	60"
TOP OF WEARING SURFACE TO BOTTOM OF GIRDER FLANGE (INCH)	70.5"
TOP OF WEARING SURFACE TO BOTTOM OF GIRDER FLANGE (FEET)	5.875'



ABUTMENT SECTION

NOTES:

1. WICK DRAINS AND SETTLEMENT MONITORING ARE REQUIRED FOR THE PROPOSED EMBANKMENT CONSTRUCTION. SEE WICK DRAIN AND INSTRUMENTATION PLANS FOR MORE DETAILS.

2. CONSTRUCTION CONSTRAINTS: PRIOR TO CONSTRUCTING THE PROPOSED PILE FOUNDATIONS, CONSTRUCT THE BRIDGE APPROACH EMBANKMENTS BEHIND THE ABUTMENT UP AT A 1:1 SLOPE FROM THE BOTTOM OF THE HEEL OF THE FOOTING TO SUBGRADE ELEVATION AND FOR A MINIMUM DISTANCE OF 250 FEET BEHIND THE ABUTMENTS. CONSTRUCTION OF THE PIER AND ABUTMENT FOUNDATIONS CAN PROCEEDE AFTER THE GEOTECHNICAL DESIGN COORDINATOR HAS DETERMINED THAT 99% CONSOLIDATION HAS BEEN REACHED. THE ESTIMATED TIME TO 99% CONSOLIDATION DEPENDS UPON THE WICK DRAIN SPACING SELECTED TO CONSTRUCT THE EMBANKMENT. AFTER THE ABUTMENT FOOTING AND BREASTWALL ARE COMPLETED AND PRIOR TO SETTING SUPERSTRUCTURE MEMBERS, CONSTRUCT THE EMBANKMENT IMMEDIATELY BEHIND THE ABUTMENT UP TO THE BEAM SEAT ELEVATION AND ON A 1:1 SLOPE UP TO THE SUBGRADE ELEVATION, WITH TYPE B GRANULAR MATERIAL CONFORMING TO 703.16.C.

3. ITEM 203 GRANULAR MATERIAL, TYPE B, AS PER PLAN: PLACE AND COMPACT GRANULAR EMBANKMENT MATERIAL IN 6 INCH LIFTS FOR THE CONSTRUCTION OF THE APPROACH EMBANKMENT BETWEEN STATIONS 119+30 TO 125+25.

DESIGN AGENCY: Tran Systems, 5747 PERIMETER DRIVE, SUITE 210, DUBLIN, OHIO 43017

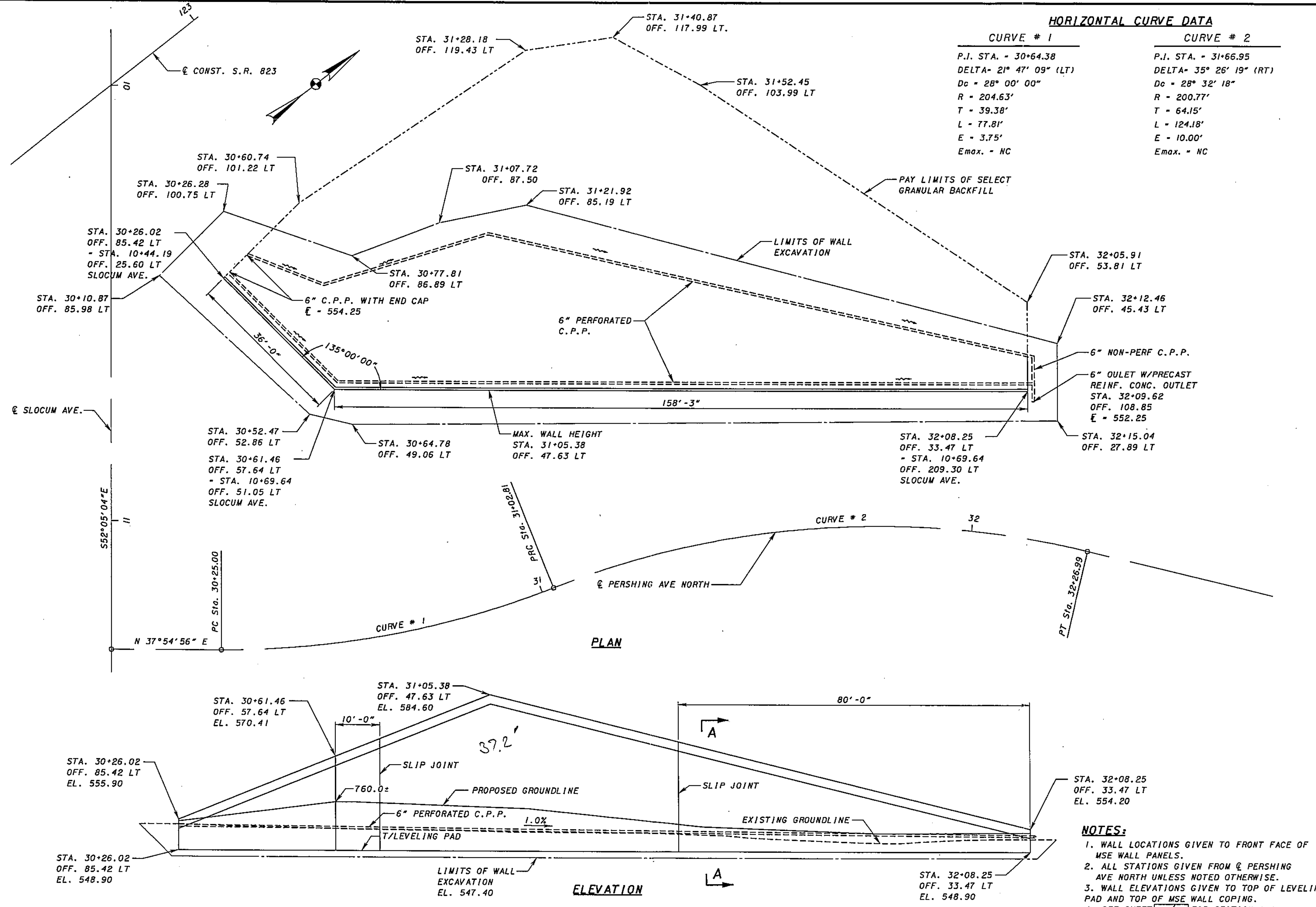
DESIGNED PJP | DRAWN CAS | REVIEWED MSL | DATE 11/07/07 | CHECKED MSL | REVISED | STRUCTURE FILE NUMBER 7306342L, 7306350R

TYPICAL ABUTMENT SECTION
BRIDGE NO. SCI-823-0229 L&R
S.R. 823 OVER SLOCUM AVENUE (T.R. 248)

SCI-823-0.00
PID 77366

5 / 7

832 / 847



HORIZONTAL CURVE DATA

CURVE # 1	CURVE # 2
P.I. STA. = 30+64.38	P.I. STA. = 31+66.95
DELTA= 21° 47' 09" (LT)	DELTA= 35° 26' 19" (RT)
Dc = 28° 00' 00"	Dc = 28° 32' 18"
R = 204.63'	R = 200.77'
T = 39.38'	T = 64.15'
L = 77.81'	L = 124.18'
E = 3.75'	E = 10.00'
Emax. = NC	Emax. = NC

NOTES:

1. WALL LOCATIONS GIVEN TO FRONT FACE OF MSE WALL PANELS.
2. ALL STATIONS GIVEN FROM ℄ PERSHING AVE NORTH UNLESS NOTED OTHERWISE.
3. WALL ELEVATIONS GIVEN TO TOP OF LEVELING PAD AND TOP OF MSE WALL COPING.
4. SEE SHEET [7] FOR SECTION A-A.

DESIGN AGENCY
TranSystems
5747 PERIMETER DRIVE, SUITE 240 DUBLIN, OHIO 43017

DESIGNED	DRAWN	REVIEWED	DATE
CAS	CAS	MSL	11/07/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
PJP		7306342L, 7306350R	

FWD. ABUTMENT MSE WALL PLAN & ELEVATION

BRIDGE NO. SCI-823-0229 L&R
SR823 OVER SLOCUM AVENUE (TR 248)

SCI-823-0.00
PID 77366

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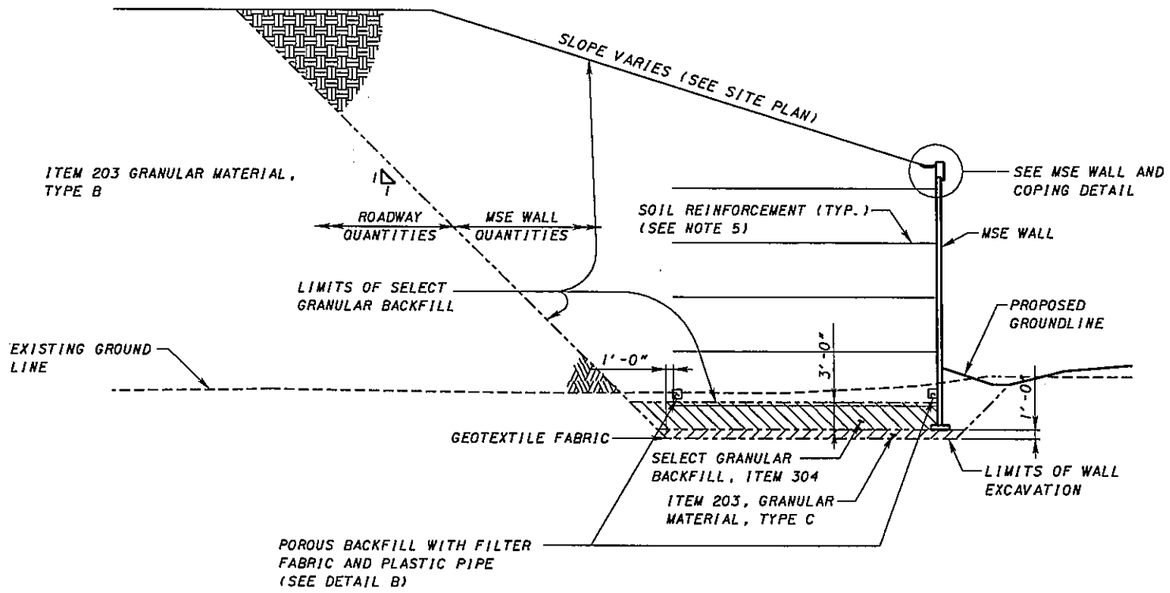
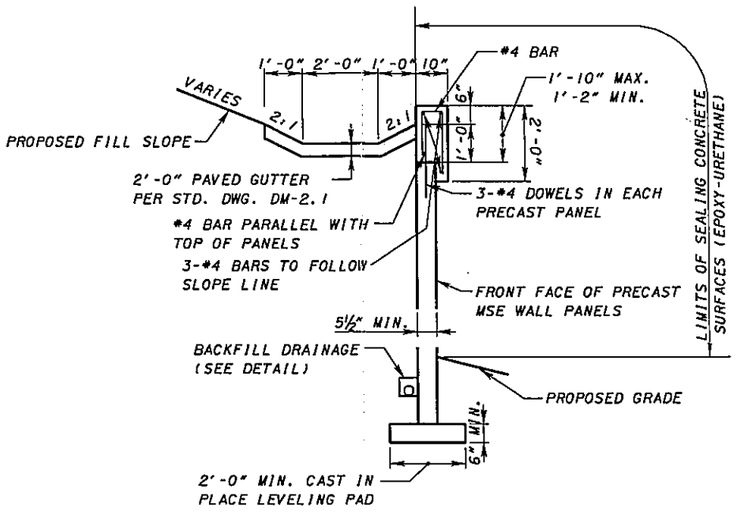
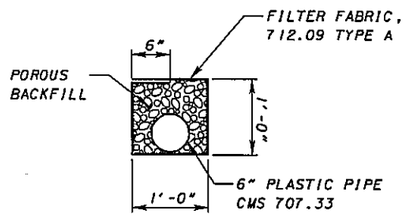


SECTION A-A



MSE WALL AND COPING DETAIL



BACKFILL DRAINAGE DETAIL

NOTES:

1. SEE SITE PLAN DRAWING FOR BORING LOCATIONS AND APPROX. TOP OF ROCK ELEVATIONS.
2. THE SLOPING LINE WHICH DEFINES THE LIMIT OF THE SELECT GRANULAR BACKFILL IS NOT AN ALLOWABLE SLOPE FOR EXCAVATION. CUT THE SIDES OF ALL EXCAVATIONS TO PREVENT CAVING OR PROTECT THE EXCAVATIONS FROM CAVING.
3. ALL REINFORCING STEEL TO BE EPOXY COATED.
4. WICK DRAINS AND SETTLEMENT MONITORING ARE REQUIRED FOR THE PROPOSED EMBANKMENT AND WALL CONSTRUCTION. SEE WICK DRAIN AND INSTRUMENTATION PLANS FOR MORE DETAILS.
5. PROPRIETARY RETAINING WALL DATA:
   THE PROPRIETARY WALL SUPPLIER SHALL DESIGN THE INTERNAL STABILITY OF A MECHANICALLY STABALIZED EARTH (MSE) WALL IN ACCORDANCE WITH SS840. THE MINIMUM REINFORCMENT LENGTH REQUIRED TO SATISFY EXTERNAL STABILITY IS 1.0*H IN ACCORDANCE WITH DLZ OHIO INC. SUBSURFACE INVESTIGATION REPORT OF 9/06/07. WALL HEIGHT H IS DEFINED IN ACCORDANCE WITH SUPPLEMENTAL SPECIFICATION 840.

DESIGN AGENCY: Trans Systems, 512 PENNSYLVANIA AVE., SUITE 210, CHARLESTON, WEST VIRGINIA 25302

DESIGNED	DRAWN	REVIEWED	DATE
CAS	CAS	MSL	11/07/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
PJP		7306342L, 7306350R	

FWD. ABUTMENT MSE WALL DETAILS
BRIDGE NO. SCI-823-0229 L&R
SR823 OVER SLOCUM AVENUE (TR248)

SCI-823-0.00
PID 77366

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APPENDIX B

Structure Cost Estimate

TranSystems

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Slocum Avenue L&R

STRUCTURE TYPE STUDY

By: PJP
Checked: MSL

Date: 10/5/2006
Date: 9/5/2006

ALTERNATIVE COST SUMMARY

Alternative No.	Span Arrangement No. Spans	Span Arrangement Lengths	Total Span Length (ft.)	Framing Alternative	Proposed Stringer Section	Subtotal Superstructure Cost	Subtotal Substructure Cost	Structure Incidental Cost (16%)	Structure Contingency Cost (20%)	Total Alternative Const. Cost	Life Cycle Maintenance Cost	Total Relative Ownership Cost
1	3	106.33'-106.33'-106.33'	323.83	5 Prestressed Concrete Girders /per BRIDGE	Modified AASHTO Type 4 (60")	$2,132,000	$2,127,000	$681,400	$0	$4,940,000	$0	$4,940,000

NOTES:

1. Structure incidental cost allowance includes provision for structure excavation, porous backfill, sealing of concrete surfaces, structural steel painting, bearings, and crushed aggregate slope protection costs.

2. Estimated construction cost does not include existing structure removal (if any), which should be quantified seperately, if required.

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Slocum Avenue L&R

STRUCTURE TYPE STUDY - PRESTRESSED CONCRETE GIRDER ALTERNATIVE 1 - SUPERSTRUCTURE

By: PJP
Checked: MSL

Date: 10/5/2006
Date: 9/5/2006

SUPERSTRUCTURE

Alternative No.	Span Arrangement No. Spans	Span Arrangement Lengths	Total Span Length (ft.)	Deck Length (ft.)	Deck Volume (cu. yd.)	Deck Concrete Cost	Deck Reinforcing Cost	Approach Slab Cost	Approach Roadway Cost	Framing Alternative	Proposed Girder Section	Prestressed Concrete Cost	Subtotal Superstructure Cost
1	3	106.33'-106.33'-106.33'	323.83	326	1261	$689,600	$319,800	$117,600	$0	5 Prestressed Concrete Girders /per BRIDGE	Modified AASHTO Type 4 (60")	$1,004,772	**$2,132,000**

COST SUPPORT CALCULATIONS

Deck Cross-Sectional Area:

Parapets:

	No.	Individual Area (sq. ft.)	Parapet Area (sq. ft.)
Parapets	1	4.26	4.26
Parapets	1	4.77	4.77

Slab:

	T (ft.)	W (ft.)	Slab Area	Haunch & Overhang Area	Total Concrete Area (sq. ft.)
Left Bridge	0.71	44.96	31.8	3.2	44.1
Right Bridge	0.71	44.96	31.8	3.2	44.1

Note: Deck width is out to out
10% of deck area allowed for haunches and overhangs.

QC/QA Concrete, Class QSC2
Unit Cost ($/cu. yd):

	Year 2005	Annual Escalation	Year 2007
Deck	$525.00	5.0%	$579.00
Parapets	$385.00	5.0%	$424.00
Weighted Average =			$547.00

Based on parapet and slab percentages of total concrete area

Epoxy Coated Reinforcing Steel
Unit Cost ($/lb):

Assume 285 lbs of reinforcing steel per cubic yard of deck concrete

	Year 2005	Annual Escalation	Year 2007
Deck Reinforcing	$0.81	5.0%	$0.89

Prestressed Concrete Girders
Unit Costs:

	Year 2005		Annual Escalation	Year 2007		No. Required	
AASHTO Type IV Beams							
Pier Diaphragms	$1,800	ea.	5.0%	$1,980	ea.	20	$39,600
Abutment Diaphragms	$1,200	ea.	5.0%	$1,320	ea.	0	$0
Intermediate Diaphragms	$905	ea.	5.0%	$1,000	ea.	72	$72,000
Modified Type 4 I-Beams (60")	$250	per ft.	5.0%	$280	ea.	3190	$893,172
							$1,004,772

Construction Complexity Factor
Percent of Superstructure = 0% Due to Deck forming, Screed and Varying Girder Spaces

Reinforced Concrete Approach Slabs (T=17")
Unit Cost ($/sq. yd.):

Length = 30 ft. Width = 90 ft
Area = 600 sq. yd.

	Year 2005	Annual Escalation	Year 2007
Approach Slabs	$178.00	5.0%	$196.00

Approach Roadway

See Rdwy. for Wick Drain Costs

		Year 2005	Annual Escalation	Year 2007
Embankment fill	0.00 cu.yd.	$4.00	5.0%	$4.41
Wick Drains	0.00 ft.	$1.00	5.0%	$1.10
Roadway incl. base	0.00 sq.yd.	$26.00	5.0%	$28.67
Barrier (single faced)	0 ft.	$50.00	5.0%	$55.13
Barrier (dble faced)	0 ft.	$80.00	5.0%	$88.20

Expansion Joints
Unit Costs ($/Lin.Ft.):

	Cost Ratio	Year 2005	Annual Escalation	Year 2007
Strip Seal Expansion Joints	1.00	$250	5.0%	$352

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Slocum Avenue L&R

STRUCTURE TYPE STUDY - PRESTRESSED CONCRETE GIRDER ALTERNATIVE 1 - SUBSTRUCTURE

By: PJP
Checked: MSL

Date: 10/5/2006
Date: 9/5/2006

SUBSTRUCTURE

Alternative No.	Span Arrangement No. Spans	Lengths	Framing Alternative	Proposed Stringer Section	Pier Concrete Cost	Pier Reinforcing Cost	Abutment Concrete Cost	Abutment Reinforcing Cost	Pile Foundation Cost	MSE Wall Cost	Additional Crane Cost	Earthwork Cost	Subtotal Substructure Cost
1	3	106.33'-106.33'-106.33'	5 Prestressed Concrete Girders /per BRIDGE	Modified AASHTO Type 4 (60")	$516,000	$102,400	$195,800	$33,900	$876,400	$327,200	$75,000	$0	**$2,127,000**

COST SUPPORT CALCULATIONS

Pier QC/QA Concrete, Class QSC1 Cost: (Spread Footing)

Component	Volume (cu. yd.)	Year 2005	Annual Escalation	Year 2007	Total Cost
Cap	316	$575.00	5.0%	$634.00	$200,340
Stem	382	$575.00	5.0%	$634.00	$242,190
Footings	222	$300.00	5.0%	$331.00	$73,480
Total	920				$516,000

Pier QC/QA Concrete, Class QSC1 Cost: (Drilled Shaft)

Component	Volume (cu. yd.)	Year 2005	Annual Escalation	Year 2007	Total Cost
Cap	0	$575.00	5.0%	$634.00	$0
Columns	0	$575.00	5.0%	$634.00	$0
Footings	0	$300.00	5.0%	$331.00	$0
Total					$0

Abutment QC/QA Concrete, Class QSC1 Cost:

Component	Volume (cu. yd.)	Year 2005	Annual Escalation	Year 2007	Total Cost
Abutment	423	$420.00	5.0%	$463.00	$195,800

Note: Includes wingwalls.

Excavation and Embankment Costs:

Component	Quantity	Year 2005	Annual Escalation	Year 2007	Total Cost
Embankment	0	$2.00	5.0%	$2.00	$0
Rock Excavation	0	$6.00	5.0%	$7.00	$0
Wick Drains	0	$1.00	5.0%	$1.00	$0

Note: Embankment and Wick Drains Included in Rdwy. Costs

Epoxy Coated Reinforcing Steel Unit Cost ($/lb):

Assume 125 lbs of reinforcing steel per cubic yard of pier concrete.
Assume 90 lbs of reinforcing steel per cubic yard of abutment concrete.

	Year 2005	Annual Escalation	Year 2007
Pier	$0.81	5.0%	$0.89
Abutment	$0.81	5.0%	$0.89

Pile Foundation Unit Cost ($/ft.): *HP 14X73 Piles, Furnished & Driven*

Number of Piles		Total Pile Length
228	SEE QUANTITY CALCULATIONS	22,020

Pile Foundation Unit Cost ($/ft.):

	Year 2005 Unit Cost	Annual Escalation	Year 2007
Furnished	$26.47	5.0%	$29.20
Driven	$9.62	5.0%	$10.60
Total			$39.80

Shaft Foundation Unit Cost ($/ft.): 36" Drilled Shaft

	Number of Shafts		Total Shaft Length
Alt. 1	0	SEE QUANTITY CALCULATIONS	0

Shaft Foundation Unit Cost ($/ft.):

Unit Cost	Escalation	2008
$125.00	5.0%	$152.00

Cost of Shafts: $ -

MSE Abutment Unit Cost ($/sq. ft.):

	Total Area (sq. ft.)	Year 2005 Unit Cost	Annual Escalation	Year 2008
Alt. 1	4,040	$70.00	5.0%	$81.00

Temporary Shoring and Support Unit Costs ($/sq. ft.):

	Temp. Shoring Area (sq. ft.)	Temp. Girder Support (lump sum)
Alt. 1	0	$ -

	Year 2004 Unit Cost	Annual Escalation	Year 2008
Temporary Shoring	$22.50	5.0%	$27.30
Cofferdam	$32.00	5.0%	$38.90

Additional Crane Cost

$ 75,000

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Slocum Avenue L&R

STRUCTURE TYPE STUDY - PRESTRESSED CONCRETE GIRDER ALTERNATIVE 1 - QUANTITY CALCULATIONS

By: PJP
Checked: MSL

Date: 10/5/2006
Date: 9/5/2006

Pier Quantities

Pier Location	Length	Cap				Stem				Footing				Total Volume
		Width	Depth	Area	Volume	Width	Height	Length	Volume	Width	Depth	Length	Volume	
Pier 1 (Piles)	52.00	5	8.21	41.05	2135	3.5	31.25	21.00	2297	15	4	25.00	1500	5931
Pier 2 (Piles)	52.00	5	8.21	41.05	2135	3.5	39	21.00	2867	15	4	25.00	1500	6501
Pier 3														0
Pier 4														0
Pier 5														0
Pier 6														0
Pier 7														0
Total (Cu.Ft.)					4269				5163				3000	12433
Total (Cu.Yd.)					158				191				111	460
			Qty x 2 (L/R)		316				382				222	920

Abutment Quantities

Abut Location	Length (feet)	Backwall				Beam Seat				Footing						Total Volume
		Width	Depth	Area	Volume	Width	Height	Area	Volume	Width	Depth	Area	# Footi	Volume		
Rear Abut	0.00	0	0	0.00	0	0	0	0.00	0	0	0	0	1	0		0
Fwd. Abut	0.00	0	0	0.00	0	0	0	0.00	0	0	0	0	1	0		0
Total (Cu.Ft.)					0				0					0		0
Total (Cu.Yd.)					0				0					0		0
			Qty x 2 (L/R)		0				0					0		423

MSE Abutment Wall Quantities

Abut Location		Wall			
		Height	Length	Area	Volume
Rear Abut		0		0.0	
RA Wing (L)				0.0	
RA Wing (R)				0.0	
Fwd Abut		0	0	0.0	
FA Wing (L)				0.0	
FA Wing (R)				0.0	
Total (Sq.Ft.)				4040	

Pile Quantities

Location	Load/girder (Kips)	# Girders	Total Girder Load	Subst Wt (kips)	Pile Cap.(Kips	No. Piles	Increase Factor	Total Piles	Top Elev.	Bot Elev.	Pile Length	Total Pile Length (Feet)
Rear Abut.	0	0	0	0	140	0	1	21	603.6	474.0	130.0	2730
Pier 1	0	0	0	0	140	0	1	36	560.6	479.1	85.0	3060
Pier 2	0	0	0	0	140	0	1	36	549.5	476.5	75.0	2700
Pier 3	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 4	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 5	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 6	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 7	0	0	0	0	140	0	1	0	0	0	0.0	0
Fwd. Abut.	0	0	0	0	140	0	1	21	593.55	476.4	120.0	2520
TotaL								114				11010
							Qty x 2 (L/R)	228				22020

36" Drilled Shafts for Piers

Location	Load/girder (Kips)	# Girders	Total Load	Subst Wt (kips)	Pile Cap.(Kips	No. Piles	Increase Factor	Total Shafts	Top Elev.	Bot Elev.	Pile Length	Total Shaft Length (Feet)
Rear Abut.	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 1	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 2	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 3	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 4	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 5	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 6	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 7	0	0	0	0	0	0	1	0	0	0	0.0	0
Fwd. Abut.	0	10	0	0	0	0	1	0	0	0	0.0	0
Total								0				0

Superstructure P/S Concrete Quantities

Location	Type of girder	# Girders	Span Length (ft.)	Total Length (ft.)	Spacing Int. diaphragm	No. of Int in span	Number of Int Diap. 1 location	Total No. in Span
Span 1	MOD TYPE 4 60	10	106.3	1063	26.58	8	3	24
Span 2		10	106.3	1063	26.58	8	3	24
Span 3		10	106.3	1063	26.58	8	3	24
Span 4		0	0.0	0	0.00			0
Span 5		0	0.0	0	0.00			0
Span 6		0	0.0	0	0.00			0
Span 7		0	0.0	0	0.00			0
Span 8		0	0.0	0	0.00			0
Span 9		0	0.0	0	0.00			0
Total	MOD TYPE 4 60			3190	Total			72