SCI-823-10.13

PID No. 79977

SR 823 over Blue Run Road (CR 29)

Preliminary Design Report Submittal

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

January 14, 2008

Prepared by:

TranSystems

TABLE OF CONTENTS

TranSystems

TranSystems

5747 Perimeter Drive
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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 Blue Run Road (CR 29)
SCI-823-10.13 Portsmouth Bypass
PID#79977

Dear Mr. Siddiqi:

Submitted for review and comment is the Preliminary Design Report for SR 823 over Blue Run Road (CR 29). Included are The TS&L drawings, the Hydraulic Report and the Final Geotechnical Report by DLZ, Ohio, dated January 18, 2007. Please find below our disposition to the August 16, 2006 comments by Jeff Crace, PE regarding the STS submittal.

1) *The leveling pad for the MSE wall should be located 1 foot below the bottom of any adjacent ditch. We recommend that the leveling pad be placed at the top of rock elevation for both walls.*

✓ The leveling pad has been placed at the approximate top of rock.

2) *Is it possible to utilize a standard Type 4 Prestressed Concrete I-beam for a 97'-3" span?*

✓ The beam size has been reduced to a 60" Type 4 Modified beam. Please note that the structure has been widened to close the median opening and thus the beam spacing was increased (see comment 4).

3) *Should the two interior barriers be higher to block the headlights of oncoming cars?*

✓ At the District's request, the structure has been widened to close the median opening and also use a 57" barrier similar to the roadway median barrier (see comment 4).

4) *Coordinate the Proposed Transverse Section for the structure with the approach typical "normal" section, inside shoulder with. Revise the stations on the Roadway Normal Sections to account for the revised structure length.*

✓At the District's request, the structure has been widened to close the median opening. The bridge limits have been coordinated with the roadway plans in the Stage One submittal.

(5) *Is railing required between Blue Run Road and the creek?*

Investigation of the existing cross sections reveals that most of the cross sections have side slopes that are less than 3:1 meeting the requirements of common grading. There is not guard rail along Blue Run Road in the existing condition and the existing creek. The intent of the project is not to improve the Blue Run Road and maintain the existing conditions as much as possible. Therefore adding guardrail is not considered a warranted as part of the bridge construction.

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

Sincerely,

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

Cc: T. Barnitz, P.E.

PRELIMINARY DESIGN REPORT NARRATIVE

1. Introduction

TranSystems Corporation 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 Blue Run (CR-29). 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 3/28/06 to incorporate the updated roadway geometry. Comments and approval of the structure type were received from ODOT on 4/27/06. Subsequent to receiving the comments a meeting with OSE staff was held to discuss tall MSE walls in excess of 40' tall. As a result of the meeting the Type Study for Blue Run road was re-visited. The results of the additional studies confirmed that the approved alternative with MSE walls was still an economical solution. The revised Type Study was submitted July 19, 2006 and comments were received August 16, 2006. The 8/16/06 comments have been incorporated into this submittal and a disposition to them has been prepared.

2. Design Criteria

The proposed structure types are 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 Recommendation

DLZ Ohio, Inc. performed the subsurface exploration for the proposed bridge and prepared the Final Bridge Foundation Recommendations dated January 18, 2007.

In summary the six test borings (TR-7, TR-8, TR-9, TR-10, B-13 and B-14) were drilled and all encountered bedrock. The depth to bedrock varied across the site from 3' to 18.5' below existing ground. All boring sencountered cohesive and granular soil deposits from soft silty clay (A-6b) to hard sandy silt (A-4a).

The MSE walls were evaluated with respect to bearing capacity, sliding, overturning, global stability and settlement. The evaluations reveal that MSE walls can be used at the rear and forward abutment locations for the proposed structure. DLZ recommends the naturally occurring soils beneath the proposed MSE walls are overexcavated to top of rock and replaced with compacted, granular fill.

Cast in place pipe piles are recommended to support the proposed abutments, in compliance with the ODOT comments. The cast in place piles will be prebored 5' in to competent bedrock and grouted in place before the construction of the MSE walls.

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 the town to another interchange with US 23 north of the town in Valley Township. Each of the proposed bridge sections will consist of two 12'-0" travel lanes with 9'-6" median shoulders and 12'-0" outside shoulders. Each bridge deck width will be 48'-5½" 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 the roadway concrete median barrier but using a base width of 1'-5 ½" and top width of 6 5/8"). The northbound and southbound bridge sections will be separated from one another, along their inside fascia, by 1". The profile grade line for both bridge sections will be located at the inside edge of pavement, which is 11'-0" from the centerline of construction of S.R. 823.

Alignment & Profile: The proposed horizontal geometry is along a tangent alignment across the entire length of both the left and right structures. The proposed mainline profile for each bridge is located on the inside edge of pavement which is 11'-0" from the centerline survey and construction S.R. 823. The left and right profiles are within a 1200' vertical curve with PVI at Station 576+00.00, g_1 = -2.60% and g_2 = 4.00%. Embankment slopes will be a maximum 2:1 in order to minimize right-of-way impacts.

The existing Blue Run (CR-29) will remain on its current horizontal and vertical alignment. The existing horizontal curve that begins under the bridge is approximately a 14°15' curve. This degree of curvature only meets approximately a 38mph design speed in accordance with L&D manual Fig. 202-2E. In addition the existing backslope of the rock cut limits the Horizontal Sight Distance to that required for a 31mph design speed. Due to these limitations the effective design speed is considered 31mph. Existing Blue Run Road does not have a posted speed limit therefore the legal speed is 55mph. The effective design speed of 31mph is less than the legal speed however, in accordance with section 105 of the L&D manual a design exception is not required since limited work will be performed on the road.

Vertical and Horizontal Clearances - Since these twin structures' vertical alignment were dictated by the overall vertical design of the new bypass profile, clearance was not a critical issue. More than 15'-0" of preferred vertical clearance could be provided for all the alternatives considered for this study.

In accordance with the L&D manual, Volume 1, a minimum horizontal clear zone width of 13'-0" from edge of traveled way to face of obstruction The 13'-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:

1. the effective design speed only 31 mph as limited by the HSSD
2. from phone records with Scioto County Engineers staff, the present ADT for CR 29 is *937*;
3. the existing survey indicates a high point in the ditch (and road) under the bridge. It will be possible to use a small traversable ditch with 6*:1 foreslopes and 4:1 backslopes* and maintain the drainage below the bridge.

The proposed MSE wall location exceeds the allowable clear zone of 13'-0". The required offset distance to satisfy horizontal stopping sight distance (HSSD) of 55mph is approximately 69'. Increasing the bridge limits to satisfy the 69' clearance obviously will increase the costs of the structure significantly. The proposed wall and abutment location satisfies a HSSD of 35mph. This is consistent with the effective design speed determined based upon the existing conditions.

An existing creek ditch, which parallels the road, will be maintained on the east side of Blue Run.

Pavement Drainage - The collection of storm water runoff will be addressed off the bridge. Pavement drainage systems have been designed and are shown in the accompanying site plans and general plan. Particular attention has been paid to the control of drainage around the MSE walls.

Utilities - No utilities will be placed on the bridge. However, lighting and ITS conduits will be provided as necessary.

Maintenance of Traffic - While the new bridge is under construction, traffic will be maintained on the existing road. It is anticipated that there will be limited closures during construction of the new structure.

5. Proposed Structure Configuration

Span Configuration: The proposed structure is a single span bridge with a span length of 97'-3" center-to-center of bearings and an 18°00'00" right forward skew. The position of the forward MSE wall satisfies the clear zone width requirements from the edge of traveled way of Blue Run Road as well as horizontal sight distance requirements from the centerline of the inside lane of Blue Run Road.

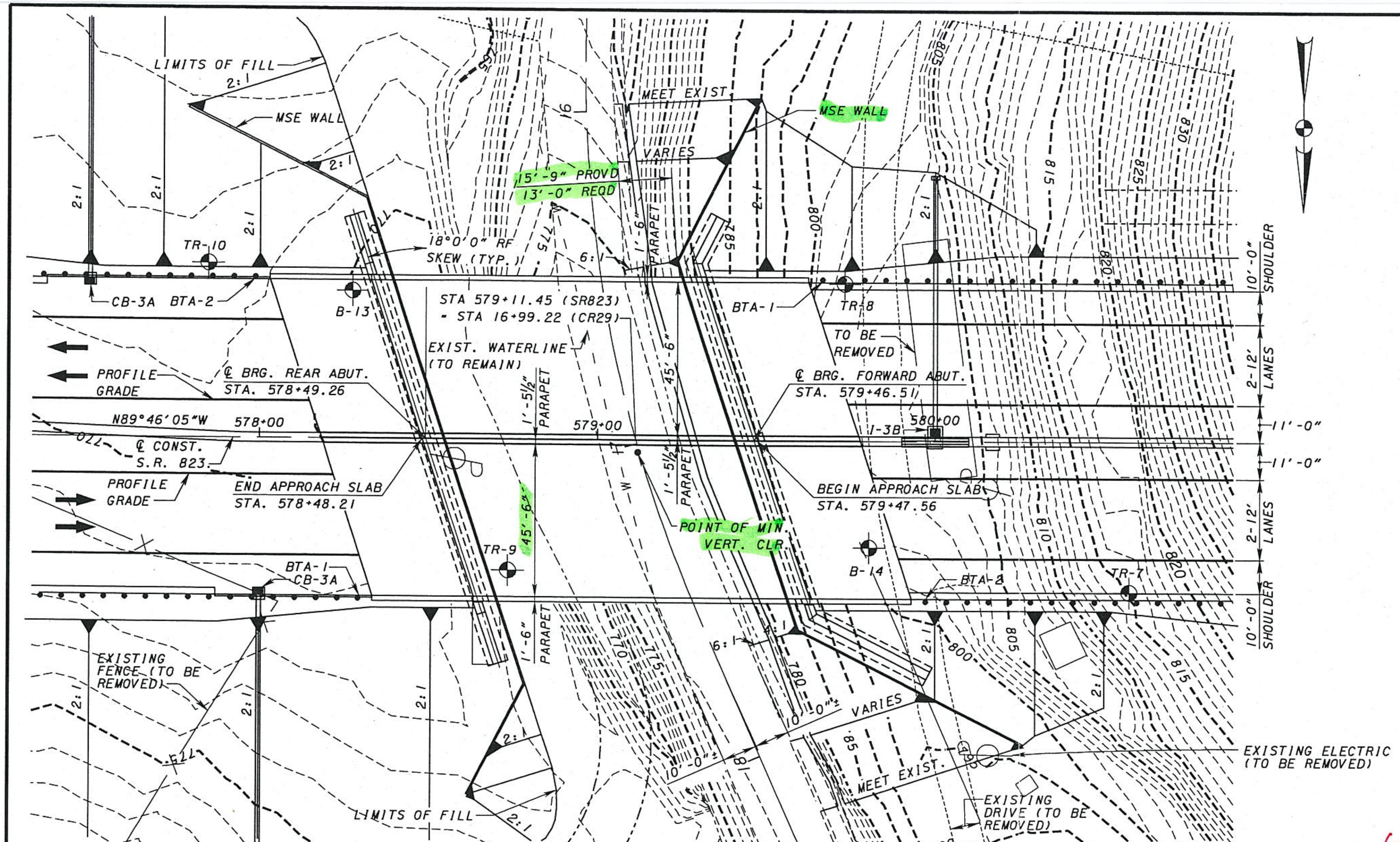
Substructure:
Abutments: Semi-integral abutments are used at the rear and forward abutment locations and are positioned on cast in place piles behind MSE walls. Cast in place piles will be pre-bored 5'-0" into bedrock and grouted in place prior to the construction of the MSE walls.

Superstructure: The superstructures for both the left and right bridges of this alternative consist of 5- 60" Modified AASHTO Type 4 prestressed concrete girders spaced at 10'-4" on center. This satisfies the HS-25 and Alternate Military Loading as well as a Future Wearing Surface loading of 60 psf. The preliminary design of these beams indicates that 6000psi release and 8000psi final concrete strengths will be required. Discussions with Ohio Prestressers Association indicate concrete strength and shipping feasibility were not of particular concern or reason for additional cost (please see attached correspondence). Elastomeric bearings are anticipated at all of the substructures. Each bridge width is 45'-6" from toe-to-toe of parapets with an overall bridge deck width of 48'-5 1/2". Deck thickness, including a 1" monolithic wearing surface, is 8 ¾".

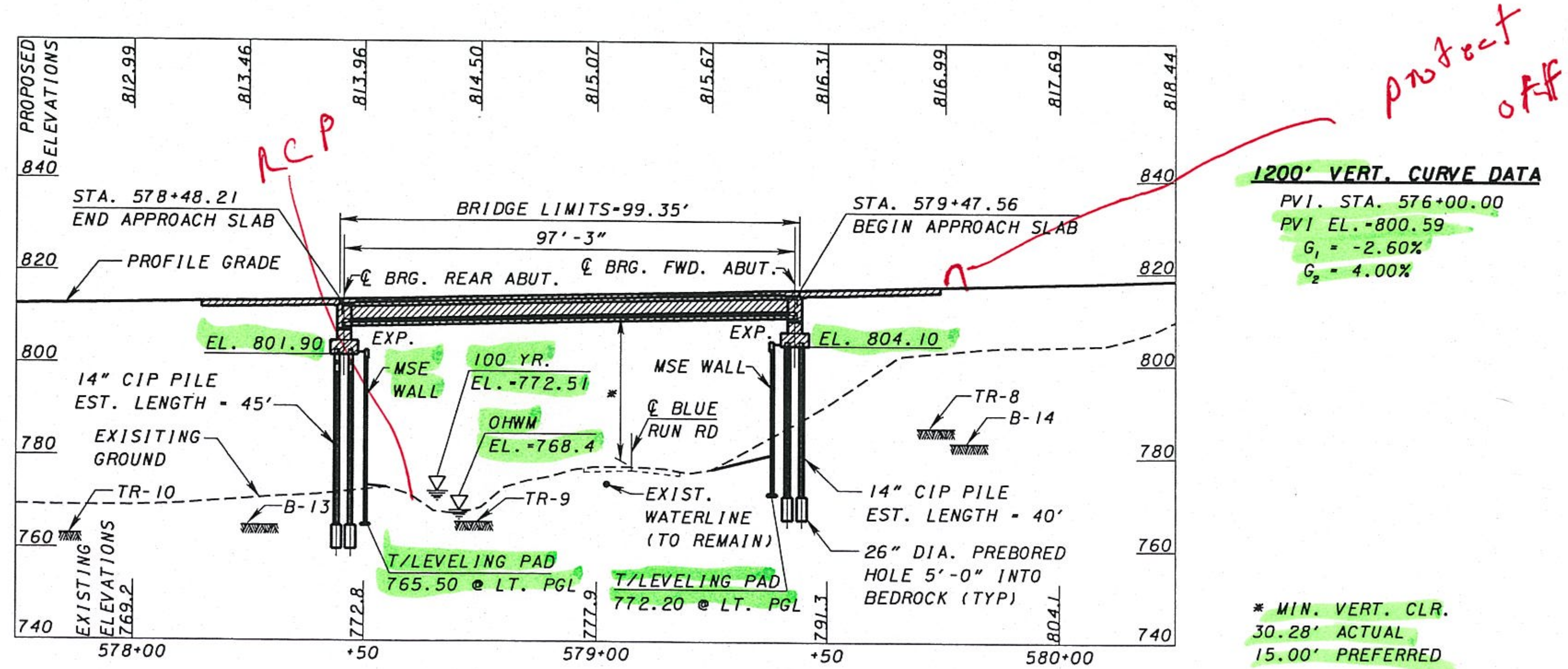
APPENDIX A

Structure Plans

TranSystems



PLAN



PROFILE ALONG PROFILE GRADE S.R. 823 LEFT BRIDGE

RCP

protect MSE from drainage off roadway during construction

1200' VERT. CURVE DATA

PVI. STA. 576+00.00
PVI EL.=800.59
G_1 = -2.60%
G_2 = 4.00%

* MIN. VERT. CLR.
30.28' ACTUAL
15.00' PREFERRED

FIRST GUARDRAIL POST OFF BRIDGE LOCATIONS

LOCATION	STATION
REAR ABUT. (NB)	578+29.33
REAR ABUT. (SB)	577+98.69
FWD. ABUT. (NB)	579+97.08
FWD. ABUT. (SB)	579+66.44

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

TRAFFIC DATA

(SR 823)
CURRENT YEAR ADT (2010) = 19,800
DESIGN YEAR ADT (2030) = 26,000
CURRENT YEAR ADTT (2010) = 2,772
DESIGN YEAR ADTT (2030) = 3,640

HYDRAULIC DATA

DRAINAGE AREA = 89.2 ACRES
Q_{50} = 132.4 cfs Q_{100} = 157.0 cfs
V_{50} = 5.7 fps V_{100} = 6.0 fps
EL_{50} = 772.26 EL_{100} = 772.51

NOTES:

1. ALL SHEETS WITH PLAN DIMENSIONS ARE SHOWN HORIZONTAL.
2. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
3. THE PROPOSED PROFILE GRADE IS WITHIN BRIDGE LIMITS. SEE ROADWAY PLANS FOR PAVEMENT ELEVATIONS BEYOND BRIDGE LIMITS.

LEGEND

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

BORING INFORMATION

No.	T/ROCK ELEV.
TR-7	807.8
TR-8	788.9
TR-9	765.8
TR-10	763.1
B-13	766.5
B-14	783.2

PROPOSED STRUCTURE

TYPE: SINGLE SPAN 60" MODIFIED AASHTO TYPE 4 PRESTRESSED CONCRETE I-BEAMS WITH COMPOSITE REINFORCED CONCRETE DECK ON SEMI-INTEGRAL ABUTMENTS AND MSE WALL SUPPORTED EMBANKMENTS.

SPAN: 97'-3" c/c BEARINGS

ROADWAY: 2 - 45'-6" TOE TO TOE OF PARAPETS

LOADING: HS-25 AND ALTERNATE MILITARY LOADING; FWS = 60 PSF

SKEW: 18°00'00" RF

CROWN: 0.016 FT/FT

ALIGNMENT: TANGENT

WEARING SURFACE: MONOLITHIC CONCRETE

APPROACH SLABS: AS-1-81 (30'-0" LONG)

LATITUDE: 82° 54' 01" N

LONGITUDE: 38° 51' 39" W

DESIGN AGENCY: TranSystems

DESIGNED: MSL | CHECKED: PJP | DRAWN: MTN | REVISED | REVIEWED: MSL | DATE: 6/9/07 | STRUCTURE FILE NUMBER: 7306563

SCIOTO COUNTY
STA. 578+48.21
STA. 579+47.56

SITE PLAN
BRIDGE NO. SCI-823-1096L
S.R. 823 OVER BLUE RUN ROAD (CR-29)

SCI-823-10.13
PID 79977

1 / 8

807 / 864

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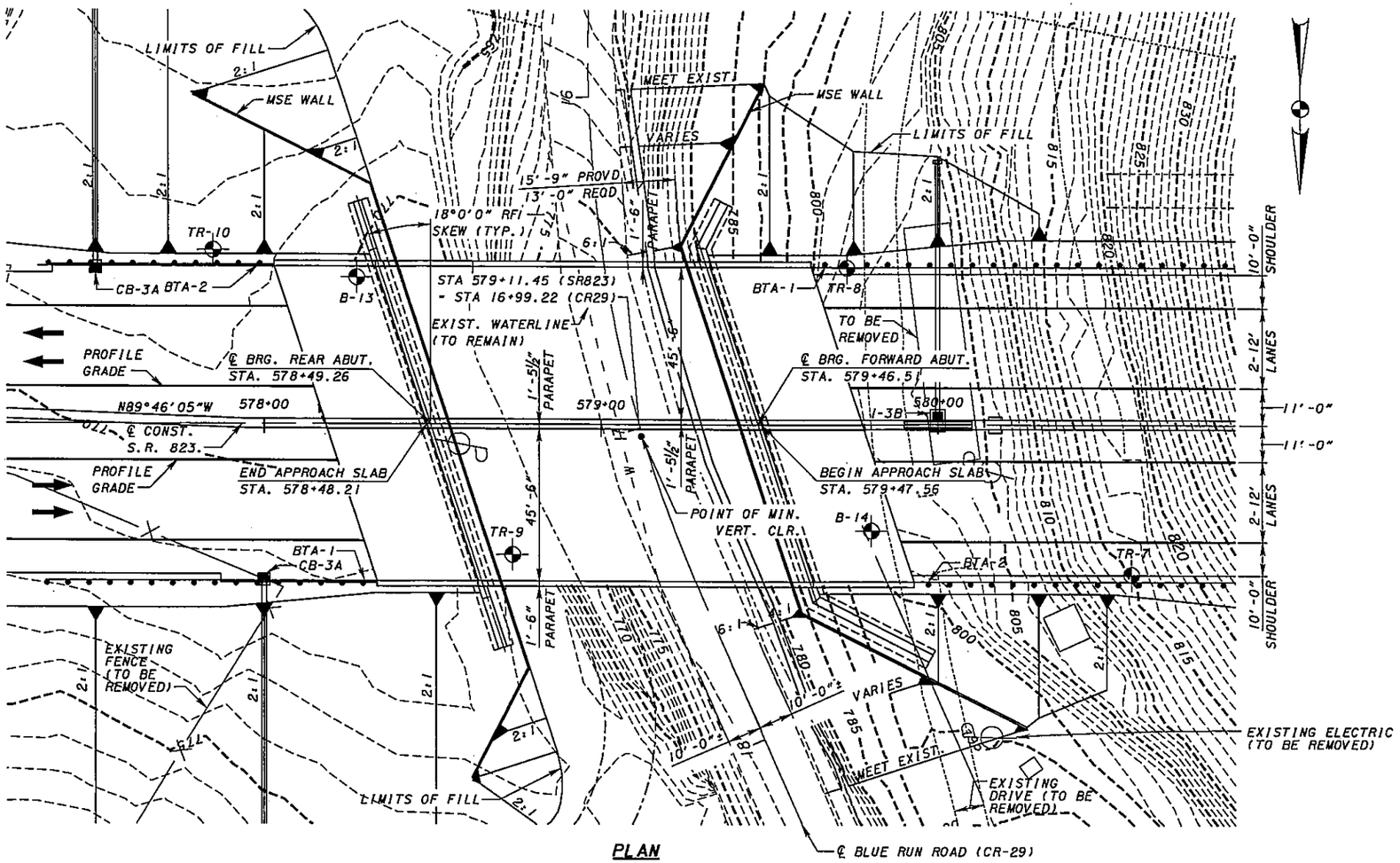
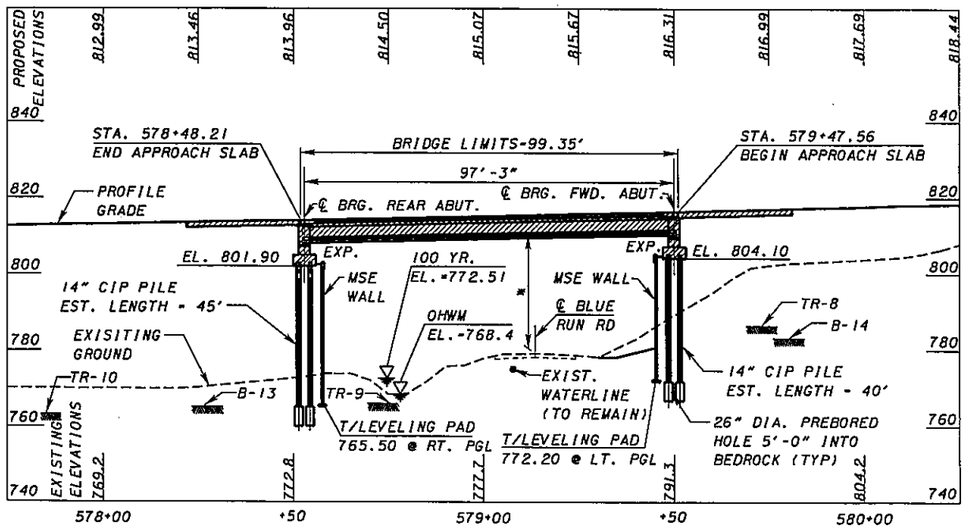


PLAN



PROFILE ALONG PROFILE GRADE S.R. 823 RIGHT BRIDGE

1200' VERT. CURVE DATA

PVI. STA. 576+00.00
PVI EL.-800.59
G_1 = -2.60%
G_2 = 4.00%

* MIN. VERT. CLR.
30.28' ACTUAL
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(TO BE PROVIDED LATER)	(TO BE PROVIDED LATER)

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NOTES:

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2. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
3. THE PROPOSED PROFILE GRADE IS WITHIN BRIDGE LIMITS. SEE ROADWAY PLANS FOR PAVEMENT ELEVATIONS BEYOND BRIDGE LIMITS.

LEGEND

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

PROPOSED STRUCTURE

TYPE: SINGLE SPAN 60" MODIFIED AASHTO TYPE 4 PRESTRESSED CONCRETE I-BEAMS WITH COMPOSITE REINFORCED CONCRETE DECK ON SEMI-INTEGRAL ABUTMENTS AND MSE WALL SUPPORTED EMBANKMENTS.

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SKEW: 18°00'00" RF

CROWN: 0.016 FT/FT

ALIGNMENT: TANGENT

WEARING SURFACE: MONOLITHIC CONCRETE

APPROACH SLABS: AS-1-81 (30'-0" LONG)

LATITUDE: 82° 54' 01" N

LONGITUDE: 38° 51' 39" W

DESIGN AGENCY: Quality Systems, 510 THIRTEEN POINT, SUITE 210, DELAWARE, OHIO 43015

DATE 6/9/07
REVIEWED MSL
STRUCTURE FILE NUMBER 7306571
DRAWN MTN
REVISED
DESIGNED MSL
CHECKED PJP

SCIOTO COUNTY
STA. 578+48.21
STA. 579+47.56

SITE PLAN
BRIDGE NO. SCI-823-1096R
S.R. 823 OVER BLUE RUN ROAD (CR-29)

SCI-823-10.13
PID 79977

2 / 8

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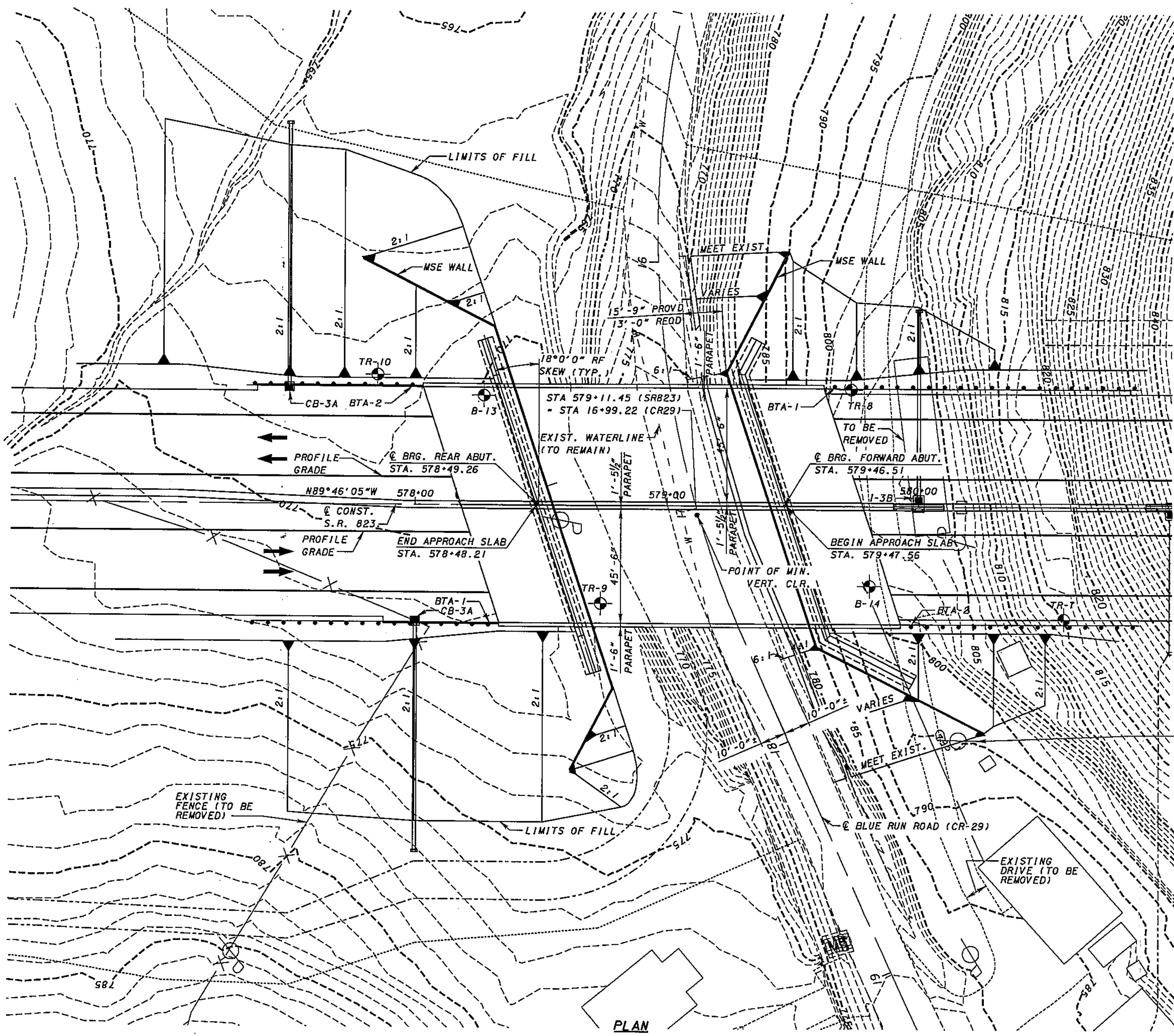

LEGEND

- ⊕ 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
MSL	MTN	MSL	6/9/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
PJP		7306563	

SCIOTO COUNTY STA. 578+48.21 STA. 579+47.56

GENERAL PLAN

BRIDGE NO. SCI-823-1096L

S.R. 823 OVER BLUE RUN ROAD (CR-29)

SCI-823-10.13 PID 79977

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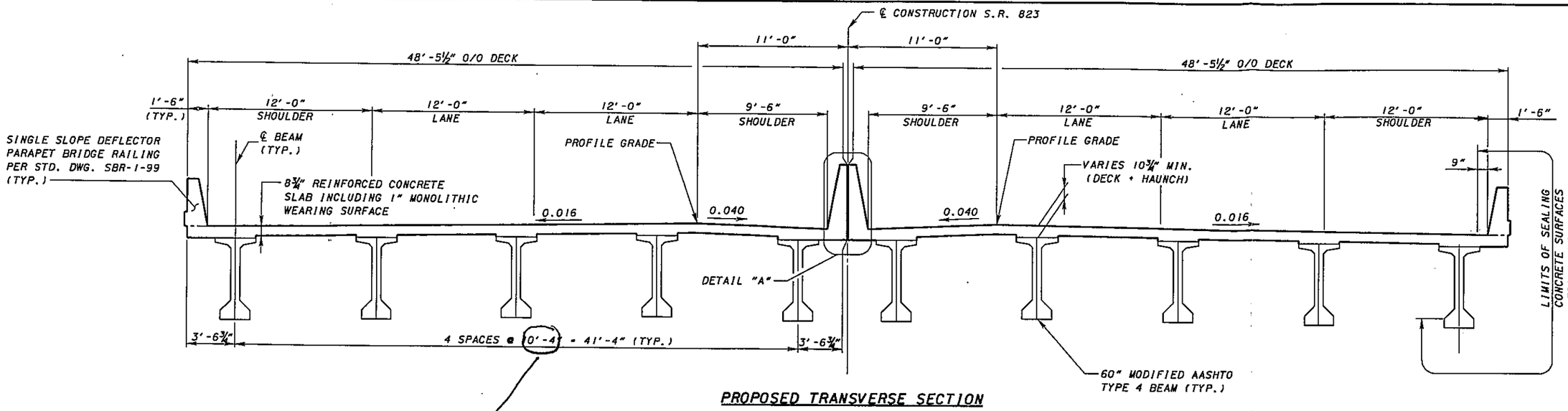
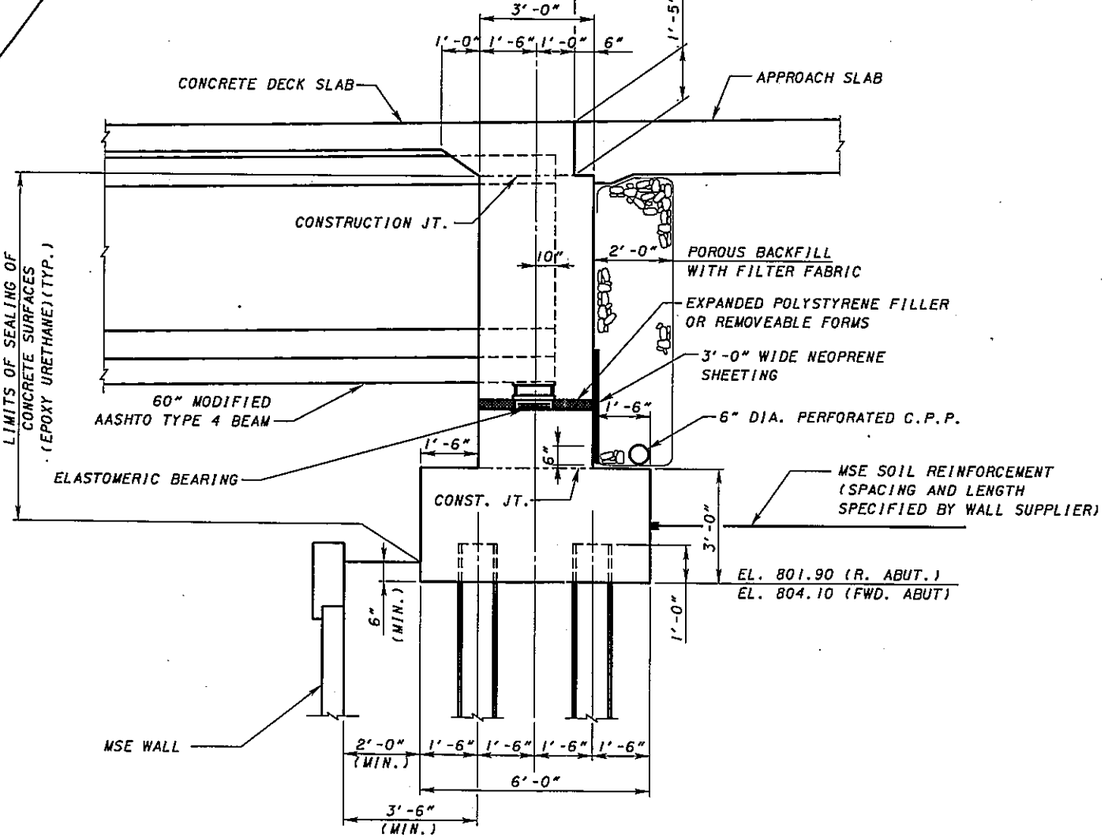
809/864

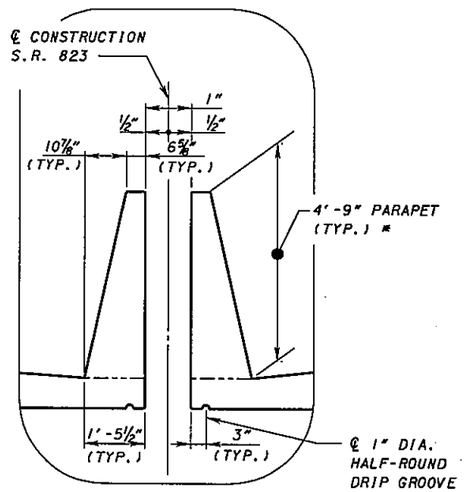


PROPOSED TRANSVERSE SECTION

SUPERSTRUCTURE DEPTH	
ITEM	60" MODIFIED AASHTO TYPE 4 BEAM
SLAB (INCLUDING WEARING SURFACE)	8¾"
HAUNCH (BOTTOM OF SLAB TO TOP OF GIRDER)	2"
GIRDER DEPTH	60"
TOP OF WEARING SURFACE TO BOTTOM OF GIRDER FLANGE (INCH)	70.75"
TOP OF WEARING SURFACE TO BOTTOM OF GIRDER FLANGE (FEET)	5.896'



TYPICAL ABUTMENT SECTION



DETAIL "A"
(NOT SHOWN TO SCALE)

* PARAPETS ARE SIMILAR TO ROADWAY CONCRETE MEDIAN BARRIER

DESIGN AGENCY: Trans Systems, 5151 FLATIRON PKWY., SUITE 100, BOULDER, COLORADO 80301

DESIGNED MSL	DRAWN CAS	REVIEWED MSL	DATE 6/9/07
CHECKED PJP	REVISED		STRUCTURE FILE NUMBER 7306563L, 7306571R

TYPICAL TRANSVERSE & ABUTMENT SECTION
BRIDGE NO. SCI-823-1096 L&R
S.R. 823 OVER BLUE RUN ROAD (CR-29)

SCI-823-10.13
PID 79977

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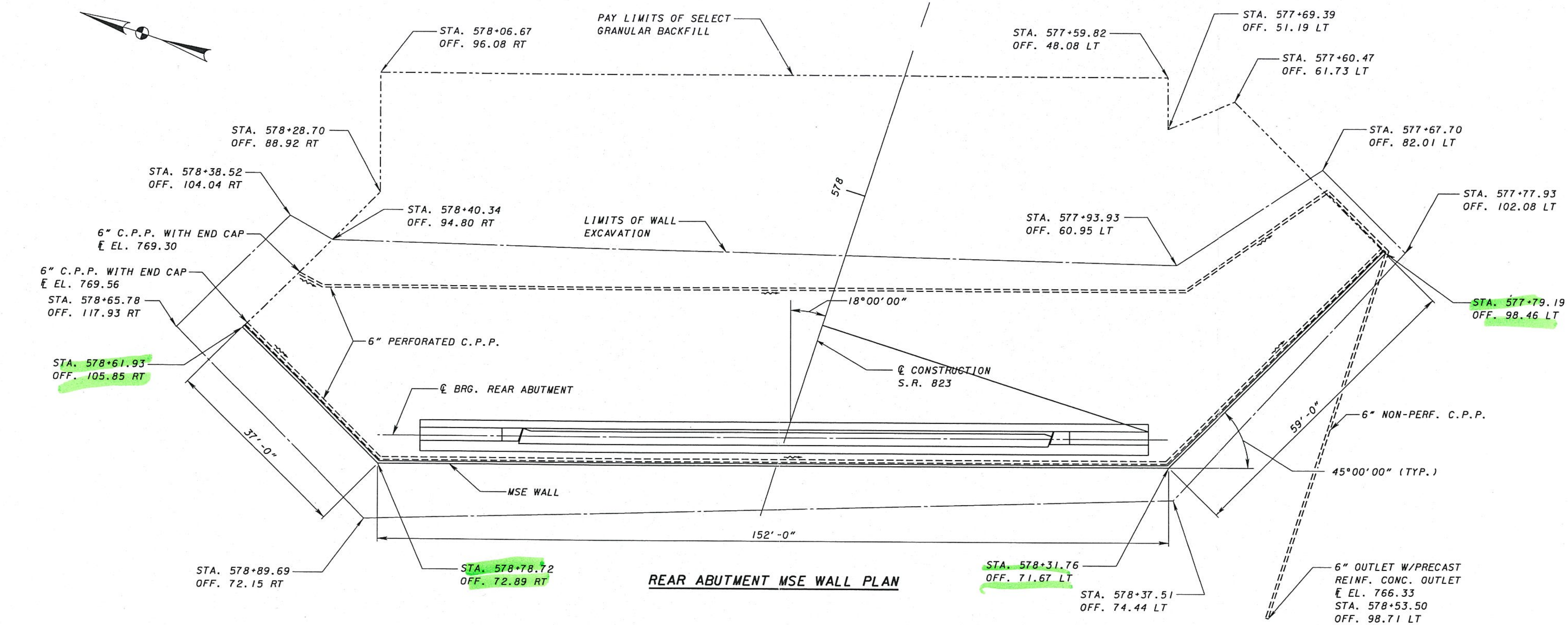
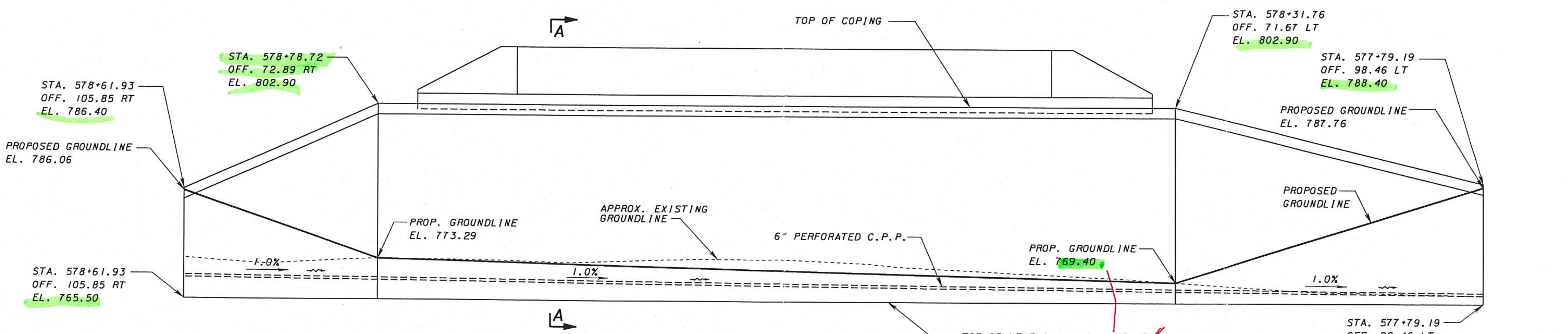


REAR ABUTMENT MSE WALL PLAN



REAR ABUTMENT MSE WALL ELEVATION

NOTES:

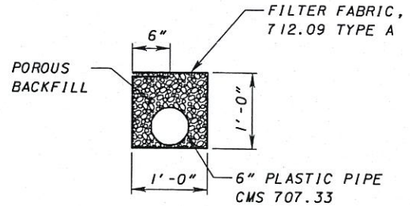
1. WALL LOCATIONS GIVEN TO FRONT FACE OF MSE WALL PANELS
2. WALL ELEVATIONS GIVEN TO TOP OF LEVELING PAD AND TOP OF WALL
3. SEE SHEET 5/7 FOR SECTION A-A

DESIGN AGENCY: TranSystems

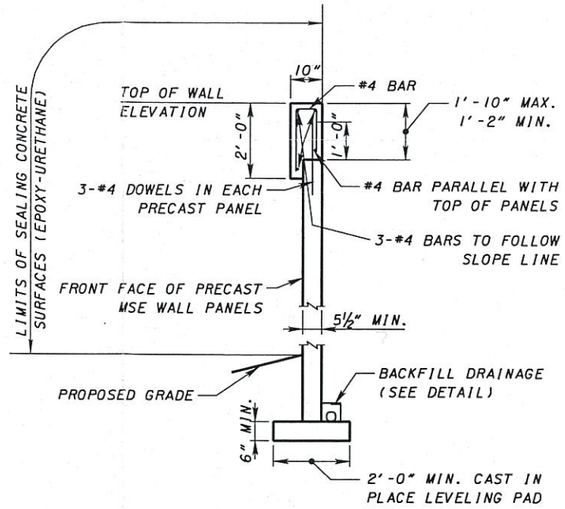
DESIGNED	CHECKED	DRAWN	REVISED	REVIEWED	DATE	STRUCTURE FILE NUMBER
MTN	PJP	MTN		MSL	6/9/07	7306563L, 7306571R

REAR ABUT. MSE WALL PLAN & ELEVATION
BRIDGE NO. SCI-823-1096 L&R
S.R. 823 OVER BLUE RUN ROAD (CR-29)

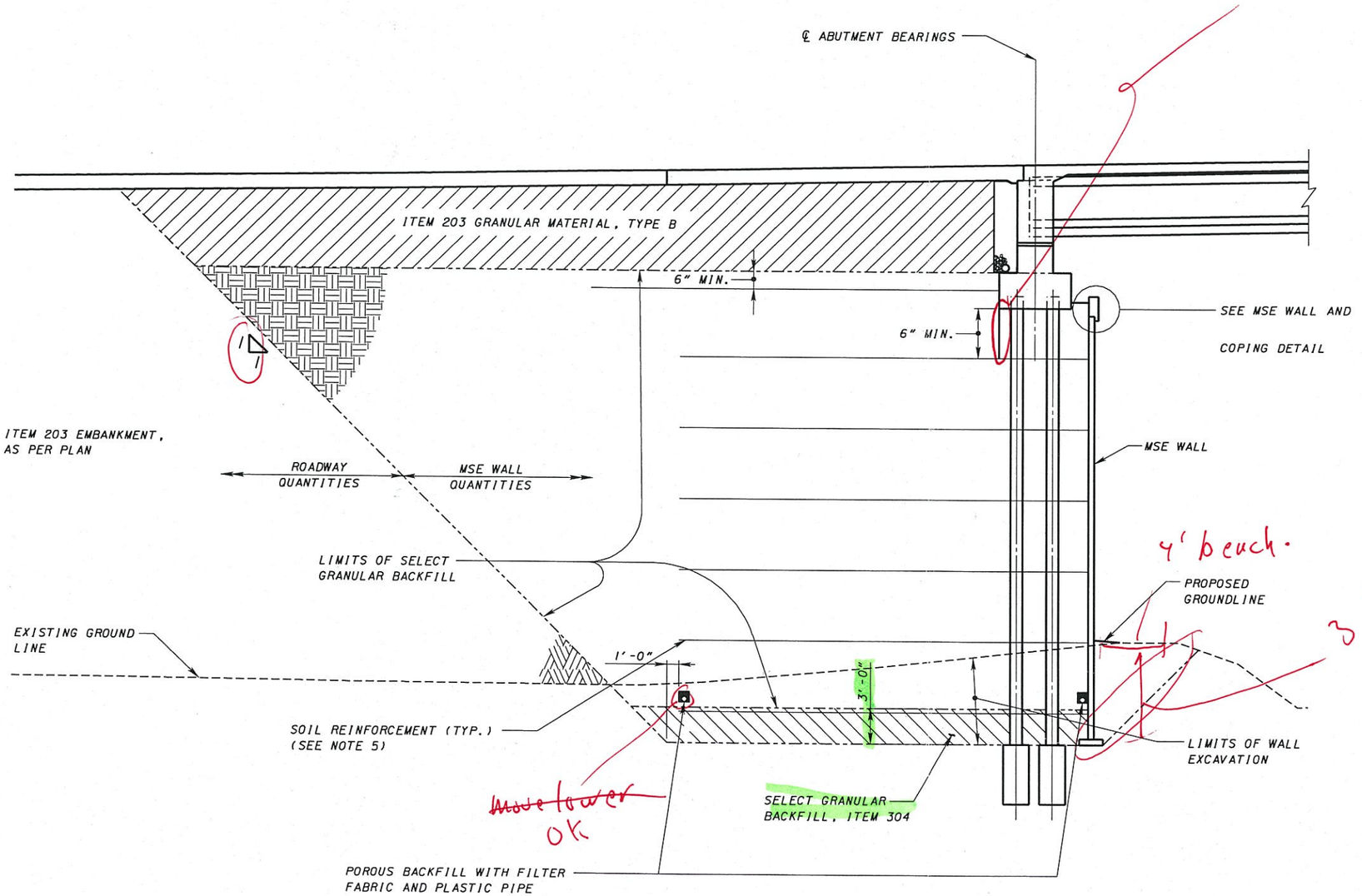
SCI-823-10.13
PID 79977



BACKFILL DRAINAGE DETAIL



MSE WALL AND COPING DETAIL



SECTION A-A

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. WALL EXCAVATION SHALL EXTEND TO A LEVEL BEDROCK SURFACE. EXCAVATION BELOW THE BOTTOM OF THE LEVELING PAD IS NOT REQUIRED IF COMPETENT BEDROCK IS ENCOUNTERED. THE DEPARTMENT WILL APPROVE WALL EXCAVATION PRIOR TO FOUNDATION PREPARATION
5. PROPRIETARY RETAINING WALL DATA: THE PROPRIETARY WALL SUPPLIER SHALL DESIGN THE INTERNAL STABILITY OF A MECHANICALLY STABALIZED EARTH (MSE) WALL IN ACCORDANCE WITH THE SPECIAL PROVISIONS TO SUPPORT THE ABUTMENT. THE DESIGN FOR INTERNAL STABILITY SHALL INCLUDE AN UNFACTORED HORIZONTAL STRIP LOAD FROM THE SUPERSTRUCTURE OF _____ K/FT APPLIED PERPENDICULAR TO THE FACE OF WALL AT THE BASE OF THE CONCRETE FOOTING.

DESIGN AGENCY
Tran Systems
TRANSYSTEMS CORPORATION
700 EAST PETE ROSE WAY, SUITE 300
CINCINNATI, OHIO 45202

DESIGNED	DRAWN	REVIEWED	DATE
MTN	DJR	MSL	6/9/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
PJP		7306563L, 7306571R	

REAR ABUT. MSE WALL DETAILS
BRIDGE NO. SCI-823-1096 L&R
S.R. 823 OVER BLUE RUN ROAD (CR-29)

SCI-823-10.13
PID 79977

6 / 8

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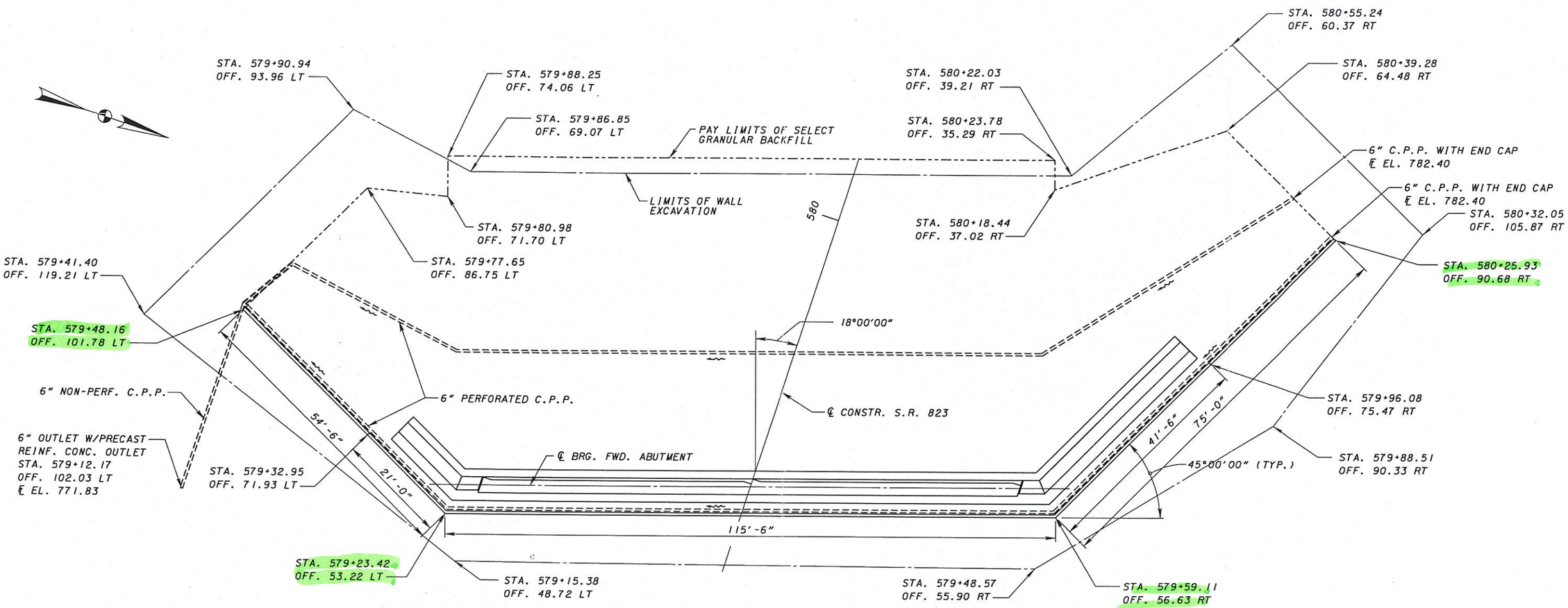
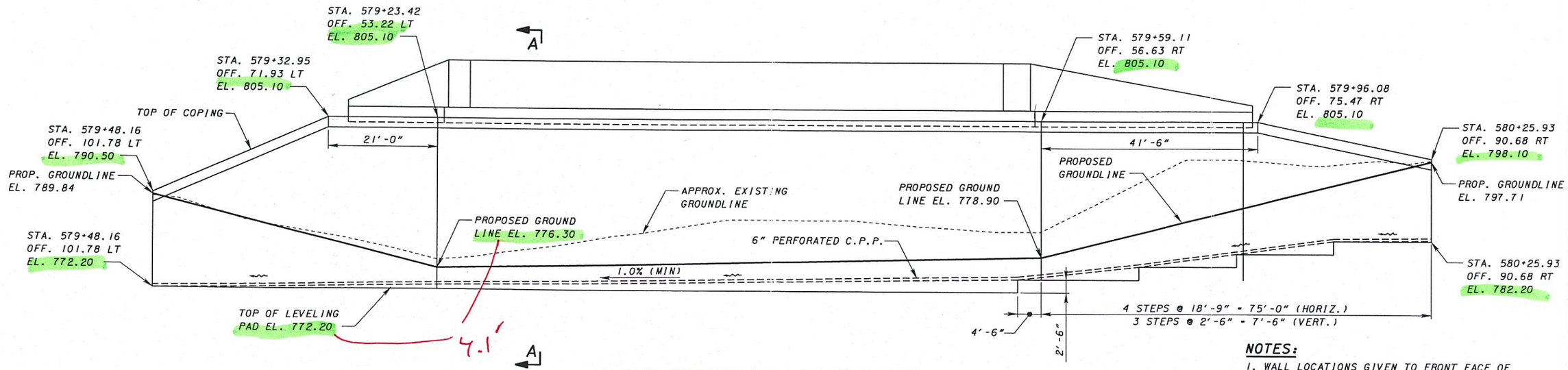


FORWARD ABUTMENT MSE WALL PLAN



FORWARD ABUTMENT MSE WALL ELEVATION

NOTES:

1. WALL LOCATIONS GIVEN TO FRONT FACE OF MSE WALL PANELS
2. WALL ELEVATIONS GIVEN TO TOP OF LEVELING PAD AND TOP OF WALL
3. SEE SHT. 7/7 FOR SECTION A-A

DESIGN AGENCY: TranSystems, 5101 PENNETT DRIVE, SUITE 210, ORTLN, OHIO 43017

DESIGNED	DRAWN	REVISED	DATE
MTN	MTN	MSL	6/9/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
PJP		7306563L, 7306571R	

FWD. ABUT. MSE WALL PLAN & ELEVATION
BRIDGE NO. SCI-823-1096 L&R
S.R. 823 OVER BLUE RUN ROAD (CR-29)

SCI-823-10.13
PID 79977

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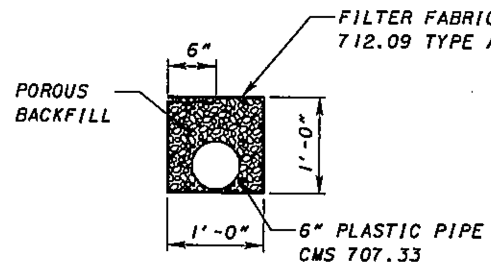
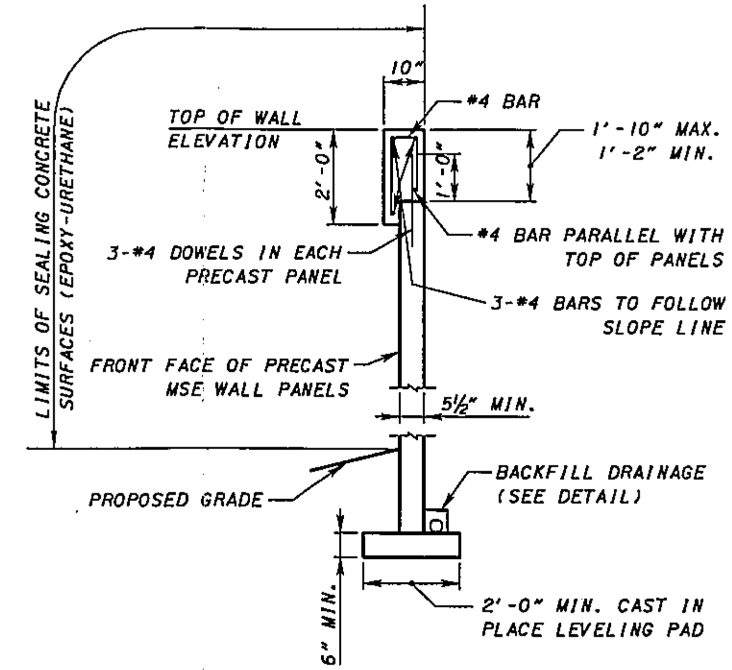
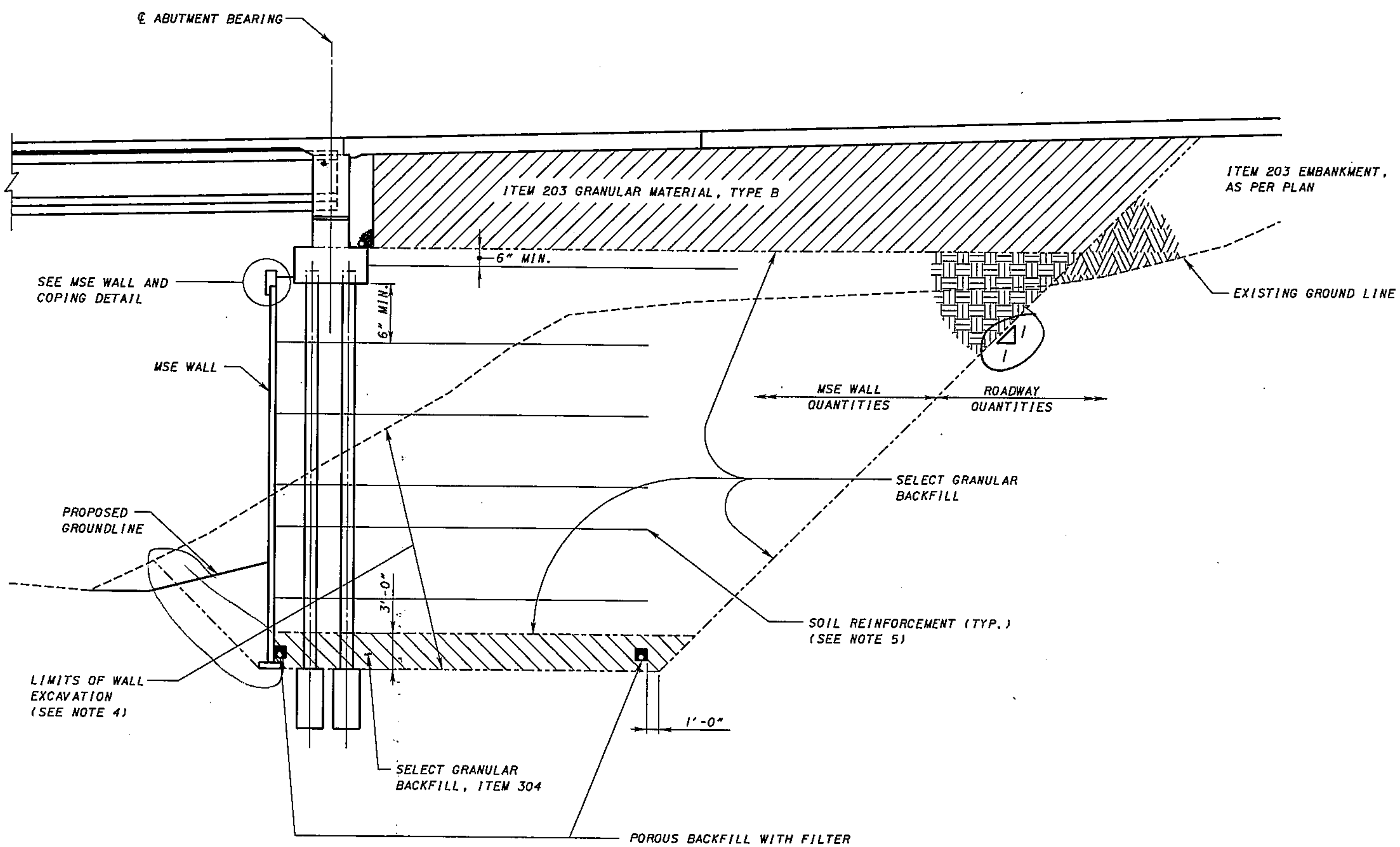


BACKFILL DRAINAGE DETAIL



MSE WALL AND COPING DETAIL



SECTION A-A

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. WALL EXCAVATION SHALL EXTEND TO A LEVEL BEDROCK SURFACE. EXCAVATION BELOW THE BOTTOM OF THE LEVELING PAD IS NOT REQUIRED IF COMPETENT BEDROCK IS ENCOUNTERED. THE DEPARTMENT WILL APPROVE WALL EXCAVATION PRIOR TO FOUNDATION PREPARATION
5. PROPRIETARY RETAINING WALL DATA:
THE PROPRIETARY WALL SUPPLIER SHALL DESIGN THE INTERNAL STABILITY OF A MECHANICALLY STABALIZED EARTH (MSE) WALL IN ACCORDANCE WITH THE SPECIAL PROVISIONS TO SUPPORT THE ABUTMENT. THE DESIGN FOR INTERNAL STABILITY SHALL INCLUDE AN UNFACTORED HORIZONTAL STRIP LOAD FROM THE SUPERSTRUCTURE OF ______ K/FT APPLIED PERPENDICULAR TO THE FACE OF WALL AT THE BASE OF THE CONCRETE FOOTING.

FWD. ABUT. MSE WALL DETAILS
BRIDGE NO. SCI-823-1096 L&R
S.R. 823 OVER BLUE RUN ROAD (CR-29)

DESIGN AGENCY: TranSystems
DESIGNED MTN | CHECKED PJP | DRAWN MTN | REVISED | REVIEWED MSL | DATE 6/9/07
STRUCTURE FILE NUMBER 7306563L, 7306571R

SCI-823-10.13
PID 79977

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APPENDIX B

Structure Cost Estimate

TranSystems

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Blue Run L/R

STRUCTURE TYPE STUDY

By: pjp
Checked:

Date: 6/7/2007
Date:

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 Cost	Life Cycle Maintenance Cost	Total Relative Ownership Cost
4	1	97.25	97.25	5 Prestressed I-Girders /per BRIDGE	Modified AASHTO Type 4 (60")	**$841,000**	**$1,304,000**	**$343,200**	**$0**	**$2,490,000**	**$0**	**$2,490,000**

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 Blue Run L/R

STRUCTURE TYPE STUDY - PRESTRESSED CONCRETE GIRDER ALTERNATIVE 4 - SUPERSTRUCTURE

By: PJP Date: 6/7/2007
Checked: Date:

SUPERSTRUCTURE

Alternative No.	Span Arrangement No. Spans	Lengths	Total Span Length (ft.)	Deck Length (ft.)	Deck Volume * (cu. yd.)	Deck Concrete Cost	Deck Reinforcing Cost	Approach Slab Cost	Framing Alternative	Proposed Girder Section	Concrete Girder Cost	Subtotal Superstructure Cost	Construction Complexity Factor	Subtotal Superstructure Cost
4	1	97.25	97.25	99.25	518	$285,100	$131,500	$128,100	5 Prestressed I-Girders /per BRIDGE	Modified AASHTO Type 4 (60")	$296,300	$841,000	0%	**$841,000**

* Includes Diaphragm Concrete

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	0.73	48.50	35.4	3.5	47.9
Right Bridge	0.73	48.50	35.4	3.5	47.9

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 =			$550.00

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.	0	$0
Abutment Diaphragms	$1,200 ea.	5.0%	$1,320 ea.	0	$0
Intermediate Diaphragms	$905 ea.	5.0%	$1,000 ea.	24	$24,000
Modified Type 4 I-Beams (60")	$250 per ft.	5.0%	$280 ea.	972.5	$272,300
				TOTAL =	**$296,300**

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 = 98 ft
Area = 327 sq. yd.

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

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

	Cost Ratio	Year 2004	Annual Escalation	Year 2007

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Blue Run L/R

STRUCTURE TYPE STUDY - PRESTRESSED CONCRETE GIRDER ALTERNATIVE 4 - SUBSTRUCTURE

By: pjp
Checked:

Date: 6/7/2007
Date:

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	Earthwotk Cost	Subtotal Substructure Cost
4	1	97.25	5 Prestressed I-Girders /per BRIDGE	Modified AASHTO Type 4 (60")	$0	$0	$132,400	$22,900	$155,900	$868,500	$75,000	$49,000	**$1,304,000**

COST SUPPORT CALCULATIONS

Pier QC/QA Concrete, Class QSC1 Cost: (HP-Pile)

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

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 Cost					$0

Abutment QC/QA Concrete, Class QSC1 Cost:

Component	Volume (cu. yd.)	Year 2005	Annual Escalation	Year 2007	Total Cost
Abutment Including Wingwalls	286	$420.00	5.0%	$463.00	$132,400

Excavation and Embankment Costs:

Component	Quantity	Year 2005	Annual Escalation	Year 2007	Total Cost
Embankment	0	$7.00	5.0%	$7.72	$0
Excavation	7400	$6.00	5.0%	$6.62	$49,000
Wick Drains	0	$1.00	5.0%	$1.10	$0

Note: Structure Excavation included in contingency esimates.

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.): *14" DIA. CIP Piles, Furnished & Driven*

Number of Piles		Total Pile Length
88	SEE QUANTITY CALCULATIONS	3,720

Pile Foundation Unit Cost ($/ft.):

	Year 2005 Unit Cost	Annual Escalation	Year 2007
Furnished	$25.00	5.0%	$27.60
Driven	$13.00	5.0%	$14.30
Total			$41.90

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

	Number of Shafts		Total Shaft Length
Alt. 4	0	SEE QUANTITY CALCULATIONS	0

Shaft Foundation Unit Cost ($/ft.):

Year 2005 Unit Cost	Annual Escalation	Year 2007
$125.00	5.0%	$138.00

Cost of Shafts: $ -

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

Alternative No.	Total Area (sq. ft.)	Year 2005 Unit Cost	Annual Escalation	Year 2007
4	15,762	$50.00	5.0%	$55.10

MSE Abutment Undercut Cost:

Alternative No.	Total Area (sq. ft.)	Depth (ft.)	Volume (cu. yd.)	Year 2005 Unit Cost	Annual Escalation	Year 2007
4	0	0.00	0	$55.00	5.0%	$60.60

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

	Temp. Shoring Area (sq. ft.)	Temp. Girder Support (lump sum)
Alt. 4	0	$ -

	Year 2004 Unit Cost	Annual Escalation	Year 2007
Temporary Shoring	$22.50	5.0%	$31.70
Coffardam	$32.00	5.0%	$37.00

Additional Crane Cost

$ 75,000

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Blue Run L/R

STRUCTURE TYPE STUDY - PRESTRESSED CONCRETE ALTERNATIVE 4 - QUANTITY CALCULATIONS

By: pjp
Checked:

Date: 6/7/2007
Date:

Pier Quantities

Pier Loca	Length	Cap				Stem				Footing				Total Volu
		Width	*Depth*	*Area*	*Volume*	*Width*	*Height*	*Length*	*Volume*	*Width*	*Depth*	*Length*	*Volume*	
Pier 1 (Spr Ftg)				0.00	0				0				0	0
Pier 2 (Spr Ftg)				0.00	0				0				0	0
Pier 3														0
Pier 4														0
Pier 5														0
Pier 6														0
Pier 7														0
Total (Cu.Ft.)					**0**				**0**				**0**	**0**
Total (Cu.Yd.)					**0**				**0**				**0**	**0**
			Qty x 2 (L/R)		**0**				**0**				**0**	**0**

Pile Quantities

Location	Load/girder (Kips)	# Girders	Total Girder	Subst Wt (kips)	Pile Cap.(Kips	No. Piles	Increase Factor	Total Piles	Top Elev.	Bot Elev.	Pile Length	Total Pile Length
Rear Abut.	0	0	0	0	140	0	1	*40*	802.9	760.0	45.0	*1800*
Pier 1	0	0	0	0	140	0	1	*0*	0	0	2.0	*0*
Pier 2	0	0	0	0	140	0	1	*0*	0	0	2.0	*0*
Pier 3	0	0	0	0	140	0	1	*0*	0	0	2.0	*0*
Pier 4	0	0	0	0	140	0	1	*0*	0	0	2.0	*0*
Pier 5	0	0	0	0	140	0	1	*0*	0	0	2.0	*0*
Pier 6	0	0	0	0	140	0	1	*0*	0	0	2.0	*0*
Pier 7	0	0	0	0	140	0	1	*0*	0	0	2.0	*0*
Fwd. Abut.	0	0	0	0	140	0	1	*48*	805.1	766.7	40.0	*1920*
TotaL								**88**				**3720**
							Total	**88**				**3720**

Abutment Quantities*

Abut Loca	Length (feet)	Backwall				Beam Seat				Footing					Total Volu
		Width	*Depth*	*Area*	*Volume*	*Width*	*Height*	*Area*	*Volume*	*Width*	*Depth*	*Area*	*# Footing*	*Volume*	
Rear Abut	0	0	0	0.00	0	0	0	0.00	0	0	3	0	1	0	0
Fwd. Abut	0	0	0	0.00	0	0	0	0.00	0	0	3	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**	**286**

*** Includes Wingwalls**

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
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	2.0	*0*
Pier 2	0	0	0	0	0	0	1	*0*	0	0	2.0	*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	Total Length	Spacing Int.	No. of Int in span	Number of Int Diap.	Total No. 1 in Span
Span 1	DD TYPE 4	10	97	973	24.31	8	3	24
Span 2		0	0	0	0.00			0
Span 3		0	0	0	0.00			0
Span 4		0	0	0	0.00			0
Span 5		0	0	0	0.00			0
Span 6		0	0	0	0.00			0
Span 7		0	0	0	0.00			0
Span 8		0	0	0	0.00			0
Span 9		0	0	0	0.00			0
					Total			24
Total	**DD TYPE 4**	**10**		**973**				

APPENDIX C

Hydraulic Report

TranSystems

SCI-823-10.31

PID No. 79977

S.R. 823 over Blue Run Road

Hydraulic Report

Submitted: February 22, 2008

TranSystems

Table of Contents

TranSystems

HYDRAULIC NARRATIVE

TranSystems

Project Description

TranSystems Corporation is providing engineering services to the Ohio Department of Transportation (ODOT) for the design of 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. The roadway design will carry the proposed S.R. 823 bypass over Blue Run Road (CR 29) and the blue line stream that runs along the west side of Blue Run Road. As part of the project new left and right overpass structures are currently designed to rest on Mechanically Stabilized Earth (MSE) walls. As requested by the Scope of Services, a hydraulic report is to be submitted before any plan development. The purpose of this report is to investigate the hydraulic impacts of the proposed crossing and the effects, if any, of the location of the MSE walls.

Design Criteria

The design year storm was selected as the 50 year as per the ODOT criteria. The 100 year storm was modeled as a check to show existing flooding. The proposed crossing is not in a Federal Emergency Management (FEMA) regulated flood plain. Therefore, the proposed crossing will not be required to meet the requirements of the National Flood Insurance Program (NFIP). The proposed bridge structure rests on bedrock with the channel at essentially the bedrock elevation. Since the bedrock is at such close proximity to the surface, scour will not be investigated for the proposed structure as per ODOT Bridge Design Manual, Section 203.3.

Structure Hydraulics

Hydraulics for the structure was calculated using HEC-RAS ver. 3.1.3. The main channel is considered woody and straight with the channel following the curves of the Blue Run Road. Looking downstream the left bank is a small floodplain with a vegetation cover of brush and trees along the channel. Adjacent the channel is grass leading up to a hill side. The right side of the channel is the roadway embankment for Blue Run Road. This study used manning numbers of 0.042 for the channel and 0.049 to 0.059 for the overbank locations outside of the bridge cross sections. The drainage area was obtained from USGS 7.5 minute Quad Maps. Within the drainage area is an existing pond of approximately 0.89 acres or 1% of the total drainage area. Per the U.S.G.S. Water Resources Investigations Resource Report 89-4126 which was used to calculate the runoff, this pond meets the qualifications for the minimum size to be accounted for in the runoff calculations. The post development conditions will leave the pond in place thus preserving the amount of existing storage capacity for this drainage area. Starting conditions for the HEC-RAS model used a normal depth set to balance the energy gradient.

Looking downstream, the existing ditch located on the right side (west side) of Blue Run Road under and near the proposed bridge drains against the grade of the road, thus limiting the amount of water the ditch can carry. It appears from field inspection that any water entering the ditch does not drain away until it reaches an elevation of 779.3. From the field survey this elevation is approximately 5 inches higher than the lowest point of the ditch. Consideration of these factors led to the right side ditch for River Stations 2900 and 2851 being modeled as an ineffective drainage area.

The existing HEC-RAS model is project 578+00 and plan 578+00. The proposed HEC-RAS model is plan MSE_57800 and geometry MSE_57800. Both existing and proposed models have the same Steady Flow (578+00). Both models are run under the 578+00 project file.

TranSystems

FLOOD HAZARD EVALUATION

TranSystems

Flood Hazard Evaluation

The MSE walls are being placed well outside the main channel of the creek, and have no significant impact on the existing water surface elevations. These results have been compiled into Table-1. The closest residential structures are over four feet above the roadway per the detail contours as shown on the Supplemental Site Plan. The model of the existing conditions shows the stream crossing the driveways at River Stations (R.S.) 3193, 3113 and 2571 for both the 50 year and 100 year storm. The model of the proposed conditions shows the stream crossing the driveways at River Stations (R.S.) 3180, 3050, 2523 and 2506 for both the 50 year and 100 year storm. The houses that connect to these driveways are well above the Water Surface Elevations (WSE). Looking at the elevations of these houses from the detailed contour maps, no Flood Hazard exists during the existing conditions or the proposed conditions for the houses in this area.

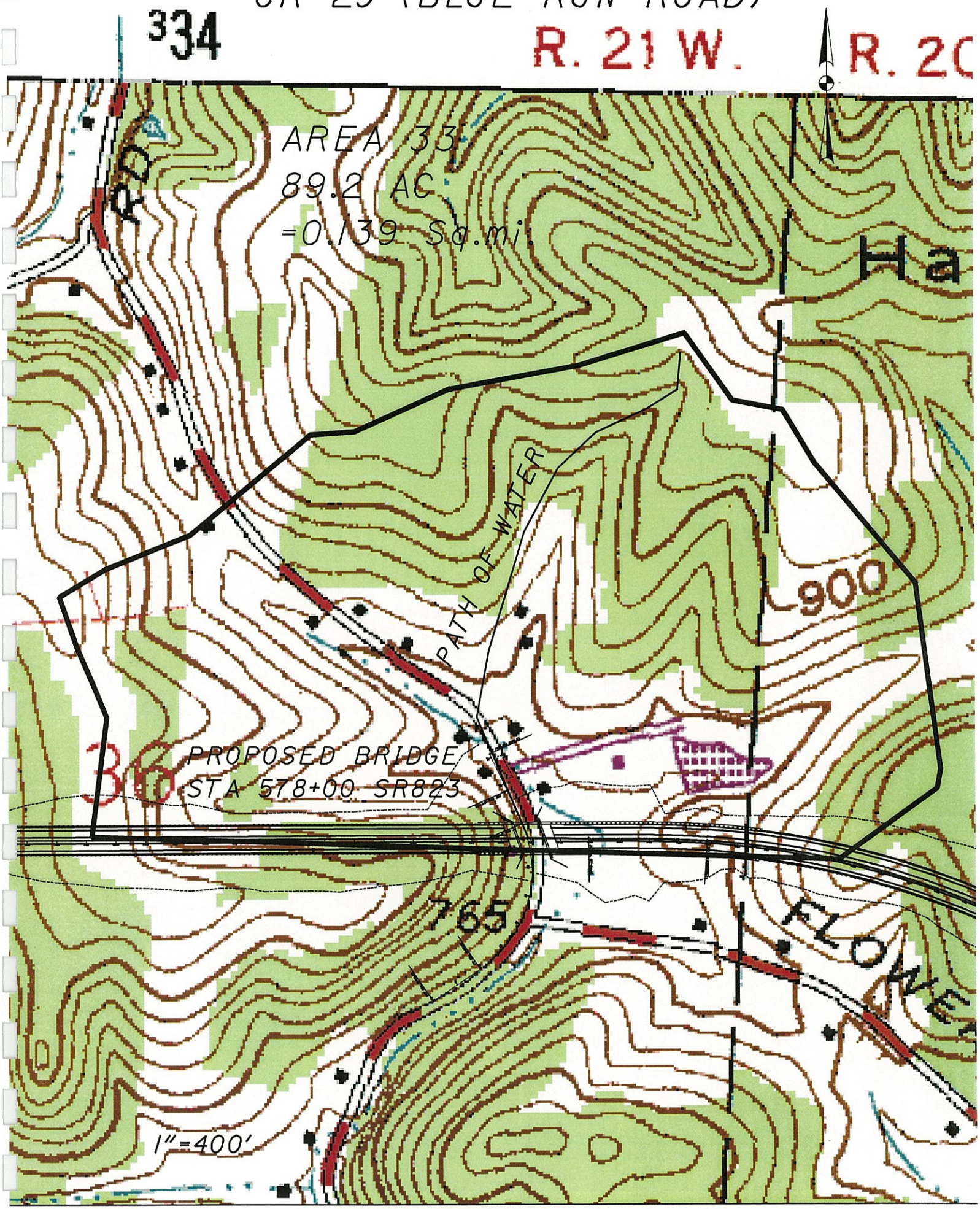
Table-1 Hydraulic Results

	Existing Conditions 50 year	Proposed Conditions 50 Year	Existing Conditions 100 Year	Proposed Conditions 100 Year
Q	132.4 cfs	132.4 cfs	157.0 cfs	157.0 cfs
V	6.7fps	5.7fps	7.0 fps	6.0fps
WSE	771.99	772.26	772.21	772.51

TranSystems

DRAINAGE AREA

TranSystems


CR 29 (BLUE RUN ROAD)
334
R. 21 W.
R. 20
AREA 33
89.2 AC
=0.139 Sq.mi.
Ha
PATH OF WATER
900
36
PROPOSED BRIDGE
STA 578+00 SR823
765
FLOWE
1"=400'

RUNOFF CALCULATION

TranSystems

TECHNIQUES FOR ESTIMATING FLOOD-PEAK DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A

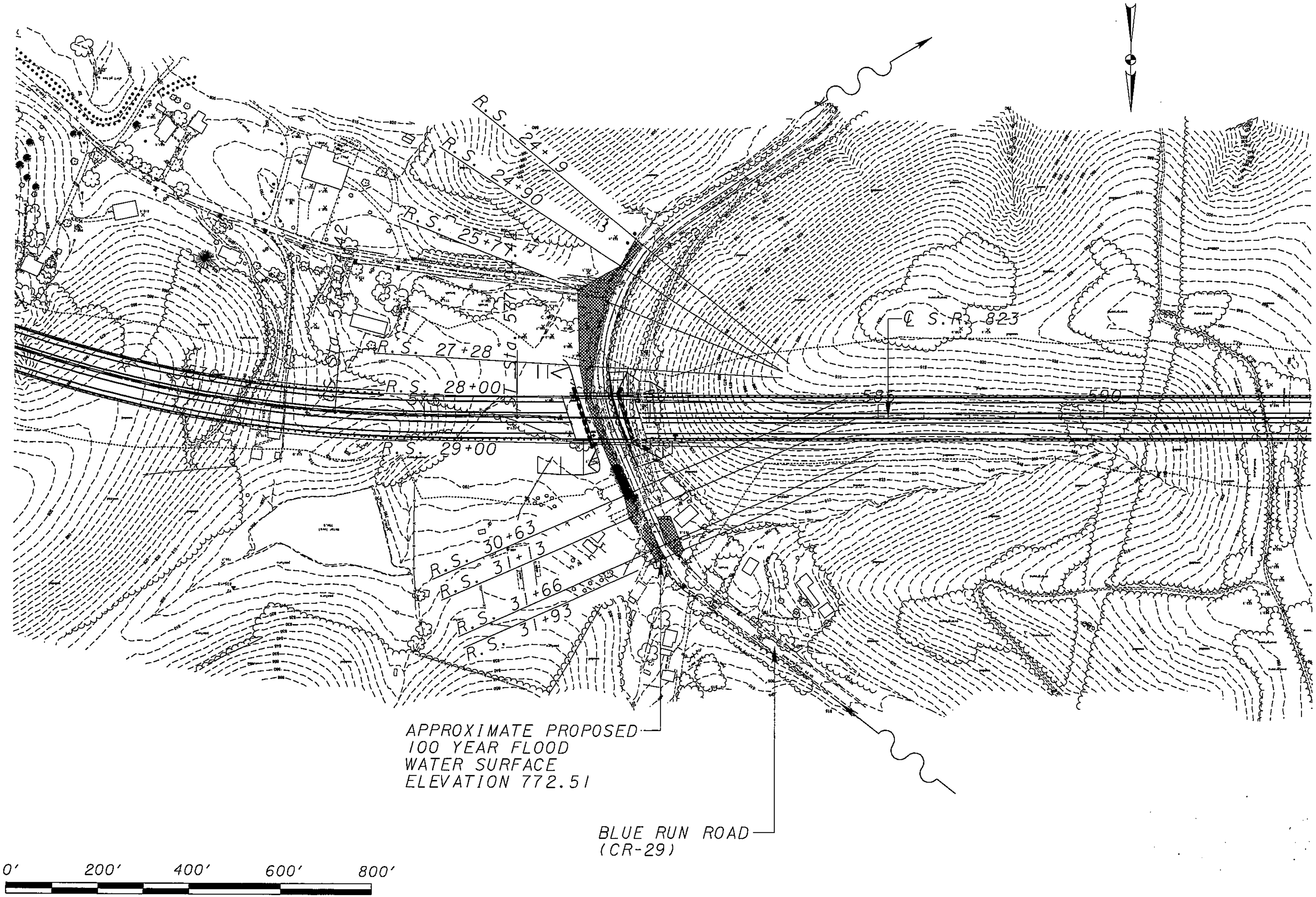
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
3884462.70	SQ. FT.	
0.139	SQ. MI.	**CONTDA** = Contributing Drainage Area
38676.60	SQ. FT.	
1.00	%	**STORAGE** = Storage Area
1985.00	FT.	**TOTAL CHANNEL LENGTH**
198.50	FT.	L_{10} = 10% of the Distance along channel
774	FT.	$Elev_{10}$ = Elevation at point L_{10}
1687.25	FT.	L_{85} = 85% of the Distance along channel
876	FT.	$Elev_{85}$ = Elevation at point L_{85}
1488.75	FT.	**Length** = $L_{85} - L_{10}$
361.75	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	**26.95**	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	**54.63**	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	**77.06**	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	**107.49**	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	**132.41**	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	**156.98**	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

SUPPLEMENTAL SITE PLAN

TranSystems



SUPPLEMENTAL SITE PLAN

BRIDGE NO. SCI-823-1096

SR 823 OVER CR-29 AND TRIB. BLUE RUN CREEK

SCIOTO CO

STA. 578+00

DESIGNED	DRAWN	REVIEWED	DATE
HJS	MSW	PJP	2/7/2007
CHECKED	REVISED	STRUCTURE FILE NUMBER	

DESIGN AGENCY

TranSystems

5747 PERIMETER DRIVE, SUITE 240 DUBLIN, OHIO 43017

SCI-823-10.31

PID 79977

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8:49:12 AM 7/23/2007 g:\C003\0064\Bridge\CN\BTS\13-CR29(BlueRun)\TS&L\823_1096ssp00l.dgn

CHANNEL PHOTOGRAPHS

TranSystems

Looking Back Station Across the Existing Stream at the Proposed Bridge

Upstream of the Proposed Bridge, Looking Downstream

TranSystems

HYDRAULIC CALCULATIONS

FOR

THE EXISTING CHANNEL

TranSystems

HEC-RAS Plan: Blue Run River: Blue Run Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3193	50 Year	132.40	777.89	781.66	780.71	781.79	0.003970	3.12	55.47	49.81	0.41
Reach-1	3193	100 Year	157.00	777.89	781.78	780.94	781.92	0.004409	3.39	61.42	53.66	0.44
Reach-1	3180		Culvert									
Reach-1	3166	50 Year	132.40	777.50	780.69	780.69	781.29	0.027241	6.53	22.99	20.90	1.00
Reach-1	3166	100 Year	157.00	777.50	780.83	780.83	781.50	0.028729	6.92	26.06	23.32	1.03
Reach-1	3113	50 Year	132.40	774.73	778.33	776.67	778.35	0.000568	1.44	119.01	73.14	0.17
Reach-1	3113	100 Year	157.00	774.73	778.42	776.82	778.45	0.000695	1.64	126.84	89.97	0.19
Reach-1	3088		Culvert									
Reach-1	3063	50 Year	132.40	774.00	776.18	776.18	776.82	0.023977	6.43	21.42	19.34	0.98
Reach-1	3063	100 Year	157.00	774.00	776.39	776.39	777.03	0.021136	6.50	25.98	24.63	0.94
Reach-1	2900	50 Year	132.40	768.95	771.99	771.87	772.68	0.021284	6.68	19.82	11.79	0.91
Reach-1	2900	100 Year	157.00	768.95	772.21	772.07	772.97	0.021221	7.00	22.42	12.34	0.92
Reach-1	2800	50 Year	132.40	766.20	769.12	769.12	769.92	0.026188	7.19	18.40	11.49	1.00
Reach-1	2800	100 Year	157.00	766.20	769.32	769.32	770.21	0.026190	7.55	20.79	12.00	1.01
Reach-1	2728	50 Year	132.40	764.90	767.37	767.37	767.94	0.021394	6.42	24.93	30.50	0.93
Reach-1	2728	100 Year	157.00	764.90	767.79	767.79	768.07	0.009460	4.90	55.06	119.21	0.64
Reach-1	2571	50 Year	132.40	760.21	764.61	761.97	764.62	0.000173	0.88	163.41	86.17	0.09
Reach-1	2571	100 Year	157.00	760.21	764.75	762.04	764.76	0.000203	0.98	175.90	90.33	0.10
Reach-1	2553		Culvert									
Reach-1	2538	50 Year	132.40	758.89	762.29		762.44	0.004894	3.34	46.02	32.46	0.45
Reach-1	2538	100 Year	157.00	758.89	762.48		762.65	0.005073	3.52	52.73	37.16	0.46
Reach-1	2522	50 Year	132.40	758.42	762.28	760.91	762.37	0.002337	2.51	63.70	43.03	0.32
Reach-1	2522	100 Year	157.00	758.42	762.48	761.09	762.57	0.002486	2.67	72.64	49.61	0.33
Reach-1	2506		Culvert									
Reach-1	2490	50 Year	132.40	757.73	760.49		760.86	0.015120	5.12	28.97	23.07	0.77
Reach-1	2490	100 Year	157.00	757.73	760.68		761.06	0.014683	5.27	33.46	24.80	0.76
Reach-1	2419	50 Year	132.40	757.20	759.93	759.30	760.13	0.007509	3.84	39.62	30.01	0.56
Reach-1	2419	100 Year	157.00	757.20	760.13	759.45	760.35	0.007505	4.01	46.05	34.89	0.56

HYDRAULIC CALCULATIONS

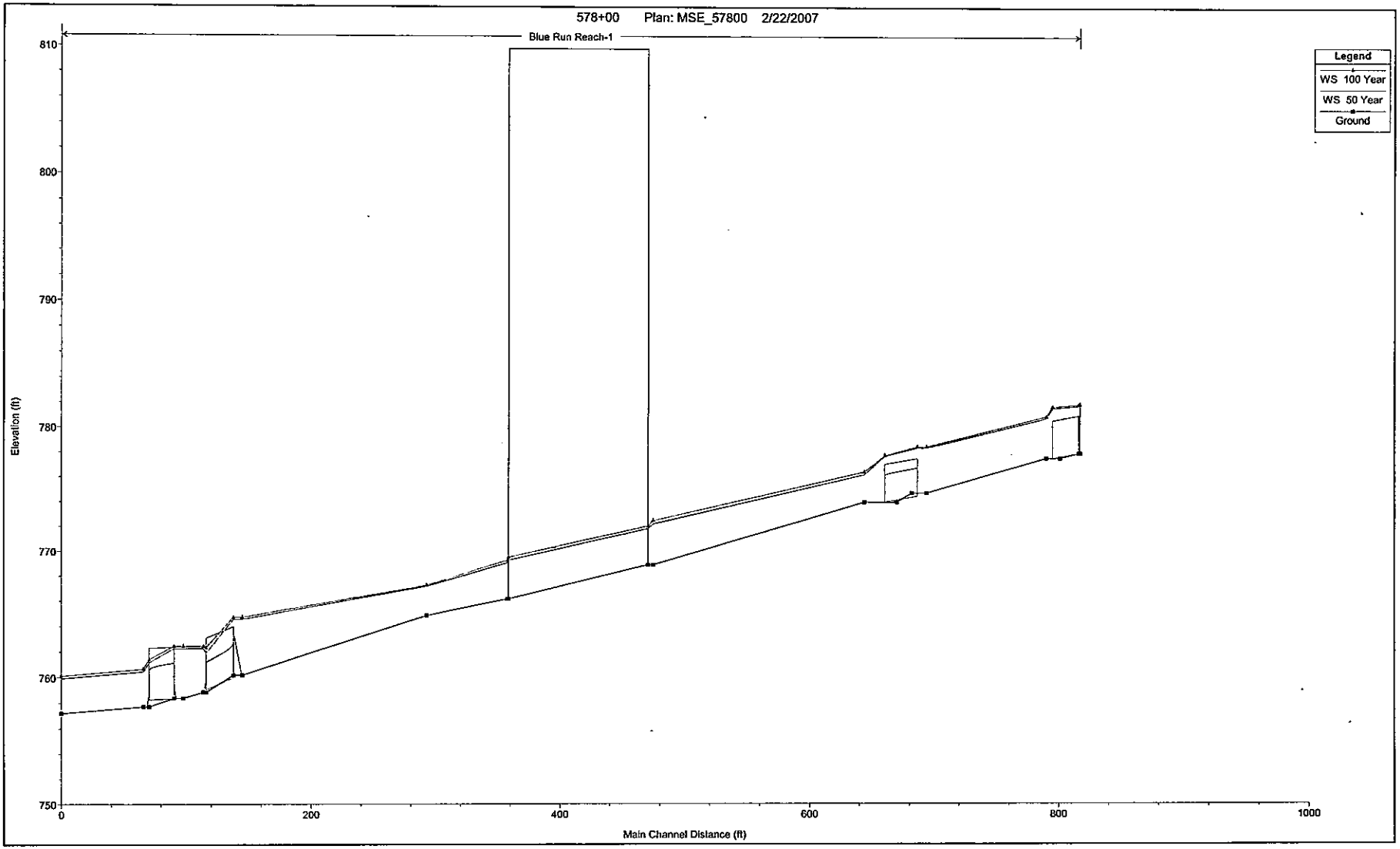
FOR

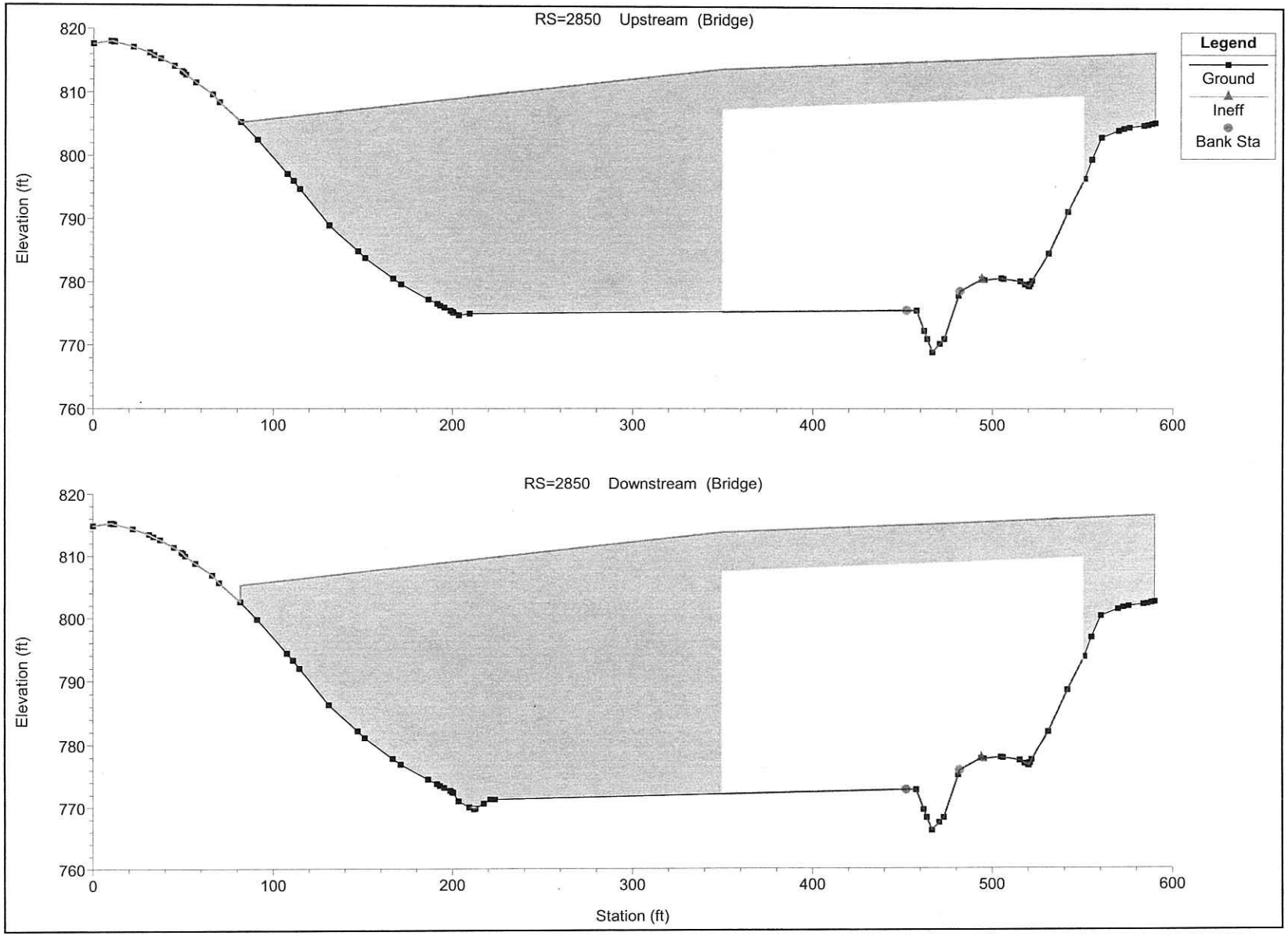
THE PROPOSED BRIDGE

TranSystems

HEC-RAS Plan: MSE 578+00 River: Blue Run Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3193	50 Year	132.40	777.89	781.66	780.73	781.79	0.003970	3.12	55.47	49.81	0.41
Reach-1	3193	100 Year	157.00	777.89	781.78	780.84	781.92	0.004409	3.39	61.42	53.66	0.44
Reach-1	3180		Culvert									
Reach-1	3166	50 Year	132.40	777.50	780.69	780.69	781.29	0.027241	6.53	22.99	20.90	1.00
Reach-1	3166	100 Year	157.00	777.50	780.83	780.83	781.50	0.028729	6.92	26.06	23.32	1.03
Reach-1	3113	50 Year	132.40	774.73	778.33	776.67	778.35	0.000568	1.44	119.01	73.14	0.17
Reach-1	3113	100 Year	157.00	774.73	778.42	776.82	778.45	0.000695	1.64	126.84	89.97	0.19
Reach-1	3088		Culvert									
Reach-1	3063	50 Year	132.40	774.00	776.18	776.18	776.82	0.023977	6.43	21.42	19.34	0.98
Reach-1	3063	100 Year	157.00	774.00	776.39	776.39	777.03	0.021136	6.50	25.98	24.63	0.94
Reach-1	2900	50 Year	132.40	768.95	772.26	771.86	772.77	0.013926	5.74	23.08	12.48	0.74
Reach-1	2900	100 Year	157.00	768.95	772.51	772.08	773.06	0.013700	5.98	26.25	13.10	0.74
Reach-1	2850		Bridge									
Reach-1	2800	50 Year	132.40	766.20	769.12	769.12	769.92	0.026188	7.19	18.40	11.49	1.00
Reach-1	2800	100 Year	157.00	766.20	769.32	769.32	770.21	0.026190	7.55	20.79	12.00	1.01
Reach-1	2728	50 Year	132.40	764.90	767.22	767.37	768.03	0.032787	7.49	20.55	28.04	1.13
Reach-1	2728	100 Year	157.00	764.90	767.31	767.79	768.24	0.035615	8.09	23.12	29.51	1.19
Reach-1	2571	50 Year	132.40	760.21	764.61	761.96	764.62	0.000173	0.88	163.41	86.17	0.09
Reach-1	2571	100 Year	157.00	760.21	764.75	762.05	764.76	0.000203	0.98	175.90	90.33	0.10
Reach-1	2553		Culvert									
Reach-1	2538	50 Year	132.40	758.89	762.29		762.44	0.004894	3.34	46.02	32.46	0.45
Reach-1	2538	100 Year	157.00	758.89	762.47		762.64	0.005199	3.55	52.16	36.79	0.47
Reach-1	2522	50 Year	132.40	758.42	762.28	760.91	762.37	0.002337	2.51	63.70	43.03	0.32
Reach-1	2522	100 Year	157.00	758.42	762.46	761.09	762.56	0.002542	2.69	71.87	49.01	0.33
Reach-1	2506		Culvert									
Reach-1	2490	50 Year	132.40	757.73	760.49		760.86	0.015120	5.12	28.97	23.07	0.77
Reach-1	2490	100 Year	157.00	757.73	760.68		761.06	0.014694	5.27	33.46	24.80	0.76
Reach-1	2419	50 Year	132.40	757.20	759.93	759.30	760.13	0.007509	3.84	39.62	30.01	0.56
Reach-1	2419	100 Year	157.00	757.20	760.13	759.45	760.35	0.007506	4.01	46.04	34.89	0.56


578+00 Plan: MSE_57800 2/22/2007
Blue Run Reach-1
Legend
WS 100 Year
WS 50 Year
Ground
Elevation (ft)
810
800
790
780
770
760
750
0
200
400
600
800
1000
Main Channel Distance (ft)


RS=2850 Upstream (Bridge)
Legend
Ground
Ineff
Bank Sta
Elevation (ft)
820
810
800
790
780
770
760
0
100
200
300
400
500
600
RS=2850 Downstream (Bridge)
Elevation (ft)
820
810
800
790
780
770
760
0
100
200
300
400
500
600
Station (ft)

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