SCI-823-10.13
PID 79977
(Portsmouth Bypass)

Phase – 2, Stage 1

Preliminary Hydraulic Calculations

Submitted January 8, 2008

TranSystems

5747 Perimeter Drive, Suite 240, Dublin, Ohio 43017

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Narrative

As discussed with ODOT, prior to the Preferred Alternative Verification Review (PAVR), culverts located under high fill[1] are to be increased in size. The increased size is the design size plus two additional sizes. This will allow a liner with a field paved invert to be inserted into it at a later date. Since a liner will be installed at the high fill locations, traffic on the roadway above the culvert can be maintained with minimal interruption when a new culvert is installed.

Currently there are no oversized storm sewers in this section of the project.

On June 13, 2005, the County Engineer requested that a copy of the LD-33 form be submitted to him at the Stage 1 Review. Therefore the LD-33 form has not yet been approved by the County Engineer. A copy of the form and calculations is attached in the Appendix.

For this Phase of the project the BMP's used are:
Exfiltration trenches and vegetative ditches as described in L&D Volume 2, section 1118. The BMP ditch calculations show required widths.

US 23 and the interchange at US 23 fall within FEMA flood zone A.

Hydraulic analysis for inlet spacing, storm sewers, culverts and ditches were done using ODOT CDSS Version 1.0.0.3.

The Report is organized as follows:

Appendix A contains all the LD-35 Drainage Criteria submitted to ODOT in July 2005

Appendix B contains all the Inlet Spacing Calculations

Appendix C contains the Storm Sewer Calculations

Appendix D contains Culverts Analysis

Appendix E contains Ditch Calculations

Appendix F contains the BMP Exfiltration Trench calculations and Ditch BMP calculations

Appendix G contains LD-33 Form

[1] (high is fill greater than or equal to 30')

APPENDIX A

LD-35, Drainage Criteria

Form LD-35
Revised April 2005

GENERAL PROJECT INFORMATION

County	Route	Section
Scioto	SR 823	0.00
	(Attach Typical Section)	

AFFECTED ROADWAYS:	Route	Average Daily Traffic	Rural / Urban
INTERSTATE OR OTHER L/A FACILITIES	SCI 823	21,200 (2008)	Rural
ARTERIALS AND COLLECTORS	U.S. 52, U.S. 23, S.R. 140		
LOCALS	Shumway-Hollow Rd Stout Hollow Road		
CLEAR ZONE	30'		

All Units are English: Yes

PIPE POLICY:

The Pipe Policy of ODOT will be used for this project. (See Section 1002 for additional information)

If a policy other than ODOT's is being used, the following material types are permitted:

(Please attach a copy of the written pipe policy. In lieu of a written policy, documentation of locally funded construction practices may be provided)

PROJECT SPECIFIC INFORMATION AFFECTING DRAINAGE:

Section A. Roadway Culverts (Type A Conduits)

1. DESIGN STORM FREQUENCY (1004.2):

   a. Mainline 50 Year

   b. Crossroads 25 Year

2. BANKFULL DESIGN (Yes) No (Circle yes if at least one culvert has bankfull design) *attach a list of culverts with bankfull designs*

3. FLOOD PLAIN CULVERT(S) NEEDED? (Yes) No (Circle yes if at least one culvert has flood plain culverts) *attach a list of culverts with flood plain culverts*

4. DURABILITY SERVICE LIFE 75 Year *attach a list of culverts with their durability service life if multiple culverts have different frequencies.*

5. ABRASIVE SITE? Yes (No) (Circle yes if at least one culvert has an abrasive site) *attach a list of culverts with their abrasive site assumptions if multiple culverts are different*

6. MAXIMUM ALLOWABLE HEADWATER FOR DESIGN STORM (1006.2):

   a. 2' below eop if drainage area >1000acres, 1' below eop if drainage area < 1000acres.

   b. 2' above crown in flat terrain, 4' above crown in a ravine.

   c.

7. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1003):

   a. U.S.G.S. Rural Equations for areas ≥6acres.

   b. Rational Method for areas < 6 acres.

8. SCALE OF TOPOGRAPHIC MAPPING USED TO DELINEATE DRAINAGE AREAS (1101.1):

   a. 24,000:1

   b.

   c.

9. MANNING'S "n" USED FOR (1105.5.5):

   a. Smooth pipe 0.012

   b. Corrugated pipe:

$2\text{-}^{2}/_{3}$" x $^{1}/_{2}$":	Full flow	0.025
3" x 1":	Full flow	0.025
6" x 2":	Full flow	0.025

Section A. Roadway Culverts - Continued

10. ENTRANCE LOSS COEFFICIENT (k_e) (1105.5.6, table 1105-1):

    a. Corrugated pipe: HW-4 Headwall 0.9 Full Headwall 0.25

    b. Smooth Concrete pipe HW-4 Headwall 0.2 Full Headwall 0.25

    d. Box Shape Full Headwall 0.2

11. MINIMUM COVER (top of pipe to subgrade) FOR (1008):

    a. Rigid pipe ODOT L&D Vol. 2 Sec. 1008.2.2

    b. Flexible pipe ODOT L&D Vol. 2 Sec. 1008.1.4

12. MAXIMUM COVER FOR (1008):

    a. Rigid pipe ODOT L&D Vol. 2 Sec. 1008.1.4

    b. Flexible pipe ODOT L&D Vol. 2 Sec. 1008.1.4

13. MAXIMUM ALLOWABLE CULVERT OUTLET VELOCITY (1002.2.2) :

    a. Bare earth channel 2fps

    b. Rock channel protection 6-20fps

    c. Use Energy Dissapators for velocities in excess of 20 f.p.s.

14. HEADWALL TYPE (1106.2):

    a. Hw-1.1

    b. HW-2.1 or HW-2.2

15. CONTACT WILL BE MADE WITH COUNTY ENGINEER TO ESTABLISH:

    a. Floodplain Issues

    b. Farm tiles

16. MINIMUM PIPE SIZE (1002.3.1, Figure 1002-1) :

    a. Freeway or limited access facility 15"

    b. Other highways 12"

Section B. Storm Sewers (Type B & C Conduits)

1. DESIGN FREQUENCY (Just Full) 10 YEAR (1104.4.1)

2. HYDRAULIC GRADIENT SHALL NOT EXCEED (1104.4.2):

   a. 12 inches below edge of pavement for 25 year frequency storm.

   b. Pavement catch basin grate or lip of inlet for 25 year frequency storm.

   c. A point in a depressed pavement sag that would result in an impassible highway for a 25 year frequency storm.

   d. Other: See ODOT L&D Vol. 2 Sec. 1104.4.2

   e. The above is based on:

      i. A pipe roughness "n" = 0.015 for pipe sizes 60" and under and 0.013 for larger sizes.

      ii. _____

3. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1003):
   a. Rational Method for areas under 6acres.

   b. U.S.G.S. Rural Equations – Report 89-4126 for areas 6acres or greater.

4. COEFFICIENT OF RUNOFF "C" FOR (1101.2.3):

   a. Pavement and paved shoulders 0.9

   b. Berms and slopes (4:1 and flatter) 0.5

   c. Berms and slopes (steeper than 4:1) 0.7

   d. Contributing areas:

      Residential 0.3-0.5 Woods 0.3-0.4 Cultivated 0.3-0.6

5. METHOD USED TO DETERMINE TIME TO FIRST CATCH BASIN OR PAVEMENT INLET (1101.2):

   a. Overland flow plus time in ditch.

   b.

6. MINIMUM TIME TO (1104.4.4):

   a. Ditch catch basin 15 minutes
   b. Pavement inlet or catch basin 10 minutes

Section B. Storm Sewers (Type B & C Conduits) - Continued

7. MINIMUM COVER OVER SEWERS (1104.2.1):

   a. Rigid pipe:

      i. Type B conduit (under pavement or paved shoulder) 9" from top of pipe to bottom of the subgrade

      ii. Type C conduit (beyond pavement or paved shoulder) 18"

   b. Flexible pipe:

      i. Type B conduit (under pavement or paved shoulder) 12"-24" from top of pipe to bottom of the subgrade

      ii. Type C conduit (beyond pavement or paved shoulder) 18"

8. DESIRABLE MINIMUM VELOCITY FOR DESIGN FLOW 3 f.p.s (1104.2.1).

9. MAXIMUM LENGTH BETWEEN MANHOLES OR SUITABLE CLEANOUT POINTS (1104.2.2) :

   a. Under 36"diameter 300'

   b. 36" - 60" diameter 500'

   c. Over 60" diameter 750' to 1000'

10. MINIMUM PIPE SIZE UNDER PAVEMENT (1104.4.6):

    a. Freeway or limited access facility 15"

    b. Other highways 12"

11. PROCEDURE TO FOLLOW WHEN EXISTING PRIVATE DRAINS ARE CUT BY PROPOSED SEWERS OR DITCHES: See Section 1104.2.1 ODOT L&D Vol. 2

Section C. Roadway Ditches

1. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1003):

   a. Rational Method with minimum Tc for areas under 6 acres.

   b. U.S.G.S. Rural Equations fir areas ≥6 acres.

2. DESIGN FREQUENCY TO DETERMINE (1102.3.1 or 1102.4):

   ADT >2000:

   a. Depth of flow determination ___10___ year

   b. Shear Stress determination (for protection and width of protection) ___5___ year

   ADT <2000:

   c. Depth of flow determination ___5___ year

   d. Shear Stress determination (for protection and width of protection) ___5___ year

3. METHOD USED TO DETERMINE TIME OF FLOW TO DITCH (1101.2):

   Overland Flow

3. ALLOWABLE SHEAR STRESS FOR DITCH LINING (1102.3):

   Permanent Ditch Protection:

   a. Seed lining ___0.40___ psf.

   b. Sod or other temporary ditch protection ___1.0___ psf.

   c. Turf Reinforcing Mat (SS836), Type 1 ___2.00___ psf.

   d. Turf Reinforcing Mat (SS836), Type 2 ___3.00___ psf.

   e. Turf Reinforcing Mat (SS836), Type 3 ___5.00___ psf.

   f. RCP, Type B___6___psf.

   g. RCP, Type C___4___ psf.

   h. RCP, Type D___2___ psf.

   Temporary Ditch Protection (Item 670):

   a. Mat, Type A ___1.25___ psf.

   b. Mat, Type B ___1.50___ psf.

   c. Mat, Type C ___2.0___ psf.

   d. Mat, Type E ___2.25___ psf.

   e. Mat, Type F ___0.45___ psf.

f. Mat, Type G 1.75 psf.

4. MANNING'S "n" USED FOR (1102.3):

a. Seed lining 0.03

b. Sod, jute, or other temporary linings 0.04

c. Turf reinforcing mats 0.04

d. Tied Concrete Block Matting 0.021

e. Rock channel protection 0.04-0.06

5. DITCH CONFIGURATION (1102.2):

a. Cut section for roadway, with 18-3/4 inch minimum depth

b. Fill Section for toe of embankment, with 18 inch minimum depth

Section C. Roadway Ditches - Continued

7. TYPE OF DITCH CATCH BASIN (1102.3.4):
   a. 2-2A, 2-2B, 2-3, 2-4, CB-4, CB-5, CB-8, CB-4A, CB-5A, CB-8A, CB-7

8. MINIMUM LONGITUDINAL SLOPE OF DITCHES IN CUT SECTIONS (1102.1):

   a. 0.5% desirable minimum

   b. 0.25% absolute minimum

9. METHOD USED TO LOCATE EXISTING FARM TILE CROSSED BY HIGHWAYS?

   a. Contact with County Engineer

   b.

   c.

   d.

10. MINIMUM WIDTH OF DITCH LININGS (1102.3.1) :

   a. Sod 7.5 ft.

   b. Temporary linings 7.5 ft.

   c. Turf reinforcing mats 7.5 ft.

11. DESIGN FREQUENCY DEPTH SHALL NOT EXCEED (1102.3.1):

   a. 1' below eop for design discharge.

   b. Toe of slope ditch not to overtop ditch bank for design year.

   c.

Section D. Median Ditches

1. DITCH CONFIGURATIONS (1102.3):

   a. Depressed 60' Median

   b. Type of barrier Type A1

2. WIDTH BETWEEN PAVEMENT EDGES Varies 14'5-3/4" to 60' ft.

3. ALLOWABLE SHEAR STRESS FOR DITCH LINING (1102.3):

   Permanent Ditch Protection:

   a. Seed lining 0.40 psf.

   i. Sod or other temporary ditch protection 1.0 psf.

   j. Turf Reinforcing Mat (SS836), Type 1 2.00 psf.

   k. Turf Reinforcing Mat (SS836), Type 2 3.00 psf.

   l. Turf Reinforcing Mat (SS836), Type 3 5.00 psf.

   m. RCP, Type B 6 psf.

   n. RCP, Type C 4 psf.

   o. RCP, Type D 2 psf.

   Temporary Ditch Protection (Item 670):

   g. Mat, Type A 1.25 psf.

   h. Mat, Type B 1.50 psf.

   i. Mat, Type C 2.0 psf.

   j. Mat, Type E 2.25 psf.

   k. Mat, Type F 0.45 psf.

   l. Mat, Type G 1.75 psf.

4. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1101.2):
   a. Rational Method for areas < 6 acres.

   b. U.S.G.S. Rural Equations for areas ≥6 acres.

5. CATCH BASIN SPACING WILL BE DETERMINED BY HYDRAULIC ANALYSIS USING (1102.3.4):

   a. 5 year frequency and "n" = 0.04 for velocity

   b. 10 year frequency and "n" = 0.04 for depth

   c. Controls:

i. Design frequency depth shall not exceed:

(1) 1' below eop design discharge.

(2)

d. Catch basin spacing, depressed median, fill section:

	Median Width	84'	60'	40'
i.	Desirable maximum	1250'	1000'	800'
ii.	Absolute maximum	1500'	1250'	1000'

5. TYPE OF MEDIAN CATCH BASIN OR INLET (1102.3.4):

a. CB- 4, Inlet No. 3, Single Slope Barrier A1, Inlet No. 3, Single Slope Barrier Type C1.

7. MINIMUM LONGITUDINAL SLOPE OF DEPRESSED EARTH MEDIAN:

0.5% preferred minimum, 0.25% absolute mninum.

Section E. Drainage for Curbed Pavements

1. CONTROLS FOR THE DETERMINATION OF INLET OR CATCH BASIN SPACING (1103):

   a. Design storm frequency ___10___ year

   b. Check storm frequency___50___ year (for underpasses or depressed roadways where the storm sewer is the only outlet)

   c. METHOD USED TO DETERMINE TIME TO FIRST CATCH BASIN OR PAVEMENT INLET:

      i. Overland Flow

      ii. 10 minute minimum.

   d. Maximum spread of flow into traveled lane ___0_____ ft. (table 1103-1)

      Outside lane width greater than 12 feet ___4___ ft.

      Total allowable spread on pavement ___4___ ft.

   e. Maximum depth of flow at curb ___5___ in .

   f. Manning's "n" for:

      i. Reinforced concrete pavement ___.015_____

      ii. Asphaltic concrete pavement ___.015_____

      iii. Paved shoulders ___.015_____

2. TYPE OF INLET OR CATCH BASIN PROPOSED FOR (1103):

   a. Continuous grades ___CB-3, CB-3A, CB-6, Inlet No.4 Type A, B, A1 and B1_____

   b. Sags _CB-3, CB-6, Inlet No.4 Type A, B, A1 and B1_____

4. INLET LIP OF CURB OPENING INLET WILL BE DEPRESSED _____ INCHES BELOW NORMAL GUTTER.

   a. A local depression of ___1/2___ inches will be used to determine spacing of combination grate and curb opening catch basins for a curb pavement section.

   b. A local depression of ___0___ inches will be used to determine spacing of combination grate and curb opening catch basins for a combination curb and gutter section.

Section F. Post Construction Storm Water Management

1. THRESHOLD LIMITS (1115):

   c. Impervious surface width drained in one direction 30 ft.

   d. Project is located within an MS4 area. Yes (No) (Circle answer)

   e. More than 80% of the drained area is discharged through a storm sewer.

      Yes (No) (Circle answer)

   f. Storm water outfall is into a TMDL Regulated Stream.

      Yes (No) (Circle answer)

APPENDIX B

Inlet Spacing Calculations

INLET SPACING DESIGN

PID : 79977 **Date :** 01/15/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#1, 519+55.41(HP) TO 533+96.38(LP) TO 561+80.30, SR823 LHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
519+55	Begin																		
527+50	I-3B	795.00	0.00	0.00	0.00	0.00	0.00	0.0290	0.0400	0.0000	9.50	0.0600	0.00	0.81	0.17	0.98	0.148	3.71	
533+00	I-3B	550.00	0.00	0.00	0.00	0.00	0.00	0.0051	0.0400	0.0000	9.50	0.0600	0.00	0.85	0.00	0.85	0.195	4.87	
533+96	I-3B	96.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.12	0.127	3.17	Sag
561+80	Begin																		
553+00	I-3C	880.00	0.00	0.00	0.00	0.00	0.00	0.0342	0.0400	0.0000	6.00	0.1670	0.00	0.58	0.00	0.58	0.118	2.95	
543+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0400	0.0400	0.0000	9.50	0.0600	0.00	0.87	0.31	1.18	0.150	3.74	
541+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0373	0.0400	0.0000	9.50	0.0600	0.00	0.52	0.04	0.56	0.114	2.86	
540+50	I-3B	50.00	0.00	0.00	0.00	0.00	0.00	0.0347	0.0400	0.0000	9.50	0.0600	0.00	0.10	0.00	0.10	0.061	1.51	
534+85	I-3B	565.00	0.00	0.00	0.00	0.00	0.00	0.0047	0.0400	0.0000	9.50	0.0600	0.00	0.70	0.00	0.70	0.184	4.60	
533+96	I-3B	89.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.11	0.123	3.07	End

SUMP DATA

Total Flow (cfs) : 0.23 **Ponded Depth (ft.) :** 0.000 **Spread on Pavement (ft.) :** 0.00

INLET SPACING DESIGN

PID : 79977 **Date :** 01/15/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#1, 519+55.41(HP) TO 533+96.38(LP) TO 561+80.30, SR823 RHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
519+55	Begin																		
527+50	I-3B	795.00	0.00	0.00	0.00	0.00	0.00	0.0290	0.0400	0.0000	9.50	0.1670	0.00	0.97	0.00	0.97	0.148	3.69	
533+00	I-3B	550.00	0.00	0.00	0.00	0.00	0.00	0.0051	0.0400	0.0000	9.50	0.1670	0.00	0.67	0.00	0.67	0.178	4.45	
533+96	I-3B	96.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.1670	0.00	******	******	0.02	0.069	1.73	Sag
561+80	Begin																		
553+00	I-3C	880.00	0.00	0.00	0.00	0.00	0.00	0.0342	0.0400	0.0000	13.20	0.0600	0.00	1.96	2.04	4.00	0.244	6.09	
543+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0400	0.0400	0.0000	9.50	0.1670	0.00	2.02	1.45	3.47	0.224	5.61	
541+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0373	0.0400	0.0000	9.50	0.1670	0.00	1.34	0.36	1.70	0.174	4.35	
540+50	I-3B	50.00	0.00	0.00	0.00	0.00	0.00	0.0347	0.0400	0.0000	9.50	0.1670	0.00	0.42	0.00	0.42	0.105	2.62	
534+85	I-3B	565.00	0.00	0.00	0.00	0.00	0.00	0.0047	0.0400	0.0000	9.50	0.1670	0.00	0.70	0.00	0.70	0.184	4.60	
533+96	I-3B	89.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.1670	0.00	******	******	0.11	0.123	3.07	End

SUMP DATA

Total Flow (cfs) : 0.13 **Ponded Depth (ft.) :** 0.000 **Spread on Pavement (ft.) :** 0.00

INLET SPACING DESIGN

PID : 79977 **Date :** 01/15/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#2, 561+80.30(HP) TO 574+72.73(LP) TO 609+88.96(HP), SR823, LHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
561+80	Begin																		
571+00	I-3C	920.00	0.00	0.00	0.00	0.00	0.00	0.0205	0.0400	0.0000	4.00	0.1670	0.00	0.58	0.00	0.58	0.130	3.25	
574+00	I-3C	300.00	0.00	0.00	0.00	0.00	0.00	0.0040	0.0400	0.0000	4.00	0.1670	0.00	0.18	0.00	0.18	0.115	2.87	
574+72	I-3C	72.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	4.00	0.1670	0.00	******	******	0.05	0.091	2.28	Sag
609+89	Begin																		
599+50	I-3B	1039.00	0.00	0.00	0.00	0.00	0.00	0.0400	0.0400	0.0000	9.50	0.0600	0.00	0.92	0.35	1.27	0.154	3.85	
590+00	I-3B	950.00	0.00	0.00	0.00	0.00	0.00	0.0400	0.0400	0.0000	9.50	0.1670	0.00	1.24	0.28	1.52	0.164	4.11	
581+00	I-3B	900.00	0.00	0.00	0.00	0.00	0.00	0.0345	0.0400	0.0000	9.50	0.1670	0.00	1.20	0.19	1.40	0.164	4.10	
580+00	I-3B	100.00	0.00	0.00	0.00	0.00	0.00	0.0290	0.0400	0.0000	9.50	0.1670	0.00	0.31	0.00	0.31	0.097	2.42	
575+50	I-3B	450.00	0.00	0.00	0.00	0.00	0.00	0.0042	0.0400	0.0000	6.00	0.1670	0.00	0.49	0.00	0.49	0.164	4.11	
574+72	I-3C	78.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	4.00	0.1670	0.00	******	******	0.05	0.091	2.27	End

SUMP DATA

Total Flow (cfs) : 0.10 **Ponded Depth (ft.) :** 0.022 **Spread on Pavement (ft.) :** 0.27

INLET SPACING DESIGN

PID : 79977 **Date :** 01/15/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#2, 561+80.30(HP) TO 574+72.73(LP) TO 609+88.96(HP), SR823, RHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
561+80	Begin																		
571+00	I-3C	920.00	0.00	0.00	0.00	0.00	0.00	0.0205	0.0650	0.0000	13.20	0.0600	0.00	2.72	1.48	4.20	0.328	5.04	
574+00	I-3C	300.00	0.00	0.00	0.00	0.00	0.00	0.0040	0.0495	0.0000	13.20	0.0600	0.00	2.46	0.39	2.85	0.348	7.02	
574+72	I-3C	72.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	13.20	0.0600	0.00	******	******	0.72	0.248	6.20	Sag
609+89	Begin																		
599+50	I-3B	1039.00	0.00	0.00	0.00	0.00	0.00	0.0400	0.0400	0.0000	9.50	0.1670	0.00	1.11	0.16	1.27	0.154	3.85	
590+00	I-3B	950.00	0.00	0.00	0.00	0.00	0.00	0.0400	0.0400	0.0000	9.50	0.0600	0.00	0.94	0.38	1.32	0.156	3.90	
581+00	I-3B	900.00	0.00	0.00	0.00	0.00	0.00	0.0345	0.0400	0.0000	9.50	0.0600	0.00	1.05	0.45	1.50	0.168	4.21	
580+00	I-3B	100.00	0.00	0.00	0.00	0.00	0.00	0.0290	0.0400	0.0000	9.50	0.0600	0.00	0.54	0.03	0.57	0.121	3.02	
575+50	I-3B	450.00	0.00	0.00	0.00	0.00	0.00	0.0042	0.0400	0.0000	13.20	0.0600	0.00	1.08	0.02	1.10	0.222	5.56	
574+72	I-3C	78.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	13.20	0.0600	0.00	******	******	0.35	0.189	4.72	End

SUMP DATA

Total Flow (cfs) : 1.06 **Ponded Depth (ft.) :** 0.106 **Spread on Pavement (ft.) :** 2.38

17

INLET SPACING DESIGN

PID : 79977 **Date :** 01/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#3, 609+88.96(HP) TO 637+66.13(LP) TO 642+99.49(HP), SR823 LHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
609+89	Begin																		
619+50	I-3B	961.00	0.00	0.00	0.00	0.00	0.00	0.0370	0.0400	0.0000	9.50	0.0600	0.00	1.02	0.44	1.46	0.165	4.11	
627+50	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0370	0.0400	0.0000	9.50	0.0600	0.00	1.79	1.77	3.56	0.230	5.75	
633+00	I-3B	550.00	0.00	0.00	0.00	0.00	0.00	0.0241	0.0400	0.0000	9.50	0.0600	0.00	2.08	1.83	3.91	0.258	6.45	
635+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0137	0.0400	0.0000	9.50	0.0600	0.00	1.78	0.83	2.61	0.247	6.16	
637+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0034	0.0400	0.0000	9.50	0.0600	0.00	1.52	0.09	1.61	0.267	6.67	
637+66	I-3B	66.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.35	0.190	4.74	Sag
642+99	Begin																		
638+50	I-3B	449.00	0.00	0.00	0.00	0.00	0.00	0.0043	0.0400	0.0000	9.50	0.0600	0.00	1.59	0.16	1.75	0.264	6.59	
637+66	I-3B	84.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.49	0.215	5.37	End

SUMP DATA

Total Flow (cfs) : 0.84 **Ponded Depth (ft.) :** 0.030 **Spread on Pavement (ft.) :** 2.86

INLET SPACING DESIGN

PID : 79977 **Date :** 01/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#3, 609+88.96(HP) TO 637+66.13(LP) TO 642+99.49(HP), SR823, RHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
609+89	Begin																		
619+50	I-3B	961.00	0.00	0.00	0.00	0.00	0.00	0.0370	0.0400	0.0000	9.50	0.1670	0.00	1.08	0.10	1.18	0.152	3.80	
627+50	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0370	0.0400	0.0000	9.50	0.1670	0.00	1.02	0.06	1.08	0.147	3.68	
633+00	I-3B	550.00	0.00	0.00	0.00	0.00	0.00	0.0241	0.0400	0.0000	9.50	0.1670	0.00	0.74	0.00	0.74	0.138	3.45	
635+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0137	0.0400	0.0000	9.50	0.1670	0.00	0.25	0.00	0.25	0.102	2.55	
637+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0034	0.0400	0.0000	9.50	0.1670	0.00	0.25	0.00	0.25	0.132	3.31	
637+66	I-3B	66.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.1670	0.00	******	******	0.08	0.110	2.75	Sag
642+99	Begin																		
638+50	I-3B	449.00	0.00	0.00	0.00	0.00	0.00	0.0043	0.0400	0.0000	9.50	0.1670	0.00	0.55	0.00	0.55	0.171	4.28	
637+66	I-3B	84.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.1670	0.00	******	******	0.10	0.119	2.98	End

SUMP DATA

Total Flow (cfs) : 0.18 **Ponded Depth (ft.) :** 0.000 **Spread on Pavement (ft.) :** 0.00

INLET SPACING DESIGN

PID : 79977 **Date :** 01/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#4, 642+99.49(HP) TO 661+36.84(LP) TO 688+23.08(LP), SR823, LHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
642+99	Begin																		
653+00	I-3B	1001.00	0.00	0.00	0.00	0.00	0.00	0.0381	0.0400	0.0000	9.50	0.0600	0.00	1.89	2.01	3.90	0.237	5.91	
655+50	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0319	0.0400	0.0000	9.50	0.0600	0.00	1.66	1.33	2.99	0.222	5.54	
658+00	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0183	0.0400	0.0000	9.50	0.0600	0.00	1.56	0.75	2.31	0.223	5.58	
660+50	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0047	0.0400	0.0000	9.50	0.0600	0.00	1.56	0.17	1.73	0.258	6.46	
661+37	I-3B	87.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.51	0.219	5.47	Sag
688+23	Begin																		
678+50	I-3B	973.00	0.00	0.00	0.00	0.00	0.00	0.0360	0.0400	0.0000	9.50	0.0600	0.00	1.88	1.92	3.80	0.237	5.92	
673+50	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0360	0.0400	0.0000	9.50	0.0600	0.00	1.90	1.97	3.87	0.238	5.96	
669+50	I-3B	400.00	0.00	0.00	0.00	0.00	0.00	0.0360	0.0400	0.0000	9.50	0.0600	0.00	1.80	1.74	3.53	0.230	5.76	
666+50	I-3B	300.00	0.00	0.00	0.00	0.00	0.00	0.0279	0.0400	0.0000	9.50	0.0600	0.00	1.67	1.23	2.91	0.225	5.62	
663+50	I-3B	300.00	0.00	0.00	0.00	0.00	0.00	0.0116	0.0400	0.0000	9.50	0.0600	0.00	1.74	0.67	2.40	0.247	6.16	
662+00	I-3B	150.00	0.00	0.00	0.00	0.00	0.00	0.0034	0.0400	0.0000	9.50	0.0600	0.00	1.23	0.02	1.26	0.243	6.08	
661+37	I-3B	63.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.27	0.172	4.31	End

SUMP DATA

Total Flow (cfs) : 0.78 **Ponded Depth (ft.) :** 0.024 **Spread on Pavement (ft.) :** 2.79

INLET SPACING DESIGN

PID : 79977 **Date :** 01/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#4, 642+99.49(HP) TO 661+36.84(LP) TO 688+23.08(LP), SR823, RHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
642+99	Begin																		
653+00	I-3B	1001.00	0.00	0.00	0.00	0.00	0.00	0.0381	0.0400	0.0000	9.50	0.1670	0.00	1.10	0.13	1.23	0.153	3.84	
655+50	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0319	0.0400	0.0000	9.50	0.1670	0.00	0.44	0.00	0.44	0.108	2.70	
658+00	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0183	0.0400	0.0000	9.50	0.1670	0.00	0.31	0.00	0.31	0.105	2.63	
660+50	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0047	0.0400	0.0000	9.50	0.1670	0.00	0.31	0.00	0.31	0.136	3.39	
661+37	I-3B	87.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.11	0.123	3.07	Sag
688+23	Begin																		
678+50	I-3B	973.00	0.00	0.00	0.00	0.00	0.00	0.0360	0.0400	0.0000	9.50	0.1670	0.00	1.08	0.11	1.19	0.153	3.83	
673+50	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0360	0.0400	0.0000	9.50	0.1670	0.00	0.72	0.00	0.72	0.127	3.16	
669+50	I-3B	400.00	0.00	0.00	0.00	0.00	0.00	0.0360	0.0400	0.0000	9.50	0.1670	0.00	0.49	0.00	0.49	0.110	2.75	
666+50	I-3B	300.00	0.00	0.00	0.00	0.00	0.00	0.0279	0.0400	0.0000	9.50	0.1670	0.00	0.37	0.00	0.37	0.104	2.59	
663+50	I-3B	300.00	0.00	0.00	0.00	0.00	0.00	0.0116	0.0400	0.0000	9.50	0.1670	0.00	0.37	0.00	0.37	0.122	3.06	
662+00	I-3B	150.00	0.00	0.00	0.00	0.00	0.00	0.0034	0.0400	0.0000	9.50	0.1670	0.00	0.18	0.00	0.18	0.118	2.96	
661+37	I-3B	63.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.1670	0.00	******	******	0.08	0.109	2.72	End

SUMP DATA

Total Flow (cfs) : 0.19 **Ponded Depth (ft.) :** 0.000 **Spread on Pavement (ft.) :** 0.00

INLET SPACING DESIGN

PID : 79977 **Date :** 01/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#5, 688+23.08(HP) TO 721+13.64(LP) TO 782+07.84(HP), SR823, LHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
688+23	Begin																		
697+00	I-3B	877.00	0.00	0.00	0.00	0.00	0.00	0.0342	0.0400	0.0000	9.50	0.0600	0.00	1.78	1.64	3.42	0.230	5.74	
702+50	I-3B	550.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0000	9.50	0.0600	0.00	1.81	1.97	3.78	0.230	5.74	
707+00	I-3B	450.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0000	9.50	0.0600	0.00	1.80	1.93	3.73	0.228	5.71	
711+00	I-3B	400.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0000	9.50	0.0600	0.00	1.73	1.77	3.49	0.223	5.57	
714+50	I-3B	350.00	0.00	0.00	0.00	0.00	0.00	0.0365	0.0400	0.0000	9.50	0.0600	0.00	1.51	1.17	2.68	0.207	5.18	
715+50	I-3B	100.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	0.97	0.32	1.29	0.162	4.06	
716+00	I-3B	50.00	0.00	0.00	0.00	0.00	0.00	0.0282	0.0400	0.0000	9.50	0.0600	0.00	0.39	0.00	0.39	0.105	2.63	
720+50	I-3B	450.00	0.00	0.00	0.00	0.00	0.00	0.0035	0.0400	0.0000	9.50	0.1670	0.00	0.55	0.00	0.55	0.178	4.45	
721+13	I-3B	63.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.1670	0.00	******	******	0.08	0.109	2.72	Sag
782+08	Begin																		
772+00	I-3C	1008.00	0.00	0.00	0.00	0.00	0.00	0.0176	0.0400	0.0000	7.00	0.1670	0.00	0.97	0.00	0.97	0.162	4.06	
765+00	I-3C	700.00	0.00	0.00	0.00	0.00	0.00	0.0176	0.0400	0.0000	7.00	0.1670	0.00	0.68	0.00	0.68	0.142	3.55	
758+00	I-3C	700.00	0.00	0.00	0.00	0.00	0.00	0.0176	0.0400	0.0000	7.00	0.1670	0.00	0.68	0.00	0.68	0.142	3.55	
750+00	I-3C	800.00	0.00	0.00	0.00	0.00	0.00	0.0265	0.0400	0.0000	7.00	0.1670	0.00	0.76	0.00	0.76	0.137	3.43	
742+00	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0460	0.0400	0.0000	9.50	0.1670	0.00	0.87	0.00	0.87	0.130	3.26	

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
732+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0460	0.0400	0.0000	9.50	0.1670	0.00	1.07	0.16	1.23	0.148	3.71	
724+00	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0158	0.0400	0.0000	9.50	0.1670	0.00	1.14	0.00	1.14	0.176	4.40	
722+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0048	0.0400	0.0000	9.50	0.1670	0.00	0.25	0.00	0.25	0.125	3.11	
721+13	I-3B	87.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.1670	0.00	******	******	0.11	0.123	3.07	End

SUMP DATA

Total Flow (cfs) : 0.19 **Ponded Depth (ft.) :** 0.000 **Spread on Pavement (ft.) :** 0.00

INLET SPACING DESIGN

PID : 79977 **Date :** 01/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH#5, 688+23.08(HP) TO 721+13.64(LP) TO 781+97.37(HP), SR823, RHS **Designer :** MC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
688+23	Begin																		
697+00	I-3B	877.00	0.00	0.00	0.00	0.00	0.00	0.0342	0.0400	0.0000	9.50	0.1670	0.00	1.02	0.05	1.07	0.149	3.72	
702+50	I-3B	550.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0000	9.50	0.1670	0.00	0.72	0.00	0.72	0.123	3.09	
707+00	I-3B	450.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0000	9.50	0.1670	0.00	0.55	0.00	0.55	0.111	2.79	
711+00	I-3B	400.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0000	9.50	0.1670	0.00	0.49	0.00	0.49	0.107	2.67	
714+50	I-3B	350.00	0.00	0.00	0.00	0.00	0.00	0.0365	0.0400	0.0000	9.50	0.1670	0.00	0.43	0.00	0.43	0.104	2.61	
715+50	I-3B	100.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	0.12	0.00	0.12	0.067	1.67	
716+00	I-3B	50.00	0.00	0.00	0.00	0.00	0.00	0.0282	0.0400	0.0000	9.50	0.1670	0.00	0.06	0.00	0.06	0.053	1.33	
720+50	I-3B	450.00	0.00	0.00	0.00	0.00	0.00	0.0035	0.0400	0.0000	9.50	0.0600	0.00	0.55	0.00	0.55	0.178	4.45	
721+13	I-3B	63.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.08	0.109	2.72	Sag
782+08	Begin																		
772+00	I-3C	1008.00	0.00	0.00	0.00	0.00	0.00	0.0176	0.0440	0.0000	9.50	0.0600	0.00	2.31	1.62	3.93	0.284	6.46	
765+00	I-3C	700.00	0.00	0.00	0.00	0.00	0.00	0.0176	0.0440	0.0000	9.50	0.0600	0.00	2.46	1.89	4.35	0.295	6.71	
758+00	I-3C	700.00	0.00	0.00	0.00	0.00	0.00	0.0176	0.0440	0.0000	9.50	0.0600	0.00	2.56	2.06	4.62	0.302	6.86	
750+00	I-3C	800.00	0.00	0.00	0.00	0.00	0.00	0.0265	0.0440	0.0000	9.50	0.0600	0.00	2.53	2.65	5.18	0.292	6.63	
742+00	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0460	0.0400	0.0000	9.50	0.0600	0.00	2.20	3.18	5.37	0.257	6.44	

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
732+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0460	0.0400	0.0000	9.50	0.0600	0.00	1.95	2.46	4.41	0.239	5.98	
724+00	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0158	0.0400	0.0000	9.50	0.0600	0.00	2.08	1.35	3.44	0.266	6.65	
722+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0048	0.0400	0.0000	9.50	0.0600	0.00	1.46	0.14	1.60	0.250	6.25	
721+13	I-3B	87.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.25	0.167	4.18	End

SUMP DATA

Total Flow (cfs) : 0.33 **Ponded Depth (ft.) :** 0.000 **Spread on Pavement (ft.) :** 0.00

INLET SPACING DESIGN

PID : 79977 **Date :** 06/04/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2, FROM 539+91.92 TO 536+50, CB-3A, SR823, 47.0' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
539+91	Begin																	
536+50	CB-3A	341.92	0.00	0.00	0.00	0.00	0.00	0.0135	0.0160	0.0160	12.00	0.1670	0.00	0.98	1.02	2.00	0.159	9.92

INLET SPACING DESIGN

PID : 79977 **Date :** 06/04/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2, FROM 540+63.57 TO 537+00, CB-3A, SR823, 47.0' LT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
540+63	Begin																	
537+00	CB-3A	363.57	0.00	0.00	0.00	0.00	0.00	0.0161	0.0400	0.0160	12.00	0.1670	0.00	1.40	0.49	1.89	0.212	5.30

INLET SPACING DESIGN

PID : 79977 **Date :** 06/04/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2, FROM 579+62.29 TO 577+50, CB-3A, SR823, 47.0' LT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
579+62	Begin																	
577+50	CB-3A	212.29	0.00	0.00	0.00	0.00	0.00	0.0152	0.0400	0.0160	12.00	0.1670	0.00	0.79	0.08	0.87	0.160	4.00

INLET SPACING DESIGN

PID : 79977 **Date :** 06/04/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2, FROM 579+92.83 TO 578+00, CB-3A, SR823, 47.0' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
579+92	Begin																	
578+00	CB-3A	192.83	0.00	0.00	0.00	0.00	0.00	0.0180	0.0400	0.0160	12.00	0.1670	0.00	0.73	0.05	0.78	0.149	3.72

INLET SPACING DESIGN

PID : 79977 **Date :** 05/18/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 3, FROM 627+00 TO 631+00, I3D, SR823, 43.5' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
627+00	Begin																	
630+50	I-3D	350.00	0.00	0.00	0.00	0.00	0.00	0.0370	0.0400	0.0280	12.00	0.0670	0.00	1.03	0.43	1.46	0.165	4.11

INLET SPACING DESIGN

PID : 79977 **Date :** 05/18/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 4, FROM 651+00 TO 654+50, I3D, SR823, 43.5' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
649+50	Begin																	
653+00	I-3D	350.00	0.00	0.00	0.00	0.00	0.00	0.0381	0.0400	0.0280	12.00	0.0670	0.00	0.49	0.01	0.50	0.110	2.74

INLET SPACING DESIGN

PID : 79977 **Date :** 05/18/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 4, FROM 651+00 TO 654+50, I3D, SR823, 43.5' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
651+00	Begin																	
654+00	I-3D	300.00	0.00	0.00	0.00	0.00	0.00	0.0400	0.0400	0.0280	12.00	0.0670	0.00	0.90	0.31	1.21	0.151	3.78

INLET SPACING DESIGN

PID : 79977 **Date :** 05/18/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 4, FROM 679+50 TO 676+00, I3D, SR823, 43.5' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
679+50	Begin																	
676+50	I-3D	300.00	0.00	0.00	0.00	0.00	0.00	0.0360	0.0400	0.0280	12.00	0.0670	0.00	0.92	0.29	1.21	0.154	3.85

INLET SPACING DESIGN

PID : 79977 **Date :** 05/18/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 4, FROM 688+00 TO 684+00, I3D, SR823, 43.5' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
688+00	Begin																	
684+50	I-3D	350.00	0.00	0.00	0.00	0.00	0.00	0.0146	0.0400	0.0280	12.00	0.0670	0.00	1.19	0.27	1.46	0.196	4.90

INLET SPACING DESIGN

PID : 79977 **Date :** 06/04/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, FROM 716+44.45 TO 720+50 CB-3A, SR823, 47.0' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
716+44	Begin																	
720+50	CB-3A	405.60	0.00	0.00	0.00	0.00	0.00	0.0035	0.0400	0.0160	12.00	0.1670	0.00	1.25	0.40	1.65	0.268	6.70

INLET SPACING DESIGN

PID : 79977 **Date :** 06/04/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, FROM 716+44.45 TO 720+50 TO 721+13.64, CB-3A, SR823, 47.0' LT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
716+44	Begin																		
720+50	CB-3A	405.55	0.00	0.00	0.00	0.00	0.00	0.0035	0.0400	0.0160	12.00	0.1670	0.00	1.25	0.40	1.65	0.268	6.70	
721+13	CB-3	63.64	0.00	0.00	0.00	0.00	0.00	0.0001	0.0400	0.0160	12.00	0.1670	0.00	******	******	0.66	0.371	9.28	Sag

INLET SPACING DESIGN

PID : 79977 **Date :** 05/18/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, FROM 703+00 TO 709+00, I3D, SR823, 43.5' LT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
703+50	Begin																	
708+50	I-3D	500.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0280	12.00	0.0670	0.00	0.62	0.08	0.70	0.122	3.05

INLET SPACING DESIGN

PID : 79977 **Date :** 05/18/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, FROM 704+00 TO 707+00, 710+50, 711+00, I3D, SR823, 43.5' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
704+00	Begin																	
707+00	I-3D	300.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0280	12.00	0.0670	0.00	0.89	0.32	1.21	0.150	3.74
710+50	I-3D	350.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0280	12.00	0.0670	0.00	1.15	0.63	1.78	0.173	4.32
711+00	I-3D	50.00	0.00	0.00	0.00	0.00	0.00	0.0420	0.0400	0.0280	12.00	0.0670	0.00	0.69	0.14	0.83	0.130	3.25

INLET SPACING DESIGN

PID : 79977 **Date :** 05/18/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, FROM 736+50 TO 732+00, 730+00, 729+50, I3D, SR823, 43.5' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
741+50	Begin																	
736+50	I-3D	500.00	0.00	0.00	0.00	0.00	0.00	0.0460	0.0400	0.0160	12.00	0.0670	0.00	1.22	0.78	2.00	0.178	4.44
732+00	I-3D	450.00	0.00	0.00	0.00	0.00	0.00	0.0460	0.0400	0.0160	12.00	0.0670	0.00	1.43	1.17	2.59	0.196	4.90
730+00	I-3D	200.00	0.00	0.00	0.00	0.00	0.00	0.0460	0.0400	0.0160	12.00	0.0670	0.00	1.21	0.78	1.99	0.177	4.43
729+50	I-3D	50.00	0.00	0.00	0.00	0.00	0.00	0.0460	0.0400	0.0160	12.00	0.0670	0.00	0.76	0.21	0.98	0.136	3.40

INLET SPACING DESIGN

PID : 19415 **Date :** 09/14/2006 **Project :** Portsmouth Bypass **Location :** SR 823

Description :

Designer : CTS

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 9.60 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
782+15	Begin																	
789+00	I-3C	685.00	0.90	0.55	2.38	3.22	10.00	0.0265	0.0440	0.0440	9.60	0.1700	5.39	1.92	0.75	2.67	0.228	5.17
799+00	I-3C	1000.00	0.90	0.80	2.38	3.55	10.00	0.0400	0.0440	0.0440	9.60	0.1700	5.39	2.47	2.15	4.63	0.259	5.89
809+00	I-3C	1000.00	0.90	0.80	2.38	3.34	10.00	0.0400	0.0440	0.0440	9.60	0.1700	5.39	2.88	3.15	6.03	0.286	6.50
818+00	I-3C	900.00	0.90	0.72	2.38	2.94	10.00	0.0400	0.0440	0.0440	9.60	0.1700	5.39	3.04	3.61	6.65	0.297	6.74
825+50	I-3B	750.00	0.90	0.42	2.38	2.63	10.00	0.0400	0.0400	0.0400	9.60	0.1700	5.39	2.67	2.97	5.64	0.269	6.73
834+00	I-3B	850.00	0.90	0.22	1.53	3.25	10.00	0.0400	0.0400	0.0400	9.60	0.1700	5.39	2.21	1.83	4.04	0.238	5.94
842+00	I-3B	800.00	0.90	0.20	1.53	3.34	10.00	0.0400	0.0400	0.0400	9.60	0.1700	5.39	1.79	1.01	2.80	0.207	5.18
850+50	I-3C	850.00	0.90	0.37	1.53	3.94	10.00	0.0295	0.0400	0.0400	9.60	0.1700	5.39	1.89	0.92	2.81	0.219	5.49

INLET SPACING DESIGN

PID : 19415 **Date :** 09/14/2006 **Project :** Portsmouth Bypass **Location :** SR 823

Description : **Designer :** CTS

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 9.60 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
842+00	Begin																	
850+50	I-3C	850.00	0.90	0.37	1.53	4.33	10.00	0.0295	0.0410	0.0410	9.60	0.1700	5.39	1.45	0.34	1.80	0.187	4.57
860+00	I-3C	950.00	0.90	0.77	2.38	7.11	10.00	0.0064	0.0440	0.0440	9.60	0.1700	5.39	3.15	0.92	4.08	0.348	7.92
867+00	I-3C	700.00	0.90	0.55	2.38	3.56	10.00	0.0182	0.0440	0.0440	9.60	0.1700	5.39	2.46	1.14	3.59	0.273	6.21
873+50	I-3B	650.00	0.90	0.46	2.38	2.85	10.00	0.0300	0.0400	0.0400	7.50	0.1700	5.39	2.10	1.27	3.37	0.234	5.86
882+00	I-3B	850.00	0.90	0.21	1.53	4.15	10.00	0.0300	0.0400	0.0160	6.10	0.1700	5.39	1.67	0.62	2.29	0.203	5.07
891+00	I-3B	900.00	0.90	0.23	1.53	4.69	10.00	0.0300	0.0400	0.0160	6.10	0.1700	5.39	1.41	0.33	1.74	0.183	4.57

INLET SPACING DESIGN

PID : 19415 **Date :** 08/15/2007 **Project :** Portsmouth Bypass **Location :** SR 823

Description : Spread calculations for NB SR 823 over Fairgrounds Road, Railroad, and US 23 **Designer :** ADW

Rainfall Area: A D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
890+68	Begin																	
893+15	I-3D	250.00	0.90	0.14	10.00	1.74	11.74	0.0300	0.0400	0.0160	8.00	0.2000	4.74	0.60	0.00	0.60	0.122	3.06
900+08	I-3D	693.00	0.90	0.38	10.00	3.84	13.84	0.0300	0.0400	0.0160	8.00	0.2000	4.38	1.34	0.15	1.50	0.173	4.32

INLET SPACING DESIGN

PID : 19415 **Date :** 08/15/2007 **Project :** Portsmouth Bypass **Location :** SR 823

Description : Spread calculations for NB SR 823 over Fairgrounds Road, Railroad, and US 23 **Designer :** ADW

Rainfall Area: AD **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
889+34	Begin																	
892+96	I-3D	361.60	0.90	0.20	10.00	2.33	12.33	0.0300	0.0400	0.0160	8.00	0.2000	4.63	0.82	0.00	0.82	0.138	3.44
899+82	I-3D	685.36	0.90	0.38	10.00	3.79	13.79	0.0300	0.0400	0.0160	8.00	0.2000	4.38	1.35	0.15	1.50	0.173	4.32

INLET SPACING DESIGN

PID : 19415 **Date :** 04/18/2007 **Project :** Portsmouth Bypass **Location :** RAMP A

Description : Ramp A spread calculations **Designer :** ADW

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
894+50	Begin																	
903+00	I-3C	850.00	0.90	0.19	10.00	5.55	15.55	0.0300	0.0400	0.0160	6.00	0.1700	4.53	0.77	0.00	0.77	0.135	3.38
1909+50	I-3C	650.00	0.90	0.43	10.00	3.67	13.67	0.0300	0.0300	0.0785	12.00	0.1700	4.79	1.34	0.51	1.85	0.168	5.60
1912+00	I-3C	245.00	0.90	0.17	10.00	1.19	11.19	0.0300	0.0785	0.0785	12.00	0.1700	5.18	1.30	0.00	1.30	0.211	2.69

INLET SPACING DESIGN

PID : 19415 **Date :** 08/15/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Description : Ramp B over Fairgrounds Rd and RR Segment 1 **Designer :** ADW

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
2612+00	Begin																		
2610+75	I-3D	125.00	0.90	0.07	10.00	0.88	10.88	0.0298	0.0710	0.0710	8.00	0.0000	5.23	******	******	0.33	0.122	1.71	End

INLET SPACING DESIGN

PID : 19415 **Date :** 08/15/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Description : Ramp B over Fairgrounds Rd and RR Segment 2 **Designer :** ADW

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
2610+75	Begin																		
2607+00	I-3D	375.00	0.90	0.33	10.00	2.81	12.81	0.0093	0.0710	0.0710	8.00	0.0000	4.92	******	******	1.46	0.264	3.72	End

INLET SPACING DESIGN

PID : 19415 **Date :** 08/15/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Description : Ramp B over Fairgrounds Rd and RR Segment 3 **Designer :** ADW

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
2607+00	Begin																		
2604+00	I-3D	300.00	0.90	0.54	10.00	0.99	10.99	0.0576	0.0710	0.0710	8.00	0.0000	5.21	******	******	2.53	0.231	3.25	End

INLET SPACING DESIGN

PID : 19415 **Date :** 08/15/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Description : Ramp B over Fairgrounds Rd and RR Segment 4 **Designer :** ADW

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
2604+00	Begin																		
2600+40	I-3D	365.00	0.90	0.79	10.00	1.59	11.59	0.0576	0.0160	0.0160	8.00	0.1670	5.11	******	******	3.63	0.151	9.45	End

INLET SPACING DESIGN

PID : 19415 **Date :** 08/15/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Description : Ramp C over Fairgrounds Rd and RR **Designer :** ADW

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
3894+45	Begin																		
3901+00	I-3D	937.00	0.90	0.65	10.00	4.10	14.10	0.0276	0.0630	0.0630	8.00	0.2000	4.73	******	******	2.77	0.262	4.16	End
3906+47	I-3D	547.00	0.90	0.36	10.00	2.31	12.31	0.0585	0.0400	0.0160	8.00	0.2000	5.00	1.28	0.34	1.62	0.157	3.92	

APPENDIX C

Storm Sewer Calculations

STORM SEWER SYSTEM

PID : 79977 **Date :** 06/01/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 536+50 SR823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	536+50	0.41	0.37	10.00	5.39	6.69	2.0	2.5	15	4.1	0.0100	749.44	4.18	6.02	0.0019	750.35	753.44	3.09	2.75	CB 3A
begin		536+50	0.41	0.37									749.40				750.34	752.65			0.015
1	2	536+50	0.00	0.00	10.02	5.39	6.68	2.0	2.5	15	60.6	0.5000	749.40	16.77	42.58	0.0019	749.61	752.65	3.04	2.00	MH 3
		536+50	0.41	0.37									719.10				720.04	722.35			0.015
2	3	536+50	0.00	0.00	10.08	5.38	6.64	2.0	2.4	15	46.2	0.0100	719.10	4.17	6.02	0.0019	719.68	722.35	2.67	2.00	MH 3
final		536+50	0.41	0.37									718.64				719.58	721.89			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 06/01/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 537+00 SR823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	537+00	0.39	0.35	10.00	5.39	6.69	1.9	2.3	15	7.9	0.0100	750.20	4.12	6.02	0.0018	751.07	754.20	3.13	2.75	CB 3A
begin		537+00	0.39	0.35									750.12				751.05	753.37			0.015
1	2	537+00	0.00	0.00	10.03	5.39	6.67	1.9	2.3	15	83.6	0.5000	750.12	16.55	42.58	0.0017	750.33	753.37	3.04	2.00	MH 3
		537+00	0.39	0.35									708.32				709.25	711.57			0.015
2	3	537+00	0.00	0.00	10.12	5.37	6.66	1.9	2.3	15	16.5	0.0100	708.32	4.11	6.02	0.0017	709.12	711.57	2.46	2.00	MH 3
final		537+00	0.39	0.35									708.16				709.09	711.41			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 04/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :FROM STA. 541+00 TO STA. 540+50 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	541+00	0.10	0.09	10.00	5.39	6.65	0.5	0.6	15	50.0	0.0360	760.02	4.42	11.43	0.0001	760.22	765.82	5.60	4.55	I 3B
begin		540+50	0.10	0.09									758.22				759.00	764.02			0.015
1	2	540+50	0.03	0.02	10.19	5.36	6.58	0.6	0.8	15	61.5	0.0100	758.22	3.00	6.02	0.0002	758.53	764.02	5.49	4.55	I 3B
		540+50	0.13	0.12									757.61				758.40	760.86			0.015
2	3	540+50	0.00	0.00	10.53	5.29	6.56	0.6	0.8	15	65.6	0.5000	757.61	11.84	42.58	0.0002	757.73	760.86	3.13	2.00	MH 3
		540+50	0.13	0.12									724.81				725.60	728.06			0.015
3	4	540+50	0.00	0.00	10.62	5.28	6.52	0.6	0.8	15	31.7	0.0100	724.81	3.00	6.02	0.0002	725.29	728.06	2.77	2.00	MH 3
final		540+50	0.13	0.12									724.49				725.28	727.74			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 04/17/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 543+00.00, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	543+00	0.54	0.48	10.00	5.39	6.65	2.6	3.2	15	56.1	0.0100	769.03	4.48	6.02	0.0033	769.71	773.73	4.02	3.45	I 3B
begin		543+00	0.54	0.48									768.47				769.46	771.72			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/09/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 553+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	553+00	0.94	0.85	10.00	5.39	6.65	4.6	5.6	15	57.9	0.0100	808.68	5.09	6.03	0.0101	809.79	813.18	3.39	3.25	I 3C
begin		553+00	0.94	0.85									808.10				809.21	811.35			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 571+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	571+00	0.99	0.89	10.00	5.39	6.66	4.8	5.9	15	58.6	0.0120	807.77	5.52	6.60	0.0111	808.84	813.07	4.23	4.05	I 3C
begin		571+00	0.99	0.89									807.07				808.18	810.32			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 04/17/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2: FROM 574+00, TO 574+72.73; FROM 575+50 TO 574+72.73 (LP), SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	574+00	0.32	0.29	10.00	5.39	6.57	1.6	1.9	15	72.7	0.0118	803.73	4.15	6.55	0.0011	804.62	809.53	4.91	4.55	I 3C
begin		574+72	0.32	0.29									802.87				804.53	809.47			0.015
1	2	575+50	0.32	0.29	10.29	5.34	6.57	3.1	3.8	15	77.3	0.0124	803.83	5.07	6.71	0.0046	804.53	809.63	5.10	4.55	I 3C
		574+72	0.64	0.58									802.87				803.89	809.47			0.015
2	3	574+72	0.16	0.14	10.55	5.29	6.53	3.8	4.7	15	63.5	0.0100	802.87	4.90	6.02	0.0070	803.74	809.47	5.73	5.35	I 3C
		574+72	0.80	0.72									802.24				803.30	805.49			0.015
3	4	574+72	0.00	0.00	10.76	5.25	6.51	3.8	4.7	15	77.7	0.2500	802.24	15.91	30.11	0.0069	802.58	805.49	2.91	2.00	MH 3
		574+72	0.80	0.72									782.82				783.88	786.07			0.015
4	5	574+72	0.00	0.00	10.84	5.24	6.50	3.8	4.7	15	13.9	0.0100	782.82	4.89	6.02	0.0069	783.83	786.07	2.23	2.00	MH 3
final		574+75	0.80	0.72									782.68				783.74	785.93			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 06/01/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 577+50 SR823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	577+50	0.18	0.16	10.00	5.39	6.69	0.9	1.1	15	7.9	0.0100	807.04	3.32	6.02	0.0004	807.79	811.04	3.25	2.75	CB 3A
begin		577+50	0.18	0.16									806.96				807.79	810.21			0.015
1	2	577+50	0.00	0.00	10.04	5.38	6.67	0.9	1.1	15	80.0	0.5000	806.96	13.07	42.58	0.0004	807.10	810.21	3.11	2.00	MH 3
		577+50	0.18	0.16									766.96				767.79	770.21			0.015
2	3	577+50	0.00	0.00	10.14	5.37	6.65	0.9	1.1	15	17.6	0.0100	766.96	3.32	6.02	0.0004	767.62	770.21	2.59	2.00	MH 3
final		577+50	0.18	0.16									766.79				767.61	770.04			0.015

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STORM SEWER SYSTEM

PID : 79977 **Date :** 06/01/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 578+00 SR823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	578+00	0.16	0.14	10.00	5.39	6.69	0.8	1.0	15	7.9	0.0100	807.89	3.21	6.02	0.0003	808.63	811.89	3.26	2.75	CB 3A
begin		578+00	0.16	0.14									807.81				808.63	811.06			0.015
1	2	578+00	0.00	0.00	10.04	5.38	6.67	0.8	1.0	15	66.3	0.5000	807.81	12.66	42.58	0.0003	807.94	811.06	3.12	2.00	MH 3
		578+00	0.16	0.14									774.66				775.48	777.91			0.015
2	3	578+00	0.00	0.00	10.13	5.37	6.65	0.8	1.0	15	17.6	0.0100	774.66	3.20	6.02	0.0003	775.31	777.91	2.60	2.00	MH 3
final		578+00	0.16	0.14									774.49				775.30	777.74			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 04/17/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 580+00.00, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL. (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	580+00	0.05	0.05	10.00	5.39	6.64	0.2	0.3	15	76.2	0.1000	811.43	5.13	19.04	0.0000	811.54	817.23	5.69	4.55	I 3B
begin		580+00	0.05	0.05									803.81				804.54	807.06			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 581+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	581+00	0.46	0.41	10.00	5.39	6.65	2.2	2.8	15	55.9	0.0100	815.73	4.31	6.03	0.0024	816.35	820.43	4.08	3.45	I 3B
begin		581+00	0.46	0.41									815.17				816.13	818.42			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 590+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	590+00		0.48	0.43	10.00	5.39	6.65	2.3	2.9	15	55.9	0.0100	851.45	4.35	6.03	0.0026	852.08	856.15	4.07	3.45	I 3B
begin		590+00		0.48	0.43									850.89				851.86	854.14			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 599+50.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	599+50	0.52	0.47	10.00	5.39	6.65	2.5	3.1	15	55.4	0.0100	888.35	4.45	6.02	0.0031	889.02	894.15	5.13	4.55	I 3B
begin		599+50	0.52	0.47									887.80				888.78	891.05			0.015
1	2	599+50	0.00	0.00	10.21	5.35	6.62	2.5	3.1	15	169.0	0.5000	887.80	18.04	42.59	0.0031	888.03	891.05	3.01	2.00	MH 3
		599+50	0.52	0.47									803.29				804.27	804.54			0.015
2	3	599+50	0.00	0.00	10.36	5.32	6.60	2.5	3.1	15	16.5	0.0100	803.29	4.44	6.02	0.0031	804.16	806.54	2.38	2.00	MH 3
final		599+50	0.52	0.47									803.13				804.11	804.38			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/23/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 619+50.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / Σ AREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	619+50	0.54	0.49	10.00	5.39	6.65	2.6	3.3	15	58.5	0.0100	891.35	4.50	6.02	0.0034	892.03	897.15	5.12	4.55	I 3B
begin		619+50	0.54	0.49									890.77				891.75	894.02			0.015
1	2	619+50	0.00	0.00	10.22	5.35	6.59	2.6	3.2	15	258.0	0.4000	890.77	16.89	38.09	0.0033	891.02	894.02	3.00	2.00	MH 3
		619+50	0.54	0.49									787.57				788.56	782.82			0.015
2	3	619+50	0.00	0.00	10.47	5.31	6.58	2.6	3.2	15	17.0	0.0100	787.57	4.47	6.02	0.0033	788.44	790.82	2.38	2.00	MH 3
final		619+50	0.54	0.49									787.40				788.39	790.65			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 627+50.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	627+50		0.85	0.76	10.00	5.39	6.65	4.1	5.1	15	60.9	0.0100	862.85	4.99	6.03	0.0082	863.82	867.55	3.73	3.45	I 3B
begin		627+50		0.85	0.76									862.24				863.32	865.49			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 3, STA. 630+50, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	630+50		0.30	0.27	10.00	5.39	6.68	1.5	1.8	15	13.1	0.0100	851.20	3.83	6.02	0.0010	851.97	855.70	3.72	3.25	I 3D
begin		630+50		0.30	0.27									851.07				851.96	854.32			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 633+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	633+00	0.58	0.52	10.00	5.39	6.65	2.8	3.5	15	60.9	0.0100	844.12	4.58	6.03	0.0038	844.83	848.82	3.99	3.45	I 3B
begin		633+00	0.58	0.52									843.51				844.51	846.76			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 635+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	635+00	0.21	0.19	10.00	5.39	6.63	1.0	1.3	15	59.2	0.0100	839.23	3.47	6.02	0.0005	839.63	845.03	5.40	4.55	I 3B
begin		635+00	0.21	0.19									838.64				839.48	841.89			0.015
1	2	635+00	0.00	0.00	10.28	5.34	6.61	1.0	1.3	15	95.5	0.4000	838.64	12.72	38.09	0.0005	838.80	841.89	3.09	2.00	MH 3
		635+00	0.21	0.19									800.46				801.31	803.71			0.015
2	3	635+00	0.00	0.00	10.41	5.32	6.59	1.0	1.3	15	19.0	0.0100	800.46	3.46	6.02	0.0005	801.13	803.71	2.58	2.00	MH 3
final		635+00	0.21	0.19									800.27				801.12	803.52			0.015

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STORM SEWER SYSTEM

PID : 79977 **Date :** 04/18/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 3: FROM 637+00, TO 637+66.13; FROM 638+50 TO 637+66.13 (LP), SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	637+00	0.21	0.19	10.00	5.39	6.59	1.0	1.3	15	66.1	0.0183	838.62	4.32	8.15	0.0005	838.96	843.32	4.36	3.45	I 3B
begin		637+66	0.21	0.19									837.41				838.36	843.21			0.015
0	1	638+50	0.48	0.43	10.00	5.39	6.64	2.3	2.8	15	83.9	0.0153	838.69	5.06	7.44	0.0026	839.25	843.39	4.14	3.45	I 3B
begin		637+66	0.69	0.62									837.41				838.37	843.21			0.015
1	2	637+66	0.16	0.14	10.28	5.34	6.59	4.1	5.0	15	63.2	0.0100	837.41	4.97	6.02	0.0080	838.36	843.21	4.85	4.55	I 3B
final		637+66	0.85	0.76									836.78				837.86	840.03			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 4, STA. 653+00, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	653+00	0.10	0.09	10.00	5.39	6.68	0.5	0.6	15	13.1	0.0100	823.25	2.80	6.02	0.0001	823.90	827.75	3.85	3.25	I 3D
begin		653+00	0.10	0.09									823.12				823.90	826.37			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 653+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	653+00	1.06	0.95	10.00	5.39	6.65	5.1	6.3	15	60.9	0.0100	822.46	5.18	6.03	0.0128	823.76	827.16	3.40	3.45	I 3B
begin		653+00	1.06	0.95									821.85				822.98	825.10			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 4, STA. 654+00, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	654+00	0.25	0.23	10.00	5.39	6.68	1.2	1.5	15	13.1	0.0100	817.95	3.65	6.02	0.0007	818.69	822.45	3.75	3.25	I 3D
begin		654+00	0.25	0.23									817.82				818.68	821.07			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 655+50.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	655+50	0.26	0.24	10.00	5.39	6.64	1.3	1.6	15	60.9	0.0100	813.11	3.71	6.03	0.0008	813.56	817.81	4.25	3.45	I 3B
begin		655+50	0.26	0.24									812.50				813.37	815.75			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 06/07/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :FROM STA. 656+00 (CB8) TO STA. 656+50 (CB8) TO STA. 658+00 (MH3) SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	656+00	3.63	2.58	15.00	4.60	5.70	11.9	14.7	18	50.7	0.0276	806.35	9.47	16.27	0.0261	807.72	811.35	3.63	3.50	CB 8
begin		656+00	3.63	2.58									804.95				806.40	809.95			0.015
1	2	656+50	0.08	0.05	15.09	4.59	5.67	12.1	14.9	18	150.0	0.0618	804.95	13.02	24.34	0.0269	805.84	809.95	4.11	3.50	CB 8
		656+50	3.71	2.63									795.68				797.13	802.23			0.015
0	2	658+00	0.26	0.24	10.00	5.39	6.67	1.3	1.6	15	72.3	0.1358	805.75	9.30	22.19	0.0008	805.98	811.55	5.57	4.55	I 3B
begin		658+00	3.97	2.87									795.93				796.80	802.23			0.015
2	3	658+00	0.00	0.00	15.28	4.57	5.66	13.1	16.2	18	135.1	0.5000	795.68	28.59	69.25	0.0318	796.19	798.93	2.74	1.75	MH 3
		658+00	3.97	2.87									728.13				729.59	730.98			0.015
3	4	658+00	0.00	0.00	15.36	4.56	5.66	13.1	16.2	18	11.8	0.0320	728.13	10.25	17.52	0.0318	729.59	730.98	1.39	1.35	MH 3
final		658+00	3.97	2.87									727.75				729.22	730.85			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 04/17/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 4: FROM 660+50, TO 661+36.84; FROM 662+00 TO 661+36.84 (LP), SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	660+50	0.26	0.24	10.00	5.39	6.62	1.3	1.6	15	86.8	0.0150	803.97	4.29	7.37	0.0008	804.38	808.67	4.29	3.45	I 3B
begin		661+36	0.26	0.24									802.67				803.54	808.47			0.015
0	1	662+00	0.16	0.14	10.00	5.39	6.64	0.8	0.9	15	63.2	0.0192	803.88	4.03	8.34	0.0003	804.18	808.58	4.40	3.45	I 3B
begin		661+36	0.42	0.38									802.67				803.49	808.47			0.015
1	2	661+36	0.16	0.14	10.34	5.33	6.57	2.8	3.4	15	67.4	0.0100	802.67	4.56	6.02	0.0038	803.38	808.47	5.09	4.55	I 3B
final		661+36	0.58	0.52									802.00				802.99	805.25			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 663+50.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	663+50	0.32	0.29	10.00	5.39	6.64	1.5	1.9	15	60.9	0.0100	805.00	3.90	6.03	0.0011	805.50	809.70	4.20	3.45	I 3B
begin		663+50	0.32	0.29									804.39				805.29	807.64			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 666+50.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	666+50	0.32	0.29	10.00	5.39	6.64	1.5	1.9	15	60.9	0.0100	810.91	3.90	6.03	0.0011	811.41	815.61	4.20	3.45	I 3B
begin		666+50	0.32	0.29									810.30				811.20	813.55			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 669+50.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	669+50	0.42	0.38	10.00	5.39	6.64	2.0	2.5	15	60.9	0.0100	821.10	4.21	6.03	0.0020	821.69	825.80	4.11	3.45	I 3B
begin		669+50	0.42	0.38									820.49				821.43	823.74			0.015

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STORM SEWER SYSTEM

PID : 79977 **Date :** 02/23/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 673+50.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	673+50	0.53	0.48	10.00	5.39	6.65	2.6	3.2	15	60.9	0.0100	834.40	4.46	6.02	0.0032	835.07	840.20	5.13	4.55	I 3B
begin		673+50	0.53	0.48									833.79				834.77	837.04			0.015
1	2	673+50	0.00	0.00	10.23	5.35	6.60	2.6	3.1	15	187.4	0.3333	833.79	15.73	34.77	0.0032	834.05	837.06	3.00	2.02	MH 3
		673+50	0.53	0.48									771.33				772.31	774.58			0.015
2	3	673+50	0.00	0.00	10.43	5.31	6.59	2.5	3.1	15	15.9	0.0100	771.33	4.45	6.02	0.0031	772.20	774.58	2.38	2.00	MH 3
final		673+50	0.53	0.48									771.17				772.15	774.42			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 4, STA. 676+50, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	676+50		0.25	0.23	10.00	5.39	6.68	1.2	1.5	15	13.1	0.0100	845.75	3.65	6.02	0.0007	846.49	850.25	3.75	3.25	I 3D
begin		676+50		0.25	0.23									845.62				846.48	848.87			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 678+50.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	678+50		1.03	0.93	10.00	5.39	6.66	5.0	6.2	15	61.3	0.0130	853.50	5.75	6.87	0.0121	854.57	858.20	3.63	3.45	I 3B
begin		678+50		1.03	0.93									852.70				853.83	855.95			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 4, STA. 684+50, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	684+50	0.30	0.27	10.00	5.39	6.68	1.5	1.8	15	13.1	0.0100	868.65	3.83	6.02	0.0010	869.42	873.15	3.73	3.25	I 3D
begin		684+50	0.30	0.27									868.52				869.41	871.77			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 04/27/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 691+00 (CATCH BASIN), 95.5' RT, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	691+00	4.96	3.53	15.00	4.60	5.66	16.2	20.0	24	181.3	0.0200	858.75	9.16	29.83	0.0104	860.01	863.75	3.74	3.00	CB 8
begin		691+00	4.96	3.53									855.12				856.93	859.12			0.015
1	2	691+00	0.00	0.00	15.33	4.56	5.66	16.1	19.9	24	82.8	0.5000	855.12	29.46	149.13	0.0103	855.64	859.12	3.49	2.00	MH 3
		691+00	4.96	3.53									813.72				815.53	817.72			0.015
2	3	691+00	0.00	0.00	15.38	4.55	5.65	16.1	19.9	24	28.6	0.0200	813.72	9.14	29.83	0.0103	815.25	817.72	2.48	2.00	MH 3
final		691+00	4.96	3.53									813.15				814.95	817.15			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 04/27/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 693+50 (CATCH BASIN), 198.4' RT, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	693+50	7.47	5.28	15.00	4.60	5.65	24.3	29.8	24	329.4	0.0400	841.75	13.15	42.18	0.0231	843.06	846.75	3.69	3.00	CB 8
begin		693+50	7.47	5.28									828.57				830.50	832.57			0.015
1	2	693+50	0.00	0.00	15.42	4.55	5.63	24.0	29.7	24	222.4	0.5000	828.57	33.09	149.13	0.0230	829.20	832.57	3.37	2.00	MH 3
		693+50	7.47	5.28									717.37				719.30	721.37			0.015
2	3	693+50	0.00	0.00	15.53	4.53	5.63	24.0	29.7	24	20.6	0.0400	717.37	13.09	42.18	0.0230	718.95	721.37	2.42	2.00	MH 3
final		693+50	7.47	5.28									716.55				718.48	720.55			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/26/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 697+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	697+00	0.92	0.83	10.00	5.39	6.65	4.5	5.5	15	57.5	0.0100	855.82	5.06	6.02	0.0097	856.90	861.62	4.72	4.55	I 3B
begin		697+00	0.92	0.83									855.25				856.35	858.50			0.015
1	2	697+50	0.00	0.00	10.19	5.36	6.62	4.4	5.5	15	202.0	0.5000	855.25	21.32	42.58	0.0096	855.56	858.50	2.94	2.00	MH 3
		697+50	0.92	0.83									754.25				755.35	757.50			0.015
2	3	697+50	0.00	0.00	10.35	5.33	6.61	4.4	5.5	15	16.5	0.0100	754.25	5.05	6.02	0.0095	755.34	755.50	0.16	0.00	MH 3
final		697+50	0.92	0.83									754.09				755.18	757.34			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/26/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 702+50.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	702+50	0.53	0.48	10.00	5.39	6.66	2.6	3.2	15	88.2	0.0500	833.50	8.02	13.47	0.0032	833.93	839.30	5.37	4.55	I 3B
begin		702+50	0.53	0.48									829.09				830.07	832.34			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 707+00 (I3B); STA. 707+00 (I3D); SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	707+00	0.48	0.43	10.00	5.39	6.65	2.3	2.8	15	48.0	0.0100	815.70	4.34	6.02	0.0026	816.34	820.40	4.06	3.45	I 3B
begin		707+00	0.48	0.43									815.22				816.22	818.47			0.015
1	2	707+00	0.25	0.23	10.18	5.36	6.65	3.5	4.3	15	13.0	0.0100	815.22	4.82	6.02	0.0060	816.22	819.65	3.43	3.18	I 3D
final		707+00	0.73	0.65									815.09				816.14	818.34			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, STA. 708+50, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	708+50	0.14	0.13	10.00	5.39	6.68	0.7	0.8	15	13.1	0.0100	810.20	3.09	6.02	0.0002	810.88	814.70	3.82	3.25	I 3D
begin		708+50	0.14	0.13									810.07				810.87	813.32			0.015

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STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, STA. 710+50, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	710+50	0.30	0.27	10.00	5.39	6.68	1.5	1.8	15	13.1	0.0100	800.45	3.83	6.02	0.0010	801.22	804.95	3.73	3.25	I 3D
begin		710+50	0.30	0.27									800.32				801.21	803.57			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 711+00 (I3B); STA. 711+00 (I3D); SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	711+00		0.42	0.38	10.00	5.39	6.65	2.0	2.5	15	48.0	0.0100	798.90	4.21	6.02	0.0020	799.49	803.60	4.11	3.45	I 3B
begin		711+00		0.42	0.38									798.42				799.36	802.85			0.015
1	2	711+00		0.04	0.04	10.19	5.36	6.64	2.2	2.8	15	13.0	0.0100	798.42	4.31	6.02	0.0024	799.28	802.85	3.57	3.18	I 3D
final		711+00		0.46	0.42									798.29				799.25	801.54			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/26/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 714+50.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / Σ AREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	714+50	0.28	0.25	10.00	5.39	6.64	1.3	1.6	15	55.9	0.0100	784.48	3.75	6.03	0.0009	784.94	789.18	4.24	3.45	I 3B
begin		714+50	0.28	0.25									783.92				784.80	787.17			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/26/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 715+50.00 TO STA. 716+00, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	715+50	0.05	0.05	10.00	5.39	6.64	0.2	0.3	15	50.0	0.0296	780.00	3.35	10.36	0.0000	780.15	785.80	5.65	4.55	I 3B
begin		715+50	0.05	0.05									778.52				779.25	784.32			0.015
1	2	715+50	0.03	0.02	10.25	5.35	6.56	0.4	0.4	15	55.3	0.0100	778.52	2.57	6.02	0.0001	778.76	784.32	5.56	4.55	I 3B
		716+00	0.08	0.07									777.97				778.72	781.22			0.015
2	3	716+00	0.00	0.00	10.61	5.28	6.52	0.4	0.4	15	102.3	0.5000	777.97	10.01	42.58	.0.0001	778.06	781.22	3.16	2.00	MH 3
		716+00	0.08	0.07									726.82				727.57	730.07			0.015
3	4	716+00	0.00	0.00	10.78	5.25	6.50	0.4	0.4	15	16.5	0.0100	726.82	2.57	6.02	0.0001	727.41	730.07	2.66	2.00	MH 3
final		716+00	0.08	0.07									726.66				727.41	729.91			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 06/01/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 720+50 SR823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	720+50	0.34	0.31	10.00	5.39	6.69	1.6	2.0	15	7.9	0.0100	772.50	3.97	6.02	0.0013	773.34	776.50	3.16	2.75	CB 3A
begin		720+50	0.34	0.31									772.42				773.33	775.67			0.015
1	2	720+50	0.00	0.00	10.03	5.39	6.68	1.6	2.0	15	63.5	0.5000	772.42	15.92	42.58	0.0013	772.61	775.67	3.06	2.00	MH 3
		720+50	0.34	0.31									740.67				741.58	743.92			0.015
2	3	720+50	0.00	0.00	10.10	5.37	6.66	1.6	2.0	15	17.5	0.0100	740.67	3.96	6.02	0.0013	741.43	743.92	2.49	2.00	MH 3
final		720+50	0.34	0.31									740.50				741.41	743.75			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 06/02/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :RH#5: FROM 720+50 & 722+00 TO 721+13.64; 720+50 TO 721+13.64 47' LT; SR823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	2	720+50	0.23	0.21	10.00	5.39	6.64	1.1	1.4	15	63.6	0.0127	771.38	3.86	6.79	0.0006	771.77	777.18	5.41	4.55	I 3B
begin		721+13	0.23	0.21									770.57				771.43	777.07			0.015
0	2	722+00	0.10	0.09	10.00	5.39	6.53	0.5	0.6	15	86.4	0.0104	771.47	2.86	6.15	0.0001	771.74	777.27	5.53	4.55	I 3B
begin		721+13	0.33	0.30									770.57				771.41	777.07			0.015
0	3	720+50	0.34	0.31	10.00	5.39	6.53	1.6	2.0	15	63.6	0.0382	772.50	6.43	11.77	0.0013	772.86	776.50	3.64	2.75	CB 3A
begin		721+13	0.67	0.60									770.07				771.32	776.37			0.015
2	3	721+13	0.08	0.07	10.50	5.30	6.53	1.9	2.4	15	49.8	0.0100	770.57	4.14	6.03	0.0018	771.41	777.07	5.66	5.25	I 3B
		721+13	0.75	0.67									770.07				771.32	776.37			0.015
3	4	721+13	0.39	0.35	10.70	5.26	6.53	5.4	6.7	15	16.1	0.0100	770.07	5.20	6.02	0.0142	771.32	776.37	5.05	5.05	CB 3
		721+13	1.14	1.02									769.91				771.05	773.16			0.015
4	5	721+13	0.00	0.00	10.76	5.26	6.50	5.4	6.6	15	105.6	0.3125	769.91	19.03	33.67	0.0141	770.30	773.16	2.86	2.00	MH 3
		721+13	1.14	1.02									736.91				738.16	740.16			0.015
5	6	721+13	0.00	0.00	10.85	5.24	6.50	5.4	6.6	15	17.7	0.0100	736.91	5.19	6.02	0.0141	738.16	740.16	2.00	2.00	MH 3
final		721+13	1.14	1.02									736.73				737.88	739.98			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/13/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 724+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	724+00	0.40	0.36	10.00	5.39	6.64	2.0	2.4	15	63.1	0.0100	773.52	4.16	6.03	0.0019	774.09	779.32	5.23	4.55	I 3B
begin		724+00	0.40	0.36									772.89				773.82	776.14			0.015
1	2	724+00	0.00	0.00	10.25	5.35	6.63	1.9	2.4	15	39.4	0.3333	772.89	14.48	34.77	0.0019	773.12	776.14	3.02	2.00	MH 3
		724+00	0.40	0.36									759.76				760.70	763.01			0.015
2	3	724+00	0.00	0.00	10.30	5.34	6.62	1.9	2.4	15	16.0	0.0100	759.76	4.15	6.02	0.0018	760.57	763.01	2.45	2.00	MH 3
final		724+00	0.40	0.36									759.60				760.54	762.85			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, STA. 729+50, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	729+50	0.04	0.04	10.00	5.39	6.67	0.2	0.2	15	13.1	0.0100	791.34	2.15	6.02	0.0000	791.93	795.84	3.91	3.25	I 3D
begin		729+50	0.04	0.04									791.21				791.93	794.46			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, STA. 730+00, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	730+00	0.17	0.15	10.00	5.39	6.68	0.8	1.0	15	13.1	0.0100	793.64	3.27	6.02	0.0003	794.33	798.14	3.81	3.25	I 3D
begin		730+00	0.17	0.15									793.51				794.33	796.76			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 732+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	732+00	0.51	0.46	10.00	5.39	6.65	2.5	3.0	15	56.0	0.0100	803.10	4.41	6.02	0.0029	803.75	807.80	4.05	3.45	I 3B
begin		732+00	0.51	0.46									802.54				803.52	805.79			0.015

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STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, STA. 732+00, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA	ΣAREA (acres)	ΔCA	ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	736+50		0.37	0.37	0.33	0.33	10.00	5.39	6.69	1.8	2.2	15	13.1	0.0100	802.84	4.07	6.02	0.0016	803.65	807.34	3.69	3.25	I 3D
begin		732+00		0.37		0.33										802.71				803.63	805.96			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 05/21/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 5, STA. 736+50, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	736+50	0.41	0.37	10.00	5.39	6.69	2.0	2.5	15	13.1	0.0100	823.54	4.18	6.02	0.0020	824.38	828.04	3.66	3.25	I 3D
begin		736+50	0.41	0.37									823.41				824.35	826.66			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 742+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	742+00	0.74	0.67	10.00	5.39	6.65	3.6	4.4	15	56.0	0.0100	849.10	4.84	6.02	0.0063	849.94	853.80	3.86	3.45	I 3B
begin		742+00	0.74	0.67									848.54				849.59	851.79			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/27/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 750+00.00, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	750+00	0.80	0.72	10.00	5.39	6.65	3.9	4.8	15	59.6	0.0100	879.41	4.93	6.03	0.0073	880.31	885.21	4.90	4.55	I 3C
begin		750+00	0.80	0.72									878.81				879.88	882.06			0.015
1	2	750+00	0.00	0.00	10.20	5.35	6.63	3.9	4.8	15	142.2	0.5000	878.81	20.49	42.58	0.0072	879.10	882.06	2.96	2.00	MH 3
		750+00	0.80	0.72									807.71				808.78	810.96			0.015
2	3	750+00	0.00	0.00	10.32	5.33	6.61	3.8	4.8	15	21.6	0.0100	807.71	4.91	6.02	0.0072	808.72	810.96	2.24	2.00	MH 3
final		750+00	0.80	0.72									807.49				808.56	810.74			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/16/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 758+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	758+00	0.70	0.63	10.00	5.39	6.65	3.4	4.2	15	61.5	0.0100	895.08	4.79	6.02	0.0056	895.89	900.38	4.49	4.05	I 3C
begin		758+00	0.70	0.63									894.47				895.50	897.72			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/27/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 765+00.00, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	765+00	0.70	0.63	10.00	5.39	6.65	3.4	4.2	15	61.1	0.0100	906.88	4.79	6.02	0.0056	907.69	912.68	4.99	4.55	I 3C
begin		765+00	0.70	0.63									906.27				907.31	909.52			0.015
1	2	765+00	0.00	0.00	10.21	5.35	6.59	3.4	4.2	15	282.7	0.3333	906.27	17.08	34.77	0.0055	906.57	909.52	2.95	2.00	MH 3
		765+00	0.70	0.63									812.05				813.08	815.30			0.015
2	3	765+00	0.00	0.00	10.49	5.30	6.58	3.4	4.2	15	10.7	0.0100	812.05	4.77	6.02	0.0055	813.04	815.30	2.26	2.00	MH 3
final		765+00	0.70	0.63									811.94				812.98	815.19			0.015

STORM SEWER SYSTEM

PID : 79977 **Date :** 02/27/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 772+00.00, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	772+00	1.01	0.91	10.00	5.39	6.65	4.9	6.0	15	63.1	0.0120	919.18	5.55	6.60	0.0117	920.28	924.98	4.70	4.55	I 3C
begin		772+00	1.01	0.91									918.42				919.55	921.67			0.015
1	2	772+00	0.00	0.00	10.19	5.36	6.60	4.9	6.0	15	229.5	0.2500	918.42	17.08	30.11	0.0115	918.82	921.67	2.86	2.00	MH 3
		772+00	1.01	0.91									861.05				862.17	864.30			0.015
2	3	772+00	0.00	0.00	10.41	5.32	6.59	4.8	6.0	15	15.6	0.0120	861.05	5.53	6.59	0.0114	862.16	864.30	2.14	2.00	MH 3
final		772+00	1.01	0.91									860.86				861.98	864.11			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 789+00 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 920.09

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	789+00	0.68	0.61	10.00	5.39	6.65	3.3	4.1	15	55.0	0.0100	924.55	4.75	6.02	0.0053	925.34	929.36	4.02	3.56	I 3C
begin		789+00	0.68	0.61									924.00				925.03	930.51			0.015
2	3	789+00	0.00	0.00	10.19	5.36	6.64	3.3	4.1	15	16.1	0.3329	924.00	16.88	34.75	0.0053	924.30	927.25	2.95	2.00	
		789+00	0.68	0.61									918.64				920.13	921.89			0.015
3	4	789+00	0.00	0.00	10.21	5.35	6.64	3.3	4.1	15	8.0	0.0100	918.64	4.74	6.02	0.0053	920.13	921.89	1.76	2.00	
final		789+00	0.68	0.61									918.56				920.09	919.81			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 799+00 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 882.38

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	799+00	1.00	0.90	10.00	5.39	6.67	4.9	6.0	15	77.0	0.0797	886.91	11.32	17.01	0.0115	887.44	891.71	4.27	3.55	I 3C
begin		799+00	1.00	0.90									880.77				882.38	882.02			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 809+00 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 847.55

JUNCTION From	JUNCTION To	STATION From	STATION To	ΔAREA	ΣAREA (acres)	ΔCA	ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	809+00		1.00		0.90		10.00	5.39	6.66	4.9	6.0	15	64.0	0.0150	846.91	6.06	7.38	0.0114	848.28	851.71	3.43	3.55	I 3C
begin		809+00		1.00		0.90										845.95				847.55	847.20			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 818+00 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 745.45

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	818+00	0.90	0.81	10.00	5.39	6.66	4.4	5.4	15	52.0	0.0100	810.91	5.04	6.02	0.0093	811.97	815.71	3.74	3.55	I 3C
begin		818+00	0.90	0.81									810.39				811.49	811.64			0.015
2	3	818+00	0.00	0.00	10.17	5.36	6.65	4.3	5.4	15	32.8	0.5000	810.39	21.25	42.58	0.0093	810.70	811.64	0.94	0.00	
		818+00	0.90	0.81									793.97				795.07	795.22			0.015
3	4	818+00	0.00	0.00	10.20	5.36	6.65	4.3	5.4	15	8.0	0.0100	793.97	5.04	6.02	0.0092	795.06	795.22	0.16	0.00	
final		818+00	0.90	0.81									793.89				794.99	795.14			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 825+50 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 781.31

JUNCTION From	JUNCTION To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	825+50	0.74	0.67	10.00	5.39	6.66	3.6	4.4	15	59.0	0.0185	780.93	6.12	8.19	0.0063	781.68	785.73	4.05	3.55	I 3B
begin		825+50	0.74	0.67									779.84				781.31	781.09			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 834+00 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 747.90

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	834+00	0.44	0.40	10.00	5.39	6.63	2.1	2.6	15	58.0	0.0054	746.93	3.38	4.43	0.0022	748.03	751.73	3.70	3.55	I 3B
begin		834+00	0.44	0.40									746.62				747.90	751.25			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 842+00 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 715.87

JUNCTION From	JUNCTION To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	842+00	0.40	0.36	10.00	5.39	6.63	1.9	2.4	15	57.0	0.0050	714.93	3.22	4.28	0.0018	715.97	719.73	3.76	3.55	I 3B
begin		842+00	0.40	0.36									714.64				715.87	719.25			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 850+50 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 675.26

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	850+50	0.58	0.52	10.00	5.39	6.67	2.8	3.5	15	60.0	0.0410	682.25	7.67	12.19	0.0039	682.73	687.05	4.32	3.55	I 3C
begin		850+50	0.58	0.52									679.79				680.79	685.95			0.015
1	2	850+50	0.00	0.00	10.13	5.37	6.66	2.8	3.5	15	17.5	0.3331	679.79	16.18	34.76	0.0038	680.07	683.04	2.97	2.00	CB 3
		850+50	0.58	0.52									673.96				675.29	677.21			0.015
2	3	850+50	0.00	0.00	10.15	5.36	6.66	2.8	3.5	15	8.0	0.0100	673.96	4.56	6.02	0.0038	675.29	677.21	1.92	2.00	I 3C
final		850+50	0.58	0.52									673.88				675.26	675.13			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 860+00 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 669.69

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	860+00	0.96	0.86	10.00	5.39	6.66	4.7	5.8	15	65.0	0.0266	669.76	7.47	9.82	0.0106	670.48	674.56	4.08	3.55	I 3C
begin		860+00	0.96	0.86									668.03				669.69	669.28			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 867+00 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 663.97

JUNCTION From	To	STATION From / To	ΔAREA / Σ AREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	867+00	0.69	0.62	10.00	5.39	6.66	3.3	4.1	15	63.0	0.0154	663.49	5.60	7.47	0.0054	664.31	668.29	3.98	3.55	I 3C
begin		867+00	0.69	0.62									662.52				663.97	663.78			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 873+50 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 646.69

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	873+50		0.59	0.53	10.00	5.39	6.65	2.9	3.5	15	56.0	0.0100	645.87	4.59	6.02	0.0040	646.91	650.67	3.76	3.55	I 3B
begin		873+50		0.59	0.53									645.31				646.69	646.56			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 882+00 **Designer :** CTS

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 621.64

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	882+00	0.30	0.27	10.00	5.39	6.64	1.5	1.8	15	54.0	0.0080	620.42	3.53	5.39	0.0010	621.70	625.22	3.52	3.55	I 3B
begin		882+00	0.30	0.27									619.99				621.64	624.60			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 09/04/2007 **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 891+15 **Designer :** ADW

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / Σ AREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	891+00	0.31	0.28	10.00	5.39	6.68	1.5	1.9	15	49.6	0.1613	585.75	10.40	24.19	0.0011	585.99	597.77	11.78	10.77	I 3B
begin		891+00	0.31	0.28									577.75				578.65	581.75			0.015
2	3	891+15	0.12	0.11	10.08	5.38	6.60	2.1	2.6	15	88.0	0.0102	577.75	4.26	6.09	0.0021	578.34	581.75	3.41	2.75	CB 5
			0.43	0.39									576.85				577.80	587.10			0.015
3	4	2611+70	0.12	0.11	10.42	5.31	6.59	2.6	3.3	15	16.2	0.5000	576.85	18.34	42.58	0.0034	577.09	578.10	1.01	0.00	
		2611+70	0.55	0.49									568.75				569.75	570.00			0.015
4	5	2611+70	0.12	0.11	10.44	5.31	6.59	3.2	4.0	15	6.0	0.0100	568.75	4.71	6.02	0.0050	569.75	570.00	0.25	0.00	
final		2611+70	0.67	0.60									568.69				569.72	569.94			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 08/28/2007 **Project :** PORTSMOUTH BYPASS **Location :** SR 823

Description :STA 893+00 **Designer :** ME

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL. (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	893+14	0.14	0.13	10.00	5.39	6.62	0.7	0.8	15	60.0	0.0100	586.33	3.09	6.02	0.0002	586.66	591.78	5.12	4.20	I 3D
begin		892+95	0.14	0.13									585.73				586.54	586.98			0.015
2	3	892+95	0.20	0.18	10.32	5.33	6.62	1.6	2.0	15	10.0	0.0110	585.73	4.09	6.32	0.0013	586.54	592.35	5.81	5.37	I 3D
		892+95	0.34	0.31									585.62				586.53	586.87			0.015
3	4	892+95	0.00	0.00	10.36	5.32	6.61	1.6	2.0	15	41.0	0.5054	585.62	15.90	42.81	0.0013	585.81	586.87	1.06	0.00	
		892+95	0.34	0.31									564.90				565.81	566.15			0.015
4	5	892+95	0.00	0.00	10.41	5.32	6.60	1.6	2.0	15	7.0	0.0100	564.90	3.95	6.02	0.0013	565.75	566.15	0.40	0.00	
final		892+95	0.34	0.31									564.83				565.74	566.08			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 08/29/2007 **Project :** PORTSMOUTH BYPASS **Location :** SR 823

Description :STA 894+50.00 **Designer :** ME

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 562.09

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	894+50	0.10	0.09	10.00	5.39	6.66	0.5	0.6	15	37.0	0.0300	582.93	4.13	10.43	0.0001	583.14	584.74	1.60	0.56	I 3B
begin		894+50	0.10	0.09									581.82				582.60	583.07			0.015
2	3	894+50	0.00	0.00	10.15	5.36	6.65	0.5	0.6	15	41.0	0.4949	581.82	10.97	42.37	0.0001	581.93	583.07	1.14	0.00	
		894+50	0.10	0.09									561.53				562.31	562.78			0.015
3	4	894+50	0.00	0.00	10.21	5.35	6.64	0.5	0.6	15	7.3	0.0301	561.53	4.10	10.45	0.0001	562.09	562.78	0.69	0.00	
final		894+50	0.10	0.09									561.31				562.09	562.56			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 08/29/2007 **Project :** PORTSMOUTH BYPASS **Location :** SR 823

Description :STA 900+00 **Designer :** ME

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	900+02	0.38	0.34	10.00	5.39	6.63	1.8	2.3	15	63.0	0.0100	565.69	4.09	6.02	0.0016	566.24	571.14	4.90	4.20	I 3D
begin		899+76	0.38	0.34									565.06				566.10	571.93			0.015
2	3	899+76	0.38	0.34	10.26	5.34	6.63	3.7	4.5	15	6.0	0.0100	565.06	4.86	6.02	0.0066	566.10	571.93	5.83	5.62	I 3D
		899+76	0.76	0.68									565.00				566.06	566.25			0.015
3	4	899+76	0.00	0.00	10.28	5.34	6.62	3.7	4.5	15	56.0	0.5029	564.99	20.24	42.71	0.0065	565.28	566.24	0.96	0.00	
		899+76	0.76	0.68									536.83				537.89	538.08			0.015
4	5	899+76	0.00	0.00	10.32	5.33	6.62	3.6	4.5	15	7.0	0.0100	536.83	4.86	6.02	0.0065	537.86	538.08	0.22	0.00	
final		899+76	0.76	0.68									536.76				537.82	538.01			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 04/22/2007 **Project :** Portsmouth Bypass **Location :** SR 823

Description : Sta. 903+00 **Designer :** ME

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 557.77

JUNCTION From	JUNCTION To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	903+00	0.19	0.17	10.00	5.39	6.63	0.9	1.1	15	56.0	0.0100	557.42	3.36	6.02	0.0004	557.80	562.22	4.42	3.55	I 3B
begin		903+00	0.19	0.17									556.86				557.77	559.36			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 04/22/2007 **Project :** Portsmouth Bypass **Location :** Ramp A

Description : Sta. 1909+50 **Designer :** ADW

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 538.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	1909+50	0.43	0.39	10.00	5.39	6.64	2.1	2.6	15	68.0	0.0100	537.41	4.23	6.02	0.0021	538.14	542.21	4.07	3.55	I 3C
begin		1909+50	0.43	0.39									536.73				538.00	537.98			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 04/22/2007 **Project :** Portsmouth Bypass **Location :** Ramp A

Description : Sta. 1912+00 **Designer :** ADW

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 536.51

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	1912+00		0.17	0.15	10.00	5.39	6.66	0.8	1.0	15	42.0	0.0155	536.33	3.82	7.49	0.0003	536.65	541.07	4.42	3.49	I 3C
begin		1912+00		0.17	0.15									535.68				536.51	536.93			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 04/22/2007 **Project :** Portsmouth By Pass **Location :** Ramp A and D trumpet

Description : Ramp A Infield Drainage 1915+00 **Designer :** ADW

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 526.57

JUNCTION From	To	STATION From	To	ΔAREA	ΣAREA (acres)	ΔCA	ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	1915+00		5.23	2.88	15.00	4.60	5.61	13.3	16.2	24	193.0	0.0048	525.06	4.91	14.56	0.0068	527.88	527.98	0.10	0.92	CB 8
begin		1915+00		5.23	2.88									524.14				526.57	528.14			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 08/28/2007 **Project :** PORTSMOUTH BYPASS **Location :** US 23 RAMP B

Description :STA. 2600+50.00 **Designer :** ME

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL. (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	2600+50	0.79	0.71	10.00	5.39	6.69	3.8	4.8	15	4.0	0.0100	545.71	4.91	6.02	0.0072	546.77	550.51	3.74	3.55	I 3D
begin		2600+50	0.79	0.71									545.67				546.74	546.92			0.015
2	3	2600+50	0.00	0.00	10.01	5.39	6.69	3.8	4.8	15	28.0	0.5068	545.67	20.53	42.87	0.0072	545.96	546.92	0.96	0.00	
		2600+50	0.79	0.71									531.48				532.55	532.73			0.015
3	4	2600+50	0.00	0.00	10.04	5.38	6.68	3.8	4.8	15	7.0	0.0100	531.27	4.91	6.02	0.0072	532.32	532.52	0.20	0.00	
final		2600+50	0.79	0.71									531.20				532.27	532.45			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 08/28/2007 **Project :** Portsmouth Bypass **Location :** US 23 Ramp C

Description : Ramp C Infield Area **Designer :** ME

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	3891+50	0.04	0.03	10.00	5.39	6.63	0.2	0.2	15	50.0	0.0300	589.50	2.99	10.43	0.0000	589.63	592.50	2.87	1.75	CB 2-2B
begin		3891+50	0.04	0.03									588.00				588.71	589.25			0.015
2	3	3891+50	0.00	0.00	10.28	5.34	6.62	0.2	0.2	15	35.0	0.4934	588.00	7.95	42.30	0.0000	588.07	589.25	1.18	0.00	
		3891+50	0.04	0.03									570.73				571.44	571.98			0.015
3	4	3891+50	0.00	0.00	10.35	5.33	6.61	0.2	0.2	15	7.0	0.0314	570.73	3.05	10.68	0.0000	571.22	571.98	0.76	0.00	
final		3891+50	0.04	0.03									570.51				571.22	571.76			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 08/29/2007 **Project :** PORTSMOUTH BYPASS **Location :** US 23 RAMP C

Description :STA 3906+47 **Designer :** ME

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	3906+47	0.91	0.82	10.00	5.39	6.68	4.4	5.5	15	23.0	0.0187	531.21	6.47	8.23	0.0095	532.10	541.92	9.82	9.46	I 3D
begin		3906+47	0.91	0.82									530.78				531.88	532.29			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 09/04/2007 **Project :** Portsmouth Bypass **Location :** US 23

Description : Sta. 616+00 **Designer :** ADW

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 24.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	616+00	0.91	0.62	10.00	5.39	6.62	3.3	4.1	15	75.0	0.0050	535.25	3.61	4.26	0.0053	536.31	537.21	0.90	0.71	CB 5
begin		616+00	0.91	0.61									534.88				535.91	535.75			0.015

STORM SEWER SYSTEM

PID : 19415 **Date :** 08/28/2007 **Project :** PORTSMOUTH BYPASS **Location :** US 23 RAMP B

Description :INLET, WIDENED US 23 SHOULDER STA 2596+90 **Designer :** ME

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

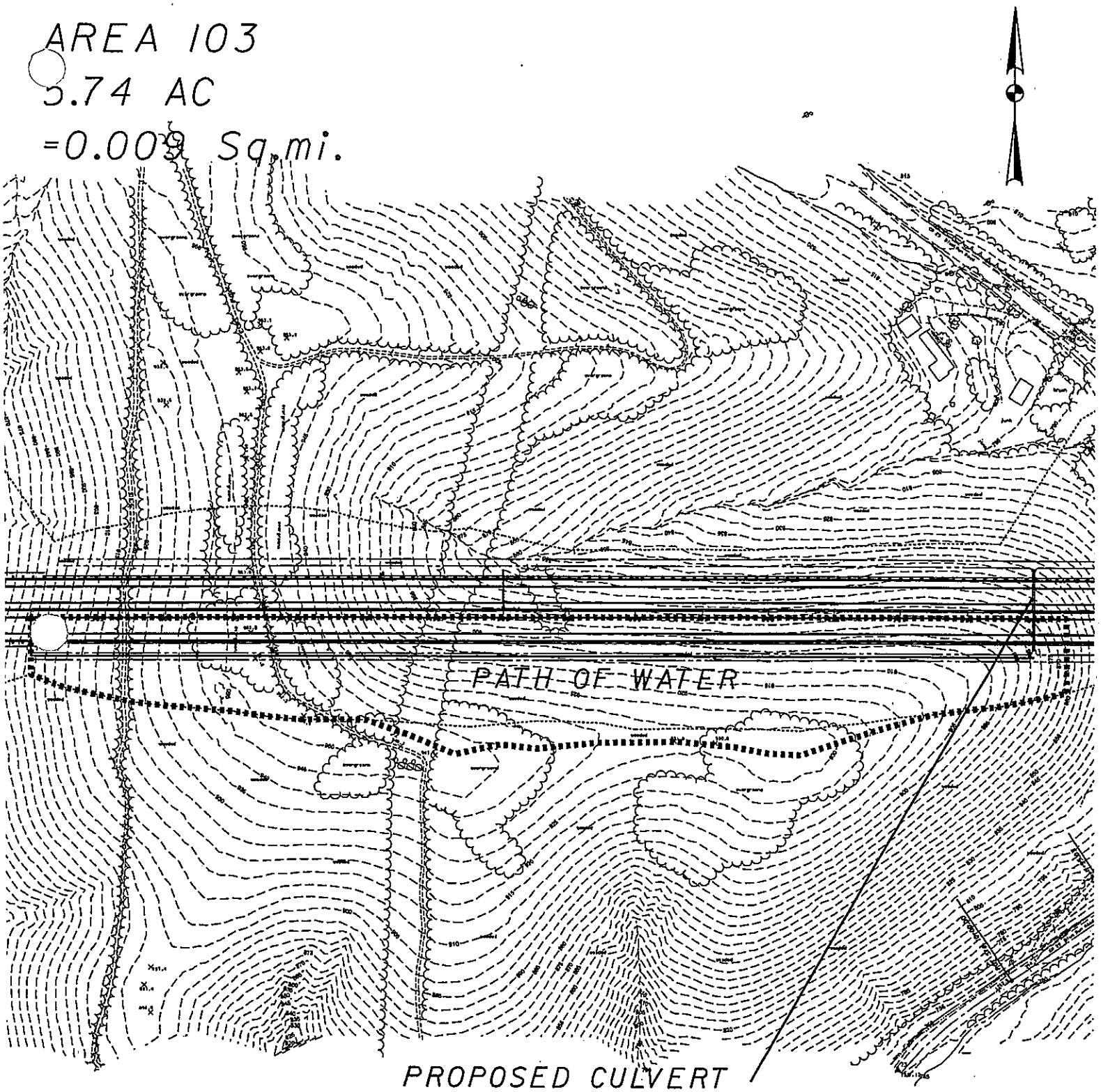
JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	2596+89	0.20	0.18	10.00	5.39	6.63	1.0	1.2	15	59.0	0.0100	533.75	3.42	6.02	0.0005	534.14	540.31	6.17	5.31	I 3C
begin		2596+89	0.20	0.18									533.16				534.00	534.40			0.015

APPENDIX D

Culvert Analysis

SR 823 STA 582+00

AREA 103
5.74 AC
=0.009 Sq.mi.



1"=200'

UNIVERSAL CULVERT DESIGN

PID : 79977 **Date :** 06/21/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 103, Sta. 582+00, 0.0 skew **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 818.34 **Outlet Invert Elevation (ft.) :** 817.14 **Tailwater Elevation (ft.) :** 817.74 **Overflow Elevation (ft.) :** 824.21

Allowable Headwater Elevation (ft.) : 823.21 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 120.00 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 21.17 @ 50 yrs. **Flood Discharge (cfs) :** 24.17 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Full Headwall								**Entrance Loss (Ke) :** 0.20		
21.17	1	21 in.	821.89	822.08	2 - F	9.09	1.75	1.62	0.0120	OUTLET**	0.00	D	0.00
19.17	1	18 in.	823.55	825.43	2 - F	10.92	1.50	1.46	0.0120	OUTLET**	2.00	D - 1	0.00
12.57	1	15 in.	831.64	834.85	2 - F	10.30	1.25	1.22	0.0120	OUTLET**	8.60	D - 2	0.00
21.17	1	24 in.	821.12	820.70	2 - E	8.78	1.43	1.65	0.0120	INLET	0.00	D + 1	0.00
24.17	1	21 in.	822.57	823.09	2 - F	10.21	1.75	1.67	0.0120	OUTLET**	0.00	F	0.00
19.17	1	18 in.	824.84	827.50	2 - F	10.92	1.50	1.46	0.0120	OUTLET**	5.00	F - 1	0.00
12.57	1	15 in.	843.35	N/A	2 - F	10.24	1.25	1.22	0.0120	OUTLET**	11.60	F - 2	0.00
24.17	1	24 in.	821.53	821.27	2 - E	8.90	1.61	1.74	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Full Headwall								**Entrance Loss (Ke) :** 0.25		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
21.17	1	27 in.	820.96	821.60	2 - F	6.95	2.25	1.61	0.0245	OUTLET**	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
21.17	1	24 in.	821.44	823.61	2 - F	7.65	2.00	1.65	0.0247	OUTLET**	0.00	D - 1	0.00
16.17	1	21 in.	822.49	828.08	2 - F	7.45	1.75	1.48	0.0248	OUTLET**	5.00	D - 2	0.00
21.17	1	30 in.	820.72	820.79	1 - A	6.56	1.98	1.56	0.0244	OUTLET*	0.00	D + 1	0.00
24.17	1	27 in.	821.30	822.42	2 - F	7.41	2.25	1.72	0.0245	OUTLET**	0.00	F	0.00
22.37	1	24 in.	821.96	825.07	2 - F	7.91	2.00	1.69	0.0247	OUTLET**	1.80	F - 1	0.00
16.17	1	21 in.	823.40	830.91	2 - F	7.45	1.75	1.48	0.0248	OUTLET**	8.00	F - 2	0.00
24.17	1	30 in.	820.96	821.09	1 - A	6.92	2.28	1.67	0.0244	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
21.17	1	36 in.	820.47	820.56	1 - A	6.10	1.82	1.48	0.0281	OUTLET*	0.00	D	0.00
21.17	1	42 in.	820.32	820.41	1 - A	5.83	1.65	1.41	0.0278	OUTLET*	0.00	D + 1	0.00
24.17	1	36 in.	820.65	820.76	1 - A	6.38	2.00	1.58	0.0281	OUTLET*	0.00	F	0.00
24.17	1	42 in.	820.47	820.57	1 - A	6.07	1.78	1.51	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
21.17	1	60 in.	820.10	820.19	1 - A	5.39	1.55	1.27	0.0332	OUTLET*	0.00	D	0.00
21.17	1	66 in.	820.07	820.12	1 - A	5.29	1.49	1.24	0.0330	OUTLET*	0.00	D + 1	0.00
24.17	1	60 in.	820.21	820.32	1 - A	5.59	1.66	1.36	0.0332	OUTLET*	0.00	F	0.00
24.17	1	66 in.	820.18	820.27	1 - A	5.49	1.59	1.32	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
21.17	1	60 in.	820.10	820.15	1 - A	5.39	1.36	1.27	0.0260	OUTLET*	0.00	D	0.00
21.17	1	66 in.	820.07	820.10	1 - A	5.29	1.32	1.24	0.0260	OUTLET*	0.00	D + 1	0.00
24.17	1	60 in.	820.21	820.28	1 - A	5.59	1.46	1.36	0.0260	OUTLET*	0.00	F	0.00
24.17	1	66 in.	820.18	820.23	1 - A	5.49	1.41	1.32	0.0260	OUTLET*	0.00	F + 1	0.00

Client: ODOT Sheet: of

Subject: Pipe Culvert Calculations @ STA 582+00 Order No:

Computed by: DL Date: 6/21/2007

Checked by: Date:

Rational Method

Coefficient of Runoff (1101.2.3)

	Area (Sft)	Area (Ac)	C
Pavement Area	52700	1.21	0.9
Non-paved Area	197280	4.53	0.45
Other			
Total Area		**5.74**	**acres**

Weighted "C" = 0.54

Overland Flow

Length	60
High Elevation	884.59
Low Elevation	878.4
Slope %	10.31667

t_o 3.56 (1101.2.2)

t_o **3.56** Compare with Fig 1101-1

Negligible

Shallow Concentrated Flow

Length	1500	
High Elevation	878.4	
Low Elevation	818.4	
Slope %	4	
k	0.457	(Grassed waterways - Table 1101-1)
V	2.998834	(1101.2.2)
t_s	8.336573	(1101.2.2)

Since the time of concentration = to + ts t_c **11.90** min

For Intensity Zone D

Frequency	a	b	c	Ac	t_c	C	I	Q cu ft/s
2 Years	85.568	16.5	0.95	5.738751	11.90	0.54	3.56	11.14
5 Years	118.822	18.7	0.969	5.738751	11.90	0.54	4.32	13.50
10 Years	112.172	16.8	0.923	5.738751	11.90	0.54	5.06	15.83
25 Years	198.92	19.3	1.004	5.738751	11.90	0.54	6.29	19.67
50 Years	206.025	19.6	0.99	5.738751	11.90	0.54	6.77	21.17
100 Years	355.551	23.199	1.076	5.738751	11.90	0.54	7.73	24.17

Worksheet for SR 823 STA 582+00

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.01770	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	0.50	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	21.17	ft^3/s

Results

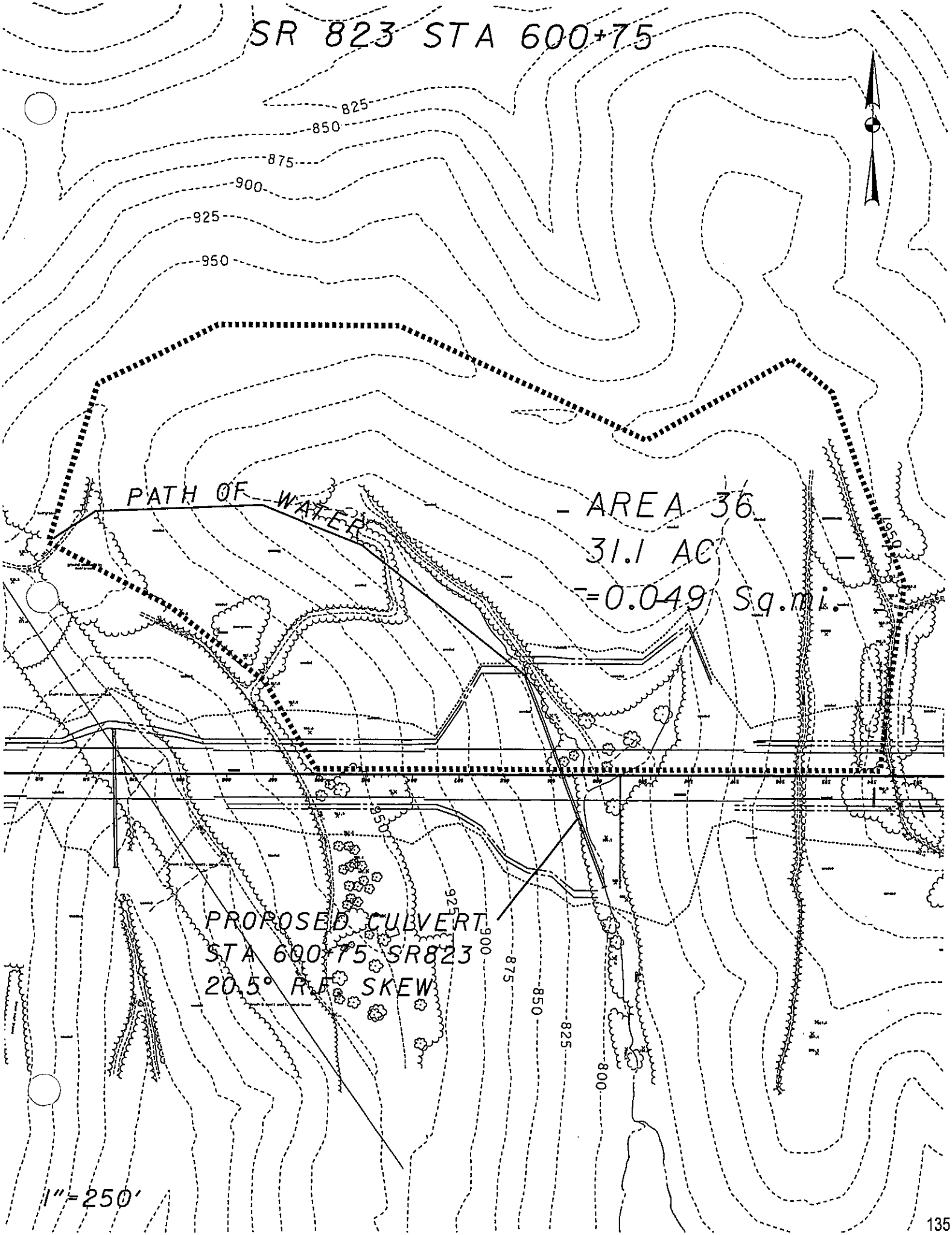
Normal Depth	0.60	ft
Flow Area	6.58	ft^2
Wetted Perimeter	12.55	ft
Top Width	12.09	ft
Critical Depth	0.50	ft
Critical Slope	0.03143	ft/ft
Velocity	3.22	ft/s
Velocity Head	0.16	ft
Specific Energy	0.76	ft
Froude Number	0.77	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.60	ft
Critical Depth	0.50	ft
Channel Slope	0.01770	ft/ft
Critical Slope	0.03143	ft/ft


SR 823 STA 600+75
825
850
875
900
925
950
PATH OF WATER
- AREA 36.
31.1 AC
=0.049 Sq.mi.
PROPOSED CULVERT
STA 600+75 SR823
20.5° R.F. SKEW
925
900
875
850
825
800
1"=250'

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 03/28/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 36, Sta. 600+75, 20.5 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 821.75 **Outlet Invert Elevation (ft.) :** 802.79 **Tailwater Elevation (ft.) :** 803.76 **Overflow Elevation (ft.) :** 876.00

Allowable Headwater Elevation (ft.) : 876.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 490.00 **Culvert Slope (ft./ft.) :** 0.0387 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 92.60 @ 50 yrs. **Flood Discharge (cfs) :** 111.20 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
92.60	1	42 in.	827.06	811.27	2 - E	21.48	1.61	2.98	0.0120	INLET	0.00	D	0.00
92.60	1	36 in.	829.13	816.92	2 - E	21.42	1.76	2.86	0.0120	INLET	0.00	D - 1	0.00
92.60	1	33 in.	831.08	822.77	2 - E	21.18	1.90	2.69	0.0120	INLET	0.00	D - 2	0.00
92.60	1	48 in.	826.24	N/A	1 - C	21.34	1.51	2.92	0.0120	INLET	0.00	D + 1	0.00
111.20	1	42 in.	828.32	813.69	2 - E	22.49	1.79	3.18	0.0120	INLET	0.00	F	0.00
111.20	1	36 in.	831.40	821.91	2 - E	22.25	2.00	2.93	0.0120	INLET	0.00	F - 1	0.00
111.20	1	33 in.	834.38	830.41	2 - E	21.63	2.22	2.72	0.0120	INLET	0.00	F - 2	0.00
111.20	1	48 in.	826.97	810.33	2 - E	22.43	1.67	3.19	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
92.60	1	48 in.	826.92	814.47	2 - E	12.96	2.22	2.92	0.0235	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
92.60	1	42 in.	828.58	822.48	2 - E	12.67	2.49	2.98	0.0237	INLET	0.00	D - 1	0.00
92.60	1	36 in.	831.93	843.06	2 - F	13.32	3.00	2.86	0.0241	OUTLET**	0.00	D - 2	0.00
92.60	1	54 in.	826.19	N/A	1 - C	13.05	2.06	2.82	0.0233	INLET	0.00	D + 1	0.00
111.20	1	48 in.	828.15	818.24	2 - E	13.50	2.49	3.19	0.0235	INLET	0.00	F	0.00
111.20	1	42 in.	830.60	829.85	2 - E	12.84	2.95	3.18	0.0237	INLET	0.00	F - 1	0.00
111.20	1	36 in.	835.22	859.60	2 - F	15.83	3.00	2.93	0.0241	OUTLET**	0.00	F - 2	0.00
111.20	1	54 in.	826.95	N/A	1 - C	13.67	2.29	3.10	0.0233	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
92.60	1	48 in.	826.92	816.91	2 - E	11.48	2.45	2.92	0.0275	INLET	0.00	D	0.00
92.60	1	42 in.	828.58	827.64	2 - E	10.97	2.87	2.98	0.0278	INLET	0.00	D - 1	0.00
92.60	1	36 in.	831.93	854.66	2 - F	13.32	3.00	2.86	0.0281	OUTLET**	0.00	D - 2	0.00
92.60	1	54 in.	826.19	N/A	1 - C	11.60	2.26	2.82	0.0273	INLET	0.00	D + 1	0.00
111.20	1	48 in.	828.15	821.76	2 - E	11.89	2.79	3.19	0.0275	INLET	0.00	F	0.00
111.20	1	42 in.	830.60	837.29	2 - F	12.11	3.50	3.18	0.0278	OUTLET**	0.00	F - 1	0.00
110.90	1	36 in.	835.22	876.33	2 - F	15.79	3.00	2.93	0.0281	OUTLET**	0.30	F - 2	0.00
111.20	1	54 in.	826.95	N/A	1 - C	12.12	2.52	3.10	0.0273	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
92.60	1	60 in.	825.85	N/A	1 - C	10.01	2.39	2.73	0.0332	INLET	0.00	D	0.00
92.60	1	66 in.	825.66	N/A	1 - C	10.02	2.27	2.65	0.0330	INLET	0.00	D + 1	0.00
111.20	1	60 in.	826.39	N/A	1 - C	10.48	2.66	3.01	0.0332	INLET	0.00	F	0.00
111.20	1	66 in.	826.11	N/A	1 - C	10.52	2.51	2.92	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
92.60	1	60 in.	825.85	N/A	1 - C	12.00	2.08	2.73	0.0260	INLET	0.00	D	0.00
92.60	1	66 in.	825.66	N/A	1 - C	11.93	1.99	2.65	0.0260	INLET	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
111.20	1	60 in.	826.39	N/A	1 - C	12.58	2.30	3.01	0.0260	INLET	0.00	F	0.00
111.20	1	66 in.	826.11	N/A	1 - C	12.54	2.20	2.92	0.0260	INLET	0.00	F + 1	0.00

SR 823 STA 600+75
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
1355515.00	SQ. FT.	
0.049	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1147.00	FT.	**TOTAL CHANNEL LENGTH**
114.70	FT.	L_{10} = 10% of the Distance along channel
831	FT.	$Elev_{10}$ = Elevation at point L_{10}
974.95	FT.	L_{85} = 85% of the Distance along channel
950	FT.	$Elev_{85}$ = Elevation at point L_{85}
860.25	FT.	**Length** = $L_{85} - L_{10}$
730.39	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	16.39	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	35.47	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	51.58	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	73.89	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	92.58	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	111.19	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 600+75

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.07180	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	92.60	ft^3/s

Results

Normal Depth	0.97	ft
Flow Area	11.56	ft^2
Wetted Perimeter	16.02	ft
Top Width	15.78	ft
Critical Depth	1.29	ft
Critical Slope	0.02447	ft/ft
Velocity	8.01	ft/s
Velocity Head	1.00	ft
Specific Energy	1.97	ft
Froude Number	1.65	
Flow Type	Supercritical	

GVF Input Data

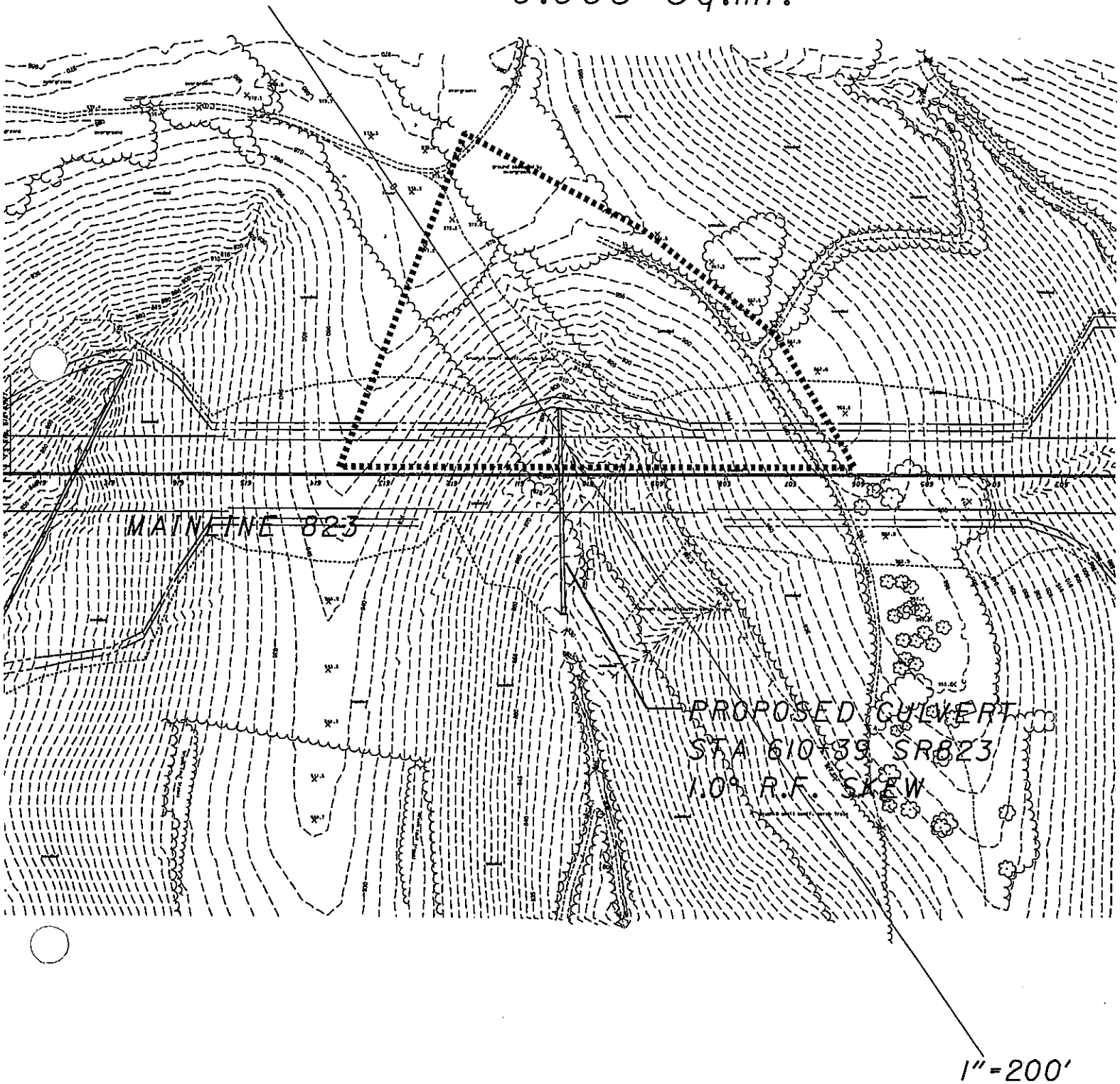
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.97	ft
Critical Depth	1.29	ft
Channel Slope	0.07180	ft/ft
Critical Slope	0.02447	ft/ft

SR 823 STA 610+39

AREA 35
5.0 AC
=0.008 Sq.mi.



1" = 200'

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 02/18/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 35, Sta. 610+39, 1.0 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 889.28 **Outlet Invert Elevation (ft.) :** 831.23 **Tailwater Elevation (ft.) :** 831.58 **Overflow Elevation (ft.) :** 908.00

Allowable Headwater Elevation (ft.) : 908.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 322.00 **Culvert Slope (ft./ft.) :** 0.1803 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 18.10 @ 50 yrs. **Flood Discharge (cfs) :** 20.60 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
18.10	1	21 in.	892.25	837.49	2 - E	25.16	0.59	1.55	0.0120	INLET	0.00	D	0.00
18.10	1	18 in.	893.55	842.76	2 - E	25.35	0.64	1.45	0.0120	INLET	0.00	D - 1	0.00
18.10	1	15 in.	897.27	857.95	2 - E	25.38	0.70	1.24	0.0120	INLET	0.00	D - 2	0.00
18.10	1	24 in.	891.71	835.36	2 - E	24.80	0.57	1.53	0.0120	INLET	0.00	D + 1	0.00
20.60	1	21 in.	892.77	838.89	2 - E	26.05	0.64	1.61	0.0120	INLET	0.00	F	0.00
20.60	1	18 in.	894.47	845.74	2 - E	26.28	0.68	1.47	0.0120	INLET	0.00	F - 1	0.00
20.60	1	15 in.	901.07	865.47	2 - E	26.13	0.77	1.25	0.0120	INLET	0.00	F - 2	0.00
20.60	1	24 in.	892.01	836.11	2 - E	25.84	0.60	1.63	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
18.10	1	24 in.	892.17	841.37	2 - E	14.75	0.83	1.53	0.0247	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
18.10	1	21 in.	893.21	849.75	2 - E	14.77	0.89	1.55	0.0248	INLET	0.00	D - 1	0.00
18.10	1	18 in.	895.19	870.68	2 - E	14.56	0.99	1.45	0.0249	INLET	0.00	D - 2	0.00
18.10	1	27 in.	891.69	N/A	1 - C	14.74	0.78	1.49	0.0245	INLET	0.00	D + 1	0.00
20.60	1	24 in.	892.68	843.90	2 - E	15.25	0.89	1.63	0.0247	INLET	0.00	F	0.00
20.60	1	21 in.	894.02	854.77	2 - E	15.22	0.96	1.61	0.0248	INLET	0.00	F - 1	0.00
20.60	1	18 in.	896.58	881.90	2 - E	14.88	1.10	1.47	0.0249	INLET	0.00	F - 2	0.00
20.60	1	27 in.	892.00	838.97	2 - E	15.27	0.84	1.59	0.0245	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
18.10	1	36 in.	891.28	N/A	1 - C	13.01	0.75	1.36	0.0281	INLET	0.00	D	0.00
18.10	1	42 in.	891.15	N/A	1 - C	12.90	0.71	1.30	0.0278	INLET	0.00	D + 1	0.00
20.60	1	36 in.	891.43	N/A	1 - C	13.50	0.80	1.46	0.0281	INLET	0.00	F	0.00
20.60	1	42 in.	891.30	N/A	1 - C	13.38	0.76	1.39	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
18.10	1	60 in.	890.87	N/A	1 - C	10.89	0.70	1.17	0.0332	INLET	0.00	D	0.00
18.10	1	66 in.	890.81	N/A	1 - C	10.82	0.68	1.14	0.0330	INLET	0.00	D + 1	0.00
20.60	1	60 in.	891.00	N/A	1 - C	11.31	0.74	1.25	0.0332	INLET	0.00	F	0.00
20.60	1	66 in.	890.93	N/A	1 - C	11.23	0.72	1.22	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
18.10	1	60 in.	890.87	N/A	1 - C	12.94	0.62	1.17	0.0260	INLET	0.00	D	0.00
18.10	1	66 in.	890.81	N/A	1 - C	12.77	0.60	1.14	0.0260	INLET	0.00	D + 1	0.00
20.60	1	60 in.	891.00	N/A	1 - C	13.44	0.66	1.25	0.0260	INLET	0.00	F	0.00
20.60	1	66 in.	890.93	N/A	1 - C	13.27	0.64	1.22	0.0260	INLET	0.00	F + 1	0.00

Client: ODOT Sheet: of

TranSystems

Subject: Pipe Culvert Calculations @ STA 610+39 Order No:

Computed by: MDC Date: 7/24/2006

Checked by: Date:

Rational Method

Coefficient of Runoff (1101.2.3)

	Area (Sft)	Area (Ac)	C
Pavement Area	25247	0.58	0.9
Non-paved Area	192934	4.43	0.45
Other			
Total Area		**5.01**	**acres**

Weighted "C" = 0.50

Overland Flow

Length	10		
High Elevation	980.5		
Low Elevation	980	t_o	1.99 (1101.2.2)
Slope %	5	t_o	0.00 Compare with Fig 1101-1
			Negligible

Shallow Concentrated Flow

Length	390	
High Elevation	980	
Low Elevation	900	
Slope %	20.51282	
k	0.457	(Grassed waterways - Table 1101-1)
V	6.791022	(1101.2.2)
t_s	0.957146	(1101.2.2)

Since the time of concentration = to + ts t_c **10.00** min

For Intensity Zone D

Frequency	a	b	c	Ac	t_c	C	I	Q cu ft/s
2 Years	85.568	16.5	0.95	5.008747	10.00	0.50	3.80	9.57
5 Years	118.822	18.7	0.969	5.008747	10.00	0.50	4.59	11.55
10 Years	112.172	16.8	0.923	5.008747	10.00	0.50	5.39	13.56
25 Years	198.92	19.3	1.004	5.008747	10.00	0.50	6.70	16.84
50 Years	206.025	19.6	0.99	5.008747	10.00	0.50	7.20	18.11
100 Years	355.551	23.199	1.076	5.008747	10.00	0.50	8.21	20.64

Worksheet for SR 823 STA 610+39

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.11800	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	18.10	ft^3/s

Results

Normal Depth	0.35	ft
Flow Area	3.05	ft^2
Wetted Perimeter	9.57	ft
Top Width	9.40	ft
Critical Depth	0.52	ft
Critical Slope	0.03108	ft/ft
Velocity	5.94	ft/s
Velocity Head	0.55	ft
Specific Energy	0.90	ft
Froude Number	1.84	
Flow Type	Supercritical	

GVF Input Data

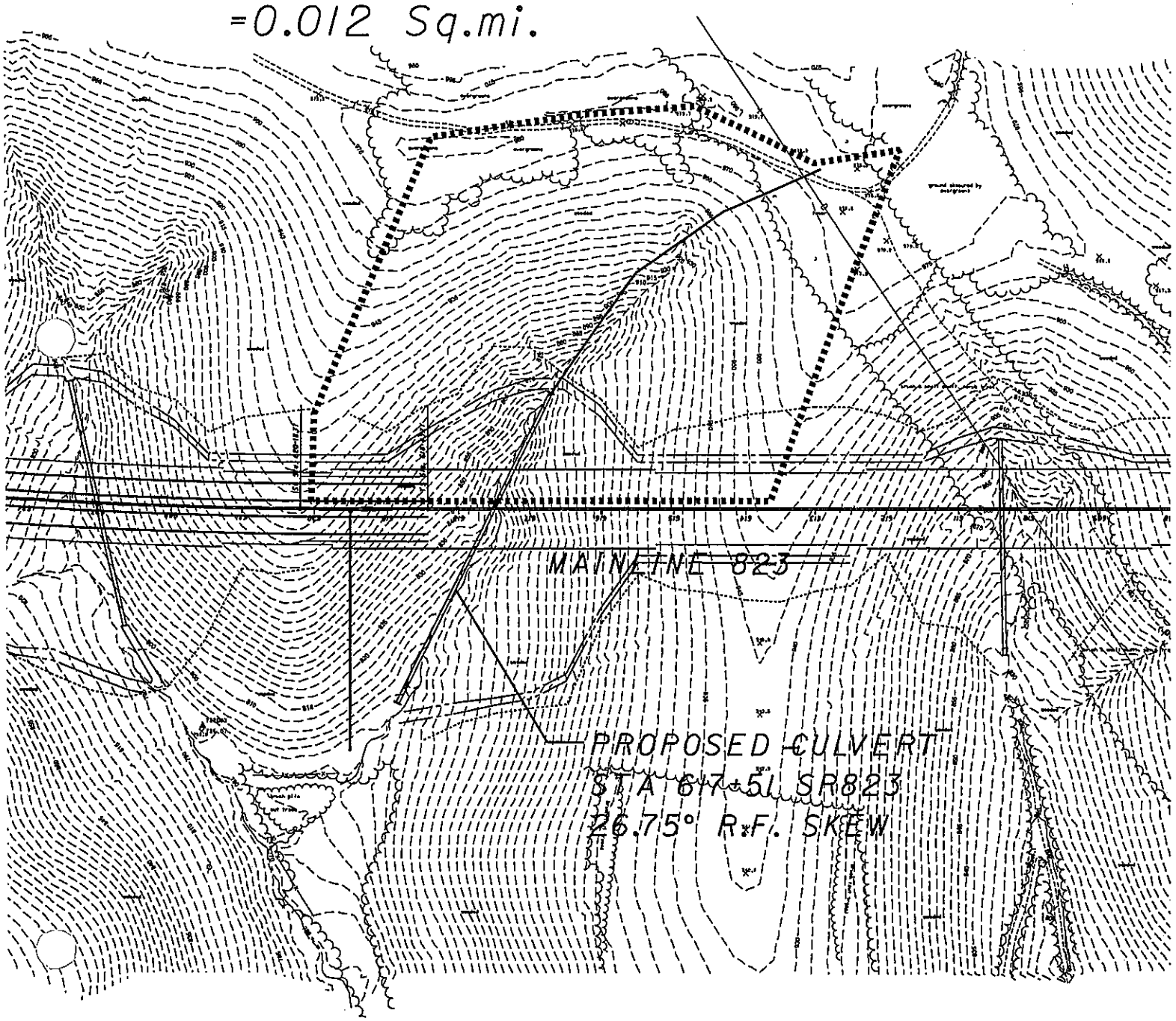
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.35	ft
Critical Depth	0.52	ft
Channel Slope	0.11800	ft/ft
Critical Slope	0.03108	ft/ft

SR 823 STA 617+51

AREA 37
7.9 AC
=0.012 Sq.mi.



1"=200'

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 08/29/2006 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 37, Sta. 617+51, 26.75 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 852.95 **Outlet Invert Elevation (ft.) :** 792.30 **Tailwater Elevation (ft.) :** 792.80 **Overflow Elevation (ft.) :** 896.00

Allowable Headwater Elevation (ft.) : 896.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 484.00 **Culvert Slope (ft./ft.) :** 0.1253 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 38.60 @ 50 yrs. **Flood Discharge (cfs) :** 46.70 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
38.60	1	30 in.	856.61	799.38	2 - E	26.48	0.84	2.10	0.0120	INLET	0.00	D	0.00
38.60	1	27 in.	857.43	802.59	2 - E	26.67	0.88	2.07	0.0120	INLET	0.00	D - 1	0.00
38.60	1	24 in.	858.97	809.02	2 - E	26.80	0.93	1.94	0.0120	INLET	0.00	D - 2	0.00
38.60	1	33 in.	856.19	N/A	1 - C	26.28	0.81	2.07	0.0120	INLET	0.00	D + 1	0.00
46.70	1	30 in.	857.49	801.68	2 - E	27.95	0.93	2.25	0.0120	INLET	0.00	F	0.00
46.70	1	27 in.	858.77	806.40	2 - E	28.07	0.98	2.16	0.0120	INLET	0.00	F - 1	0.00
46.70	1	24 in.	861.06	815.88	2 - E	28.16	1.04	1.97	0.0120	INLET	0.00	F - 2	0.00
46.70	1	33 in.	856.79	799.15	2 - E	27.73	0.90	2.26	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
38.60	1	33 in.	856.75	804.77	2 - E	15.86	1.18	2.07	0.0241	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
38.60	1	30 in.	857.61	811.44	2 - E	15.76	1.25	2.10	0.0244	INLET	0.00	D - 1	0.00
38.60	1	27 in.	859.04	823.80	2 - E	15.65	1.34	2.07	0.0245	INLET	0.00	D - 2	0.00
38.60	1	36 in.	856.27	N/A	1 - C	15.79	1.13	2.02	0.0241	INLET	0.00	D + 1	0.00
46.70	1	33 in.	857.76	809.53	2 - E	16.67	1.31	2.26	0.0241	INLET	0.00	F	0.00
46.70	1	30 in.	859.04	819.32	2 - E	16.50	1.40	2.25	0.0244	INLET	0.00	F - 1	0.00
46.70	1	27 in.	860.98	837.44	2 - E	16.26	1.53	2.16	0.0245	INLET	0.00	F - 2	0.00
46.70	1	36 in.	856.98	804.31	2 - E	16.62	1.26	2.23	0.0241	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
38.60	1	36 in.	856.27	N/A	1 - C	14.13	1.23	2.02	0.0281	INLET	0.00	D	0.00
38.60	1	42 in.	855.85	N/A	1 - C	14.09	1.15	1.93	0.0278	INLET	0.00	D + 1	0.00
46.70	1	36 in.	856.98	807.22	2 - E	14.84	1.37	2.23	0.0281	INLET	0.00	F	0.00
46.70	1	42 in.	856.26	N/A	1 - C	14.86	1.27	2.13	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
38.60	1	60 in.	855.43	N/A	1 - C	11.99	1.10	1.73	0.0332	INLET	0.00	D	0.00
38.60	1	66 in.	855.32	N/A	1 - C	11.90	1.07	1.68	0.0330	INLET	0.00	D + 1	0.00
46.70	1	60 in.	855.71	N/A	1 - C	12.68	1.21	1.91	0.0332	INLET	0.00	F	0.00
46.70	1	66 in.	855.60	N/A	1 - C	12.60	1.17	1.86	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
38.60	1	60 in.	855.43	N/A	1 - C	14.25	0.98	1.73	0.0260	INLET	0.00	D	0.00
38.60	1	66 in.	855.32	N/A	1 - C	14.09	0.95	1.68	0.0260	INLET	0.00	D + 1	0.00
46.70	1	60 in.	855.71	N/A	1 - C	15.07	1.07	1.91	0.0260	INLET	0.00	F	0.00
46.70	1	66 in.	855.60	N/A	1 - C	14.91	1.04	1.86	0.0260	INLET	0.00	F + 1	0.00

SR 823 STA 617+51
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
344871.00	SQ. FT.	
0.012	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
510.00	FT.	**TOTAL CHANNEL LENGTH**
51.00	FT.	L_{10} = 10% of the Distance along channel
885	FT.	$Elev_{10}$ = Elevation at point L_{10}
433.50	FT.	L_{85} = 85% of the Distance along channel
980	FT.	$Elev_{85}$ = Elevation at point L_{85}
382.50	FT.	**Length** = $L_{85} - L_{10}$
1311.37	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	6.22	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	14.09	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	20.91	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	30.47	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	38.61	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	46.68	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 617+51

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.14500	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	38.60	ft^3/s

Results

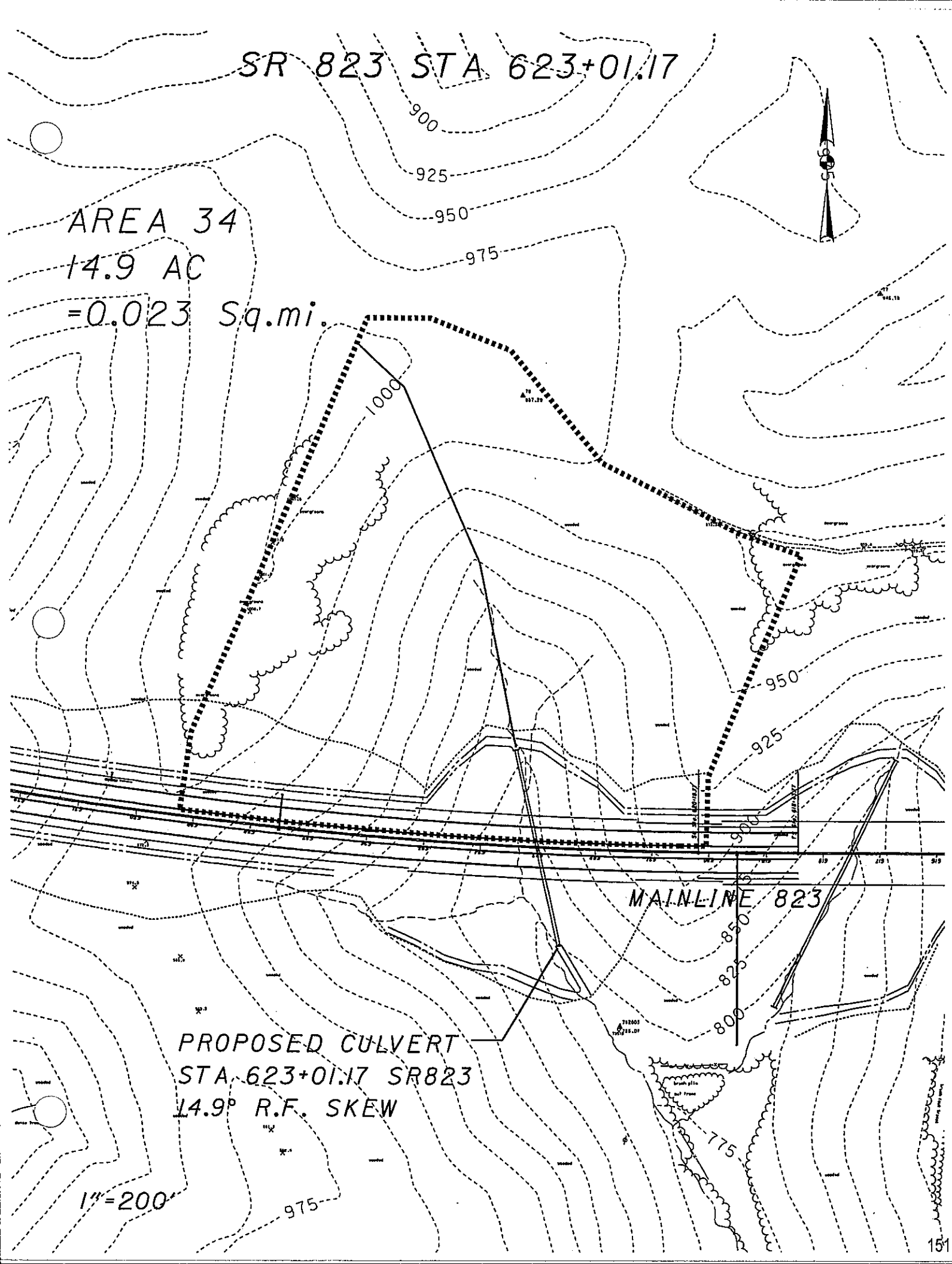
Normal Depth	0.50	ft
Flow Area	4.95	ft^2
Wetted Perimeter	12.09	ft
Top Width	11.96	ft
Critical Depth	0.78	ft
Critical Slope	0.02798	ft/ft
Velocity	7.80	ft/s
Velocity Head	0.95	ft
Specific Energy	1.44	ft
Froude Number	2.14	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.78	ft
Channel Slope	0.14500	ft/ft
Critical Slope	0.02798	ft/ft


SR 823 STA 623+01.17
AREA 34
14.9 AC
=0.023 Sq.mi.
900
925
950
975
1000
950
925
900
850
825
800
775
MAINLINE 823
PROPOSED CULVERT
STA 623+01.17 SR823
14.9° R.F. SKEW
1"=200'
975

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 08/29/2006 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 34, Sta. 623+01.17, 14.9 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 826.84 **Outlet Invert Elevation (ft.) :** 823.34 **Tailwater Elevation (ft.) :** 823.50 **Overflow Elevation (ft.) :** 856.00

Allowable Headwater Elevation (ft.) : 856.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 350.00 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 60.00 @ 50 yrs. **Flood Discharge (cfs) :** 72.40 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
60.00	1	36 in.	831.17	829.83	2 - E	11.43	2.09	2.50	0.0120	INLET	0.00	D	0.00
60.00	1	33 in.	831.91	831.68	2 - E	10.93	2.39	2.49	0.0120	INLET	0.00	D - 1	0.00
60.00	1	30 in.	833.19	834.92	2 - F	12.41	2.50	2.39	0.0120	OUTLET**	0.00	D - 2	0.00
60.00	1	42 in.	830.49	N/A	1 - C	11.60	1.85	2.43	0.0120	INLET	0.00	D + 1	0.00
72.40	1	36 in.	832.18	831.63	2 - E	11.65	2.46	2.69	0.0120	INLET	0.00	F	0.00
72.40	1	33 in.	833.34	834.35	2 - F	12.43	2.75	2.61	0.0120	OUTLET**	0.00	F - 1	0.00
72.40	1	30 in.	835.22	839.11	2 - F	14.82	2.50	2.45	0.0120	OUTLET**	0.00	F - 2	0.00
72.40	1	42 in.	831.05	829.01	2 - E	12.12	2.08	2.67	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
60.00	1	42 in.	830.93	831.57	2 - F	8.43	3.50	2.43	0.0237	OUTLET**	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
60.00	1	36 in.	832.32	837.90	2 - F	9.53	3.00	2.50	0.0241	OUTLET**	0.00	D - 1	0.00
60.00	1	33 in.	833.66	844.36	2 - F	10.62	2.75	2.49	0.0241	OUTLET**	0.00	D - 2	0.00
60.00	1	48 in.	830.40	830.86	1 - A	7.89	2.60	2.33	0.0235	OUTLET*	0.00	D + 1	0.00
72.40	1	42 in.	831.83	834.08	2 - F	9.21	3.50	2.67	0.0237	OUTLET**	0.00	F	0.00
72.40	1	36 in.	833.97	843.37	2 - F	10.84	3.00	2.69	0.0241	OUTLET**	0.00	F - 1	0.00
72.40	1	33 in.	835.79	852.82	2 - F	12.43	2.75	2.61	0.0241	OUTLET**	0.00	F - 2	0.00
72.40	1	48 in.	830.94	831.34	1 - A	8.47	3.00	2.57	0.0235	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
60.00	1	48 in.	830.40	830.84	1 - A	7.89	2.92	2.33	0.0275	OUTLET*	0.00	D	0.00
60.00	1	42 in.	830.93	833.11	2 - F	8.43	3.50	2.43	0.0278	OUTLET**	0.00	D - 1	0.00
60.00	1	36 in.	832.32	841.38	2 - F	9.53	3.00	2.50	0.0281	OUTLET**	0.00	D - 2	0.00
60.00	1	54 in.	830.17	830.60	1 - A	7.54	2.62	2.25	0.0273	OUTLET*	0.00	D + 1	0.00
72.40	1	48 in.	830.94	831.47	1 - A	8.47	3.65	2.57	0.0275	OUTLET*	0.00	F	0.00
72.40	1	42 in.	831.83	836.33	2 - F	9.21	3.50	2.67	0.0278	OUTLET**	0.00	F - 1	0.00
72.40	1	36 in.	833.97	848.44	2 - F	10.84	3.00	2.69	0.0281	OUTLET**	0.00	F - 2	0.00
72.40	1	54 in.	830.57	831.04	1 - A	8.04	2.97	2.48	0.0273	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
60.00	1	60 in.	830.02	830.44	1 - A	7.30	2.76	2.18	0.0332	OUTLET*	0.00	D	0.00
60.00	1	66 in.	829.90	830.29	1 - A	7.12	2.60	2.12	0.0330	OUTLET*	0.00	D + 1	0.00
72.40	1	60 in.	830.38	830.87	1 - A	7.76	3.11	2.40	0.0332	OUTLET*	0.00	F	0.00
72.40	1	66 in.	830.24	830.69	1 - A	7.54	2.90	2.33	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
60.00	1	60 in.	830.02	830.47	1 - A	7.30	2.38	2.18	0.0260	OUTLET*	0.00	D	0.00
60.00	1	66 in.	829.90	830.35	1 - A	7.12	2.27	2.12	0.0260	OUTLET*	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
72.40	1	60 in.	830.38	830.87	1 - A	7.76	2.66	2.40	0.0260	OUTLET*	0.00	F	0.00
72.40	1	66 in.	830.24	830.72	1 - A	7.54	2.52	2.33	0.0260	OUTLET*	0.00	F + 1	0.00

SR 823 STA 623+01.17
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
648836.00	SQ. FT.	
0.023	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
738.00	FT.	**TOTAL CHANNEL LENGTH**
73.80	FT.	L_{10} = 10% of the Distance along channel
850	FT.	$Elev_{10}$ = Elevation at point L_{10}
627.30	FT.	L_{85} = 85% of the Distance along channel
970	FT.	$Elev_{85}$ = Elevation at point L_{85}
553.50	FT.	**Length** = $L_{85} - L_{10}$
1144.72	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	9.95	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	22.23	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	32.78	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	47.52	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	60.00	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	72.41	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 623+01

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.07500	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	58.06	ft^3/s

Results

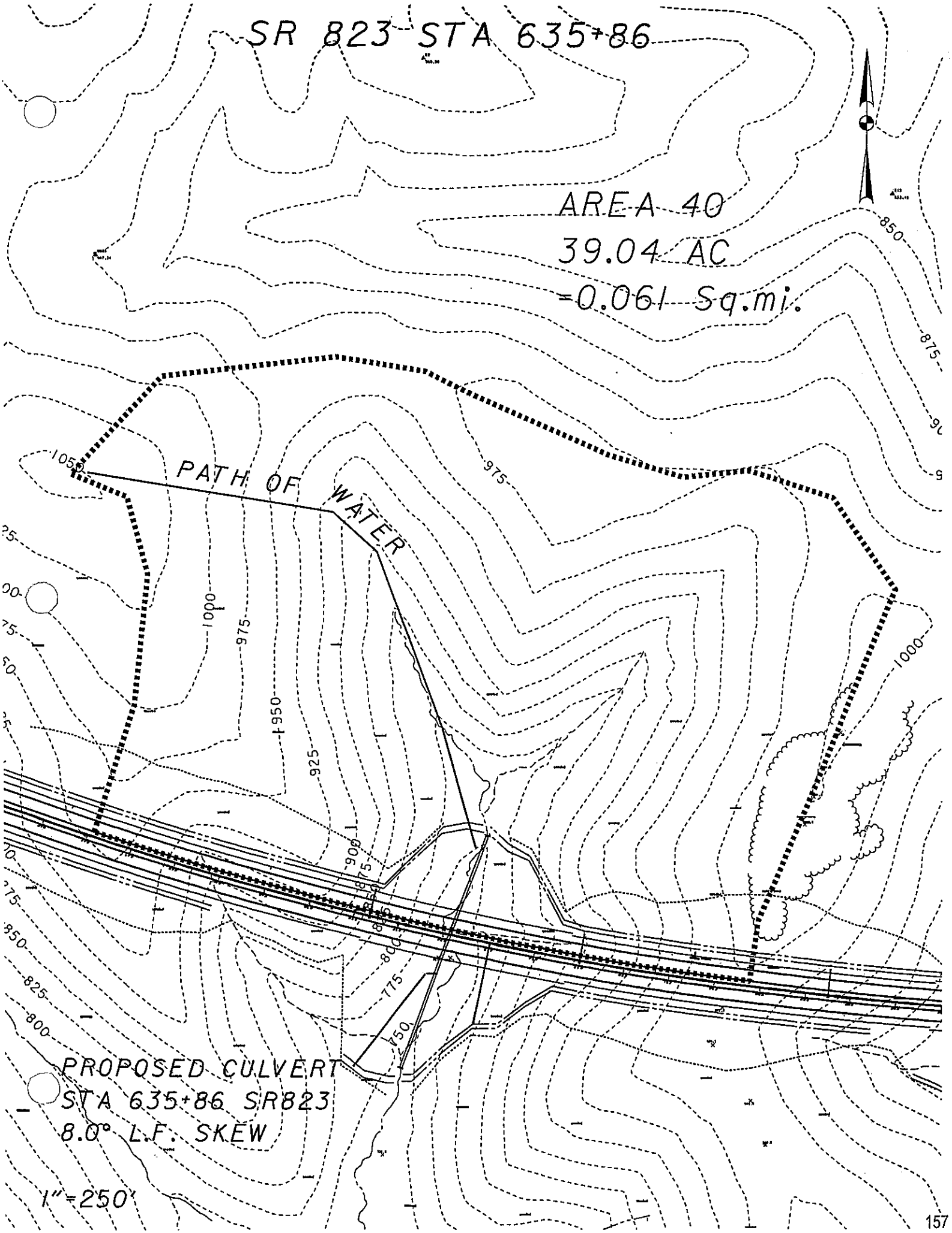
Normal Depth	0.79	ft
Flow Area	7.56	ft^2
Wetted Perimeter	11.53	ft
Top Width	11.16	ft
Critical Depth	1.07	ft
Critical Slope	0.02562	ft/ft
Velocity	7.68	ft/s
Velocity Head	0.92	ft
Specific Energy	1.71	ft
Froude Number	1.65	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.79	ft
Critical Depth	1.07	ft
Channel Slope	0.07500	ft/ft
Critical Slope	0.02562	ft/ft


SR 823 STA 635+86
AREA 40
39.04 AC
=0.061 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
STA 635+86 SR823
8.0° L.F. SKEW
1"=250'

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 08/21/2006 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 40, Sta. 635+86, 8.0 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 774.87 **Outlet Invert Elevation (ft.) :** 743.39 **Tailwater Elevation (ft.) :** 744.71 **Overflow Elevation (ft.) :** 840.00

Allowable Headwater Elevation (ft.) : 840.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 538.00 **Culvert Slope (ft./ft.) :** 0.0585 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 123.20 @ 50 yrs. **Flood Discharge (cfs) :** 148.40 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
123.20	1	48 in.	780.64	752.20	2 - E	26.80	1.58	3.33	0.0120	INLET	0.00	D	0.00
123.20	1	42 in.	782.38	756.67	2 - E	26.93	1.68	3.27	0.0120	INLET	0.00	D - 1	0.00
123.20	1	36 in.	786.19	767.58	2 - E	26.79	1.86	2.95	0.0120	INLET	0.00	D - 2	0.00
123.20	1	54 in.	779.88	N/A	1 - C	26.60	1.50	3.27	0.0120	INLET	0.00	D + 1	0.00
148.40	1	48 in.	781.97	754.65	2 - E	28.18	1.75	3.58	0.0120	INLET	0.00	F	0.00
148.40	1	42 in.	784.62	761.18	2 - E	28.20	1.88	3.38	0.0120	INLET	0.00	F - 1	0.00
148.40	1	36 in.	790.69	777.16	2 - E	27.74	2.12	2.98	0.0120	INLET	0.00	F - 2	0.00
148.40	1	54 in.	780.72	751.65	2 - E	28.02	1.65	3.58	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
123.20	1	54 in.	780.63	755.79	2 - E	16.37	2.15	3.27	0.0233	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
123.20	1	48 in.	782.18	762.75	2 - E	16.24	2.33	3.33	0.0235	INLET	0.00	D - 1	0.00
123.20	1	42 in.	785.14	778.27	2 - E	15.74	2.65	3.27	0.0237	INLET	0.00	D - 2	0.00
123.20	1	60 in.	779.89	N/A	1 - C	16.37	2.04	3.17	0.0232	INLET	0.00	D + 1	0.00
148.40	1	54 in.	782.02	759.78	2 - E	17.15	2.41	3.58	0.0233	INLET	0.00	F	0.00
148.40	1	48 in.	784.35	769.95	2 - E	16.88	2.64	3.58	0.0235	INLET	0.00	F - 1	0.00
148.40	1	42 in.	788.36	792.53	2 - F	15.58	3.50	3.38	0.0237	OUTLET**	0.00	F - 2	0.00
148.40	1	60 in.	780.79	N/A	1 - C	17.20	2.26	3.49	0.0232	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
123.20	1	54 in.	780.63	758.30	2 - E	14.54	2.37	3.27	0.0273	INLET	0.00	D	0.00
123.20	1	48 in.	782.18	767.50	2 - E	14.34	2.58	3.33	0.0275	INLET	0.00	D - 1	0.00
123.20	1	42 in.	785.14	788.30	2 - F	13.17	3.50	3.27	0.0278	OUTLET**	0.00	D - 2	0.00
123.20	1	60 in.	779.89	N/A	1 - C	14.61	2.22	3.17	0.0271	INLET	0.00	D + 1	0.00
148.40	1	54 in.	782.02	763.43	2 - E	15.19	2.66	3.58	0.0273	INLET	0.00	F	0.00
148.40	1	48 in.	784.35	776.85	2 - E	14.80	2.98	3.58	0.0275	INLET	0.00	F - 1	0.00
148.40	1	42 in.	788.36	807.08	2 - F	15.58	3.50	3.38	0.0278	OUTLET**	0.00	F - 2	0.00
148.40	1	60 in.	780.79	N/A	1 - C	15.32	2.47	3.49	0.0271	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
123.20	1	60 in.	779.89	N/A	1 - C	12.56	2.50	3.17	0.0332	INLET	0.00	D	0.00
123.20	1	66 in.	779.52	N/A	1 - C	12.59	2.37	3.08	0.0330	INLET	0.00	D + 1	0.00
148.40	1	60 in.	780.79	N/A	1 - C	13.14	2.80	3.49	0.0332	INLET	0.00	F	0.00
148.40	1	66 in.	780.17	N/A	1 - C	13.22	2.63	3.40	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
123.20	1	60 in.	779.89	N/A	1 - C	15.05	2.17	3.17	0.0260	INLET	0.00	D	0.00
123.20	1	66 in.	779.52	N/A	1 - C	14.99	2.08	3.08	0.0260	INLET	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
148.40	1	60 in.	780.79	N/A	1 - C	15.81	2.41	3.49	0.0260	INLET	0.00	F	0.00
148.40	1	66 in.	780.17	N/A	1 - C	15.77	2.30	3.40	0.0260	INLET	0.00	F + 1	0.00

SR 823 STA 635+86.00
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
1700412.00	SQ. FT.	
0.061	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1340.00	FT.	**TOTAL CHANNEL LENGTH**
134.00	FT.	L_{10} = 10% of the Distance along channel
790	FT.	$Elev_{10}$ = Elevation at point L_{10}
1139.00	FT.	L_{85} = 85% of the Distance along channel
1000	FT.	$Elev_{85}$ = Elevation at point L_{85}
1005.00	FT.	**Length** = $L_{85} - L_{10}$
1103.28	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	21.01	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	46.26	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	67.83	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	97.88	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	123.17	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	148.44	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 635+86

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.04560	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	123.20	ft^3/s

Results

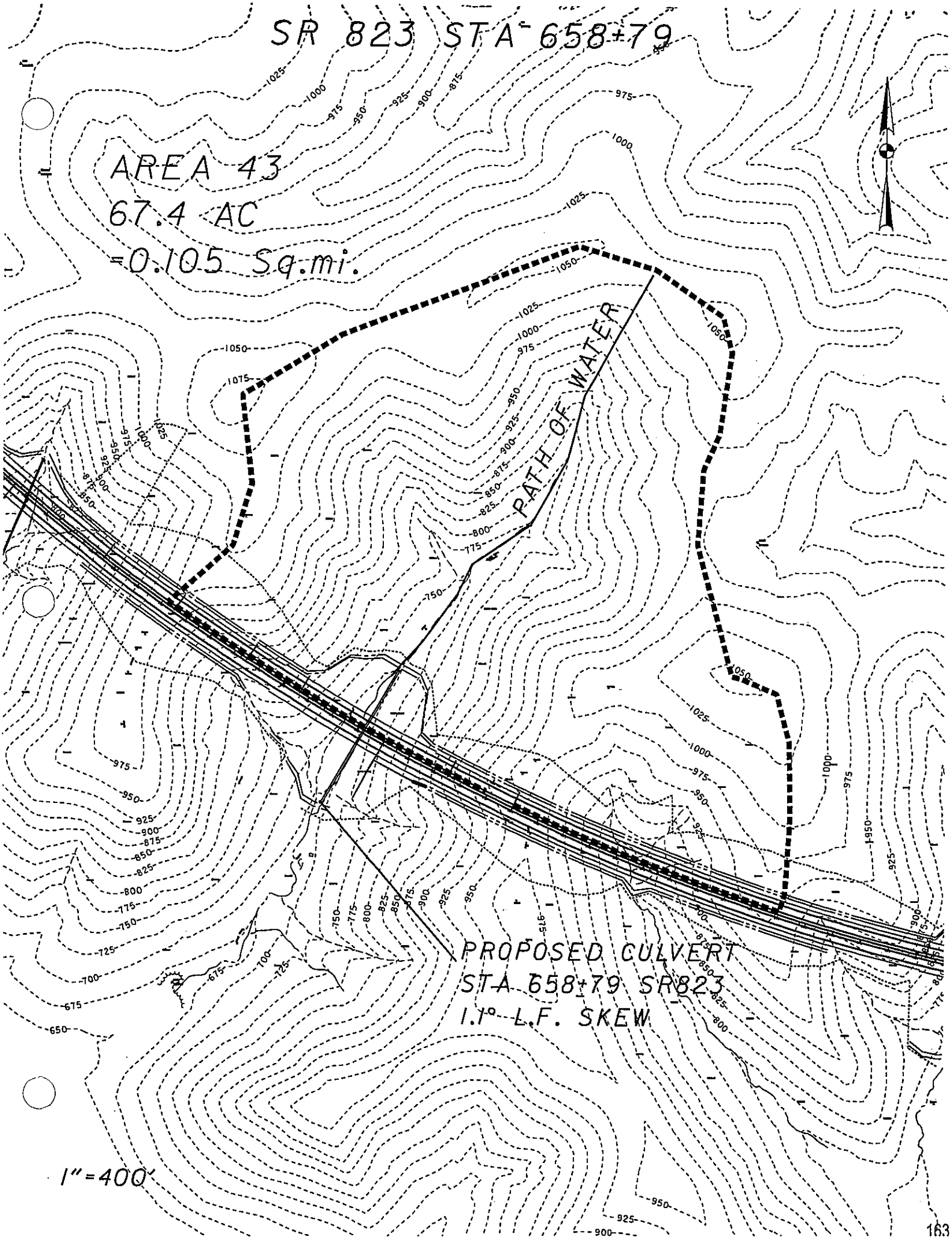
Normal Depth	1.32	ft
Flow Area	15.86	ft^2
Wetted Perimeter	16.38	ft
Top Width	15.95	ft
Critical Depth	1.58	ft
Critical Slope	0.02310	ft/ft
Velocity	7.77	ft/s
Velocity Head	0.94	ft
Specific Energy	2.26	ft
Froude Number	1.37	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.32	ft
Critical Depth	1.58	ft
Channel Slope	0.04560	ft/ft
Critical Slope	0.02310	ft/ft


SR 823 STA 658+79
AREA 43
67.4 AC
=0.105 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
STA 658+79 SR823
11° L.F. SKEW
1"=400'

CULVERT ANALYSIS

PID : 19415 **Date :** 04/03/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 43, Sta. 658+79, 1.1 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 720.37 **Outlet Invert Elevation (ft.) :** 691.47
Pipe Quantity : 1

Culvert Type : Circular Corrugated **Pipe Length (ft.) :** 534.00 **Culvert Slope (ft./ft.) :** 0.0541
Corrugation Type : Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)
Pipe Size : 78 in.
Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
184.20	29.28	725.81	N/A	1 - C	16.10	2.45	3.61	0.0260	INLET	0.00	691.47
221.80	29.85	726.56	N/A	1 - C	16.92	2.71	3.98	0.0260	INLET	0.00	691.47
259.40	30.52	727.40	N/A	1 - C	17.63	2.96	4.32	0.0260	INLET	0.00	691.47

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 04/03/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 43, Sta. 658+79, 1.1 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 720.37 **Outlet Invert Elevation (ft.) :** 691.47 **Tailwater Elevation (ft.) :** 692.80 **Overflow Elevation (ft.) :** 808.00

Allowable Headwater Elevation (ft.) : 806.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 534.00 **Culvert Slope (ft./ft.) :** 0.0541 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 184.20 @ 50 yrs. **Flood Discharge (cfs) :** 221.80 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
184.20	1	60 in.	726.60	699.82	2 - E	28.68	1.81	3.88	0.0120	INLET	0.00	D	0.00
184.20	1	54 in.	727.66	702.15	2 - E	28.85	1.90	3.92	0.0120	INLET	0.00	D - 1	0.00
184.20	1	48 in.	729.79	706.81	2 - E	28.94	2.02	3.79	0.0120	INLET	0.00	D - 2	0.00
184.20	1	66 in.	726.07	N/A	1 - C	28.47	1.74	3.80	0.0120	INLET	0.00	D + 1	0.00
221.80	1	60 in.	727.81	701.74	2 - E	30.19	2.00	4.22	0.0120	INLET	0.00	F	0.00
221.80	1	54 in.	729.52	705.18	2 - E	30.29	2.11	4.16	0.0120	INLET	0.00	F - 1	0.00
221.80	1	48 in.	732.69	712.01	2 - E	30.26	2.26	3.90	0.0120	INLET	0.00	F - 2	0.00
221.80	1	66 in.	726.93	N/A	1 - C	29.99	1.92	4.17	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
184.20	1	66 in.	726.74	N/A	1 - C	17.69	2.48	3.80	0.0231	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
184.20	1	60 in.	727.86	706.97	2 - E	17.64	2.63	3.88	0.0232	INLET	0.00	D - 1	0.00
184.20	1	54 in.	729.91	714.60	2 - E	17.48	2.83	3.92	0.0233	INLET	0.00	D - 2	0.00
184.20	1	72 in.	726.14	N/A	1 - C	17.74	2.37	3.70	0.0229	INLET	0.00	D + 1	0.00
221.80	1	66 in.	728.12	706.19	2 - E	18.55	2.76	4.17	0.0231	INLET	0.00	F	0.00
221.80	1	60 in.	729.89	712.11	2 - E	18.43	2.95	4.22	0.0232	INLET	0.00	F - 1	0.00
221.80	1	54 in.	732.82	723.24	2 - E	18.08	3.24	4.16	0.0233	INLET	0.00	F - 2	0.00
221.80	1	72 in.	727.12	N/A	1 - C	18.64	2.63	4.08	0.0229	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
184.20	1	66 in.	726.74	N/A	1 - C	15.80	2.71	3.80	0.0269	INLET	0.00	D	0.00
184.20	1	60 in.	727.86	710.05	2 - E	15.67	2.89	3.88	0.0271	INLET	0.00	D - 1	0.00
184.20	1	54 in.	729.91	720.18	2 - E	15.36	3.17	3.92	0.0273	INLET	0.00	D - 2	0.00
184.20	1	72 in.	726.14	N/A	1 - C	15.85	2.58	3.70	0.0267	INLET	0.00	D + 1	0.00
221.80	1	66 in.	728.12	708.79	2 - E	16.52	3.03	4.17	0.0269	INLET	0.00	F	0.00
221.80	1	60 in.	729.89	716.58	2 - E	16.30	3.27	4.22	0.0271	INLET	0.00	F - 1	0.00
221.80	1	54 in.	732.82	731.33	2 - E	15.60	3.77	4.16	0.0273	INLET	0.00	F - 2	0.00
221.80	1	72 in.	727.12	N/A	1 - C	16.64	2.87	4.08	0.0267	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
184.20	1	66 in.	726.74	N/A	1 - C	13.53	3.07	3.80	0.0330	INLET	0.00	D	0.00
184.20	1	60 in.	727.86	715.83	2 - E	13.35	3.31	3.88	0.0332	INLET	0.00	D - 1	0.00
184.20	1	72 in.	726.14	N/A	1 - C	13.64	2.89	3.70	0.0327	INLET	0.00	D + 1	0.00
221.80	1	66 in.	728.12	713.80	2 - E	14.10	3.46	4.17	0.0330	INLET	0.00	F	0.00
221.80	1	60 in.	729.89	724.96	2 - E	13.73	3.83	4.22	0.0332	INLET	0.00	F - 1	0.00
221.80	1	72 in.	727.12	N/A	1 - C	14.28	3.23	4.08	0.0327	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
184.20	1	66 in.	726.74	N/A	1 - C	16.20	2.66	3.80	0.0260	INLET	0.00	D	0.00
184.20	1	60 in.	727.86	709.13	2 - E	16.18	2.81	3.88	0.0260	INLET	0.00	D - 1	0.00
184.20	1	72 in.	726.14	N/A	1 - C	16.16	2.54	3.70	0.0260	INLET	0.00	D + 1	0.00
221.80	1	66 in.	728.12	708.14	2 - E	16.96	2.97	4.17	0.0260	INLET	0.00	F	0.00
221.80	1	60 in.	729.89	715.25	2 - E	16.85	3.18	4.22	0.0260	INLET	0.00	F - 1	0.00
221.80	1	72 in.	727.12	N/A	1 - C	16.97	2.82	4.08	0.0260	INLET	0.00	F + 1	0.00

SR 823 STA 658+79.00
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
2934678.00	SQ. FT.	
0.105	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1692.00	FT.	**TOTAL CHANNEL LENGTH**
169.20	FT.	L_{10} = 10% of the Distance along channel
732	FT.	**Elev$_{10}$** = Elevation at point L_{10}
1438.20	FT.	L_{85} = 85% of the Distance along channel
987	FT.	**Elev$_{85}$** = Elevation at point L_{85}
1269.00	FT.	**Length** = L_{85} - L_{10}
1060.99	FT./MI.	**SLOPE** = (Elev$_{10}$-Elev$_{85}$)/Length
	CFS	**Q$_{\#}$** = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	31.98	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	69.77	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	101.94	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	146.66	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	184.18	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	221.77	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 658+79

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.06600	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	152.94	ft^3/s

Results

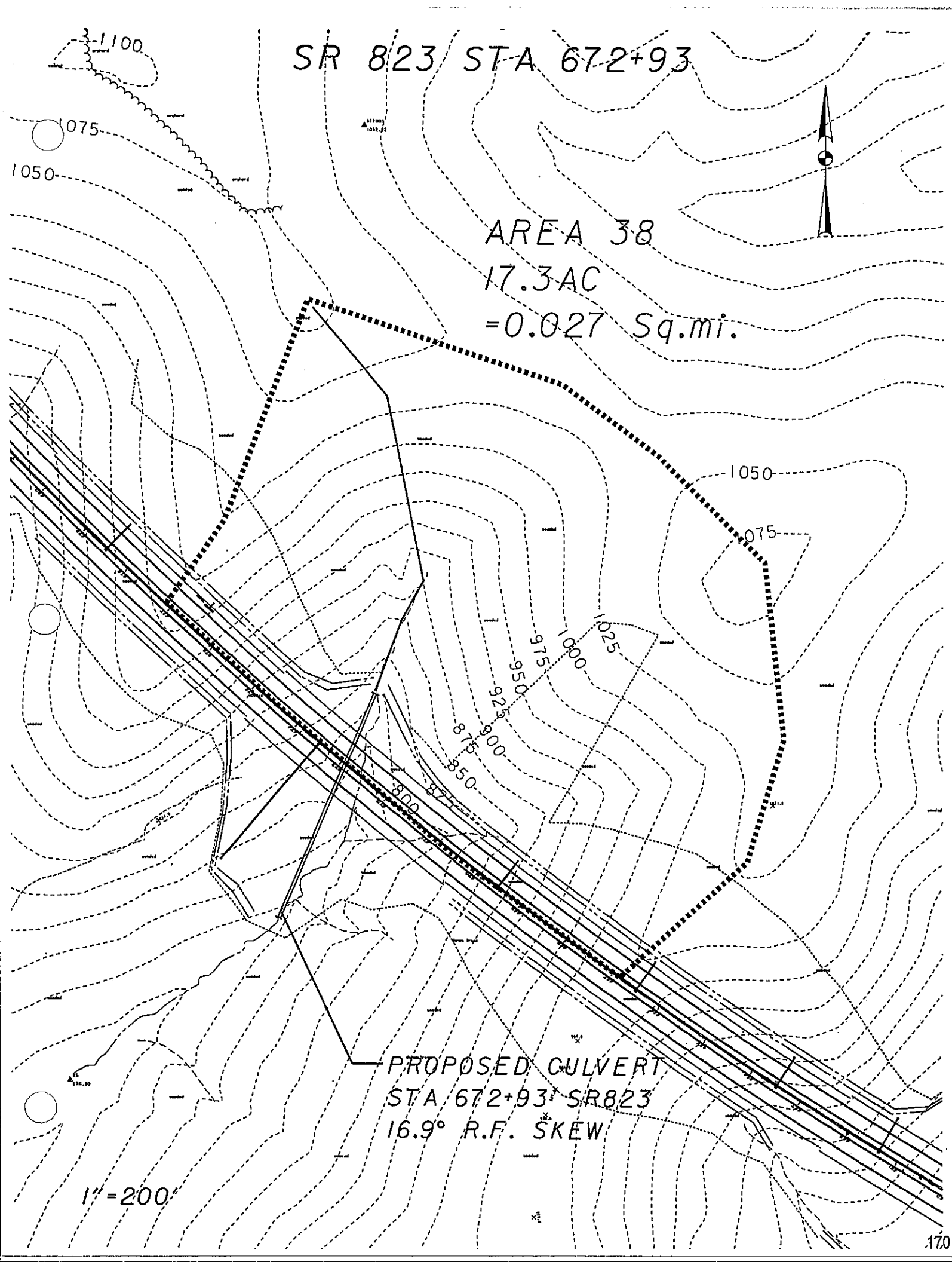
Normal Depth	1.29	ft
Flow Area	17.03	ft^2
Wetted Perimeter	18.66	ft
Top Width	18.34	ft
Critical Depth	1.69	ft
Critical Slope	0.02276	ft/ft
Velocity	8.98	ft/s
Velocity Head	1.25	ft
Specific Energy	2.55	ft
Froude Number	1.64	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.29	ft
Critical Depth	1.69	ft
Channel Slope	0.06600	ft/ft
Critical Slope	0.02276	ft/ft


SR 823 STA 672+93
AREA 38
17.3AC
=0.027 Sq.mi.
1100
1075
1050
1050
1075
1025
1000
975
950
925
900
875
850
825
800
PROPOSED CULVERT
STA 672+93 SR823
16.9° R.F. SKEW
1" = 200'

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 04/03/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 38, Sta. 672+93, 16.9 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 796.61 **Outlet Invert Elevation (ft.) :** 715.28 **Tailwater Elevation (ft.) :** 716.10 **Overflow Elevation (ft.) :** 838.00

Allowable Headwater Elevation (ft.) : 837.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 426.00 **Culvert Slope (ft./ft.) :** 0.1909 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 76.80 @ 50 yrs. **Flood Discharge (cfs) :** 93.10 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Full Headwall								**Entrance Loss (Ke) :** 0.20		
76.80	1	42 in.	801.00	721.69	2 - E	36.32	0.95	2.74	0.0120	INLET	0.00	D	0.00
76.80	1	36 in.	802.27	725.13	2 - E	36.88	1.01	2.74	0.0120	INLET	0.00	D - 1	0.00
76.80	1	33 in.	803.50	728.70	2 - E	37.07	1.05	2.64	0.0120	INLET	0.00	D - 2	0.00
76.80	1	48 in.	800.52	N/A	1 - C	35.88	0.91	2.65	0.0120	INLET	0.00	D + 1	0.00
93.10	1	42 in.	801.90	723.36	2 - E	38.43	1.05	2.98	0.0120	INLET	0.00	F	0.00
93.10	1	36 in.	803.87	728.48	2 - E	38.83	1.12	2.86	0.0120	INLET	0.00	F - 1	0.00
93.10	1	33 in.	805.69	733.77	2 - E	39.07	1.16	2.70	0.0120	INLET	0.00	F - 2	0.00
93.10	1	48 in.	801.09	N/A	1 - C	37.95	1.00	2.92	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Full Headwall								**Entrance Loss (Ke) :** 0.25		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
76.80	1	42 in.	801.45	727.84	2 - E	22.26	1.36	2.74	0.0237	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
76.80	1	36 in.	803.17	739.74	2 - E	22.10	1.48	2.74	0.0241	INLET	0.00	D - 1	0.00
76.80	1	33 in.	804.91	751.92	2 - E	22.07	1.56	2.64	0.0241	INLET	0.00	D - 2	0.00
76.80	1	48 in.	800.75	N/A	1 - C	22.19	1.28	2.65	0.0235	INLET	0.00	D + 1	0.00
93.10	1	42 in.	802.58	732.40	2 - E	23.43	1.51	2.98	0.0237	INLET	0.00	F	0.00
93.10	1	36 in.	805.31	749.94	2 - E	23.17	1.66	2.86	0.0241	INLET	0.00	F - 1	0.00
93.10	1	33 in.	807.94	767.89	2 - E	23.01	1.77	2.70	0.0241	INLET	0.00	F - 2	0.00
93.10	1	48 in.	801.46	725.62	2 - E	23.41	1.42	2.92	0.0235	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
76.80	1	42 in.	801.45	730.93	2 - E	19.80	1.48	2.74	0.0278	INLET	0.00	D	0.00
76.80	1	36 in.	803.17	746.68	2 - E	19.69	1.62	2.74	0.0281	INLET	0.00	D - 1	0.00
76.80	1	48 in.	800.75	N/A	1 - C	19.83	1.39	2.65	0.0275	INLET	0.00	D + 1	0.00
93.10	1	42 in.	802.58	736.93	2 - E	20.84	1.65	2.98	0.0278	INLET	0.00	F	0.00
93.10	1	36 in.	805.31	760.14	2 - E	20.57	1.83	2.86	0.0281	INLET	0.00	F - 1	0.00
93.10	1	48 in.	801.46	727.77	2 - E	20.88	1.54	2.92	0.0275	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
76.80	1	60 in.	800.19	N/A	1 - C	16.99	1.40	2.48	0.0332	INLET	0.00	D	0.00
76.80	1	66 in.	800.02	N/A	1 - C	16.89	1.35	2.41	0.0330	INLET	0.00	D + 1	0.00
93.10	1	60 in.	800.64	N/A	1 - C	17.94	1.55	2.74	0.0332	INLET	0.00	F	0.00
93.10	1	66 in.	800.44	N/A	1 - C	17.86	1.49	2.66	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
76.80	1	60 in.	800.19	N/A	1 - C	20.22	1.24	2.48	0.0260	INLET	0.00	D	0.00
76.80	1	66 in.	800.02	N/A	1 - C	20.03	1.20	2.41	0.0260	INLET	0.00	D + 1	0.00
93.10	1	60 in.	800.64	N/A	1 - C	21.37	1.37	2.74	0.0260	INLET	0.00	F	0.00
93.10	1	66 in.	800.44	N/A	1 - C	21.16	1.32	2.66	0.0260	INLET	0.00	F + 1	0.00

SR 823 STA 672+93.00
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
755758.00	SQ. FT.	
0.027	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
737.00	FT.	**TOTAL CHANNEL LENGTH**
73.70	FT.	L_{10} = 10% of the Distance along channel
857	FT.	$Elev_{10}$ = Elevation at point L_{10}
626.45	FT.	L_{85} = 85% of the Distance along channel
1050	FT.	$Elev_{85}$ = Elevation at point L_{85}
552.75	FT.	**Length** = $L_{85} - L_{10}$
1843.58	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	12.17	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	27.77	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	41.38	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	60.52	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	76.82	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	93.08	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 672+93

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.10400	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	76.80	ft^3/s

Results

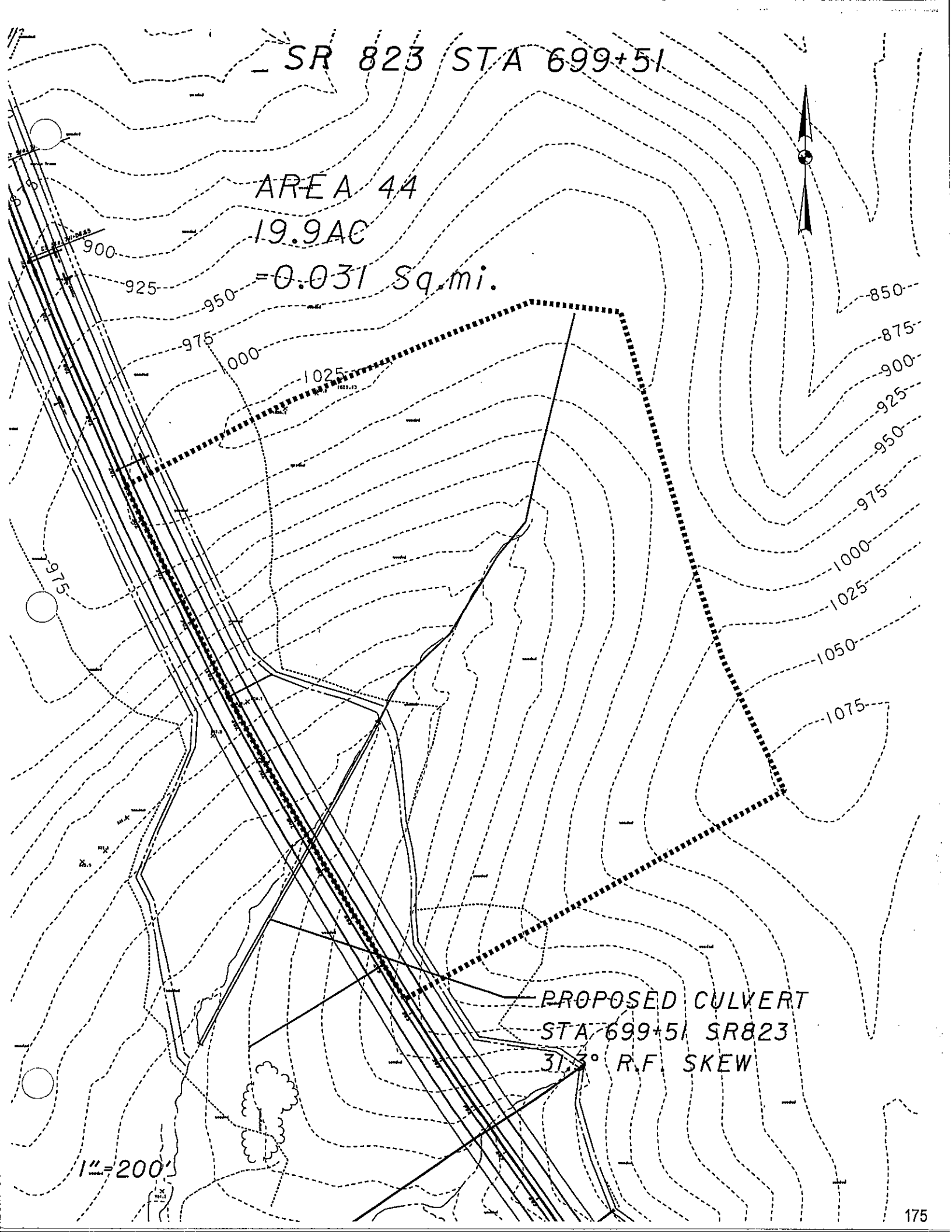
Normal Depth	0.82	ft
Flow Area	8.55	ft^2
Wetted Perimeter	13.17	ft
Top Width	12.91	ft
Critical Depth	1.21	ft
Critical Slope	0.02477	ft/ft
Velocity	8.98	ft/s
Velocity Head	1.25	ft
Specific Energy	2.07	ft
Froude Number	1.94	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.82	ft
Critical Depth	1.21	ft
Channel Slope	0.10400	ft/ft
Critical Slope	0.02477	ft/ft


SR 823 STA 699+51
AREA 44
19.9AC
=0.031 Sq.mi.
PROPOSED CULVERT
STA 699+51 SR823
31.3° R.F. SKEW
1"=200'
850
875
900
925
950
975
1000
1025
1050
1075

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 03/04/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 44, Sta. 699+51. 31.3 Skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 770.71 **Outlet Invert Elevation (ft.) :** 713.37 **Tailwater Elevation (ft.) :** 714.30 **Overflow Elevation (ft.) :** 831.00

Allowable Headwater Elevation (ft.) : 831.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 656.00 **Culvert Slope (ft./ft.) :** 0.0874 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 82.30 @ 50 yrs. **Flood Discharge (cfs) :** 99.60 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
82.30	1	42 in.	775.42	721.62	2 - E	28.03	1.21	2.83	0.0120	INLET	0.00	D	0.00
82.30	1	36 in.	776.99	727.25	2 - E	28.24	1.29	2.79	0.0120	INLET	0.00	D - 1	0.00
82.30	1	33 in.	778.52	733.11	2 - E	28.33	1.35	2.66	0.0120	INLET	0.00	D - 2	0.00
82.30	1	48 in.	774.83	N/A	1 - C	27.69	1.15	2.75	0.0120	INLET	0.00	D + 1	0.00
99.60	1	42 in.	776.47	724.10	2 - E	29.52	1.34	3.06	0.0120	INLET	0.00	F	0.00
99.60	1	36 in.	778.90	732.41	2 - E	29.68	1.44	2.89	0.0120	INLET	0.00	F - 1	0.00
99.60	1	33 in.	781.17	741.05	2 - E	29.65	1.52	2.71	0.0120	INLET	0.00	F - 2	0.00
99.60	1	48 in.	775.46	N/A	1 - C	29.21	1.26	3.02	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
82.30	1	48 in.	775.30	N/A	1 - C	17.05	1.63	2.75	0.0235	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
82.30	1	42 in.	776.55	733.20	2 - E	16.99	1.76	2.83	0.0237	INLET	0.00	D - 1	0.00
82.30	1	36 in.	779.28	754.40	2 - E	16.62	1.98	2.79	0.0241	INLET	0.00	D - 2	0.00
82.30	1	54 in.	774.77	N/A	1 - C	17.03	1.55	2.65	0.0233	INLET	0.00	D + 1	0.00
99.60	1	48 in.	776.31	728.98	2 - E	17.93	1.82	3.02	0.0235	INLET	0.00	F	0.00
99.60	1	42 in.	778.27	741.06	2 - E	17.80	1.97	3.06	0.0237	INLET	0.00	F - 1	0.00
99.60	1	36 in.	782.04	772.17	2 - E	17.10	2.30	2.89	0.0241	INLET	0.00	F - 2	0.00
99.60	1	54 in.	775.42	N/A	1 - C	17.94	1.71	2.93	0.0233	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
82.30	1	48 in.	775.30	N/A	1 - C	15.18	1.78	2.75	0.0275	INLET	0.00	D	0.00
82.30	1	42 in.	776.55	738.65	2 - E	15.06	1.94	2.83	0.0278	INLET	0.00	D - 1	0.00
82.30	1	36 in.	779.28	766.67	2 - E	14.61	2.23	2.79	0.0281	INLET	0.00	D - 2	0.00
82.30	1	54 in.	774.77	N/A	1 - C	15.18	1.68	2.65	0.0273	INLET	0.00	D + 1	0.00
99.60	1	48 in.	776.31	732.77	2 - E	15.94	1.99	3.02	0.0275	INLET	0.00	F	0.00
99.60	1	42 in.	778.27	749.05	2 - E	15.72	2.19	3.06	0.0278	INLET	0.00	F - 1	0.00
99.60	1	36 in.	782.04	790.14	2 - F	14.25	3.00	2.89	0.0281	OUTLET**	0.00	F - 2	0.00
99.60	1	54 in.	775.42	N/A	1 - C	15.98	1.87	2.93	0.0273	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
82.30	1	60 in.	774.52	N/A	1 - C	13.08	1.79	2.57	0.0332	INLET	0.00	D	0.00
82.30	1	66 in.	774.37	N/A	1 - C	13.04	1.71	2.50	0.0330	INLET	0.00	D + 1	0.00
99.60	1	60 in.	775.01	N/A	1 - C	13.78	1.98	2.84	0.0332	INLET	0.00	F	0.00
99.60	1	66 in.	774.79	N/A	1 - C	13.75	1.89	2.76	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
82.30	1	60 in.	774.52	N/A	1 - C	15.61	1.57	2.57	0.0260	INLET	0.00	D	0.00
82.30	1	66 in.	774.37	N/A	1 - C	15.46	1.52	2.50	0.0260	INLET	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
99.60	1	60 in.	775.01	N/A	1 - C	16.45	1.74	2.84	0.0260	INLET	0.00	F	0.00
99.60	1	66 in.	774.79	N/A	1 - C	16.33	1.67	2.76	0.0260	INLET	0.00	F + 1	0.00

SR 823 STA 699+51.00
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
864858.00	SQ. FT.	
0.031	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
840.00	FT.	**TOTAL CHANNEL LENGTH**
84.00	FT.	L_{10} = 10% of the Distance along channel
790	FT.	$Elev_{10}$ = Elevation at point L_{10}
714.00	FT.	L_{85} = 85% of the Distance along channel
985	FT.	$Elev_{85}$ = Elevation at point L_{85}
630.00	FT.	**Length** = $L_{85} - L_{10}$
1634.29	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})/Length$
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	13.25	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	30.00	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	44.54	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	64.95	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	82.29	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	99.59	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 699+51

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.08700	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	82.30	ft^3/s

Results

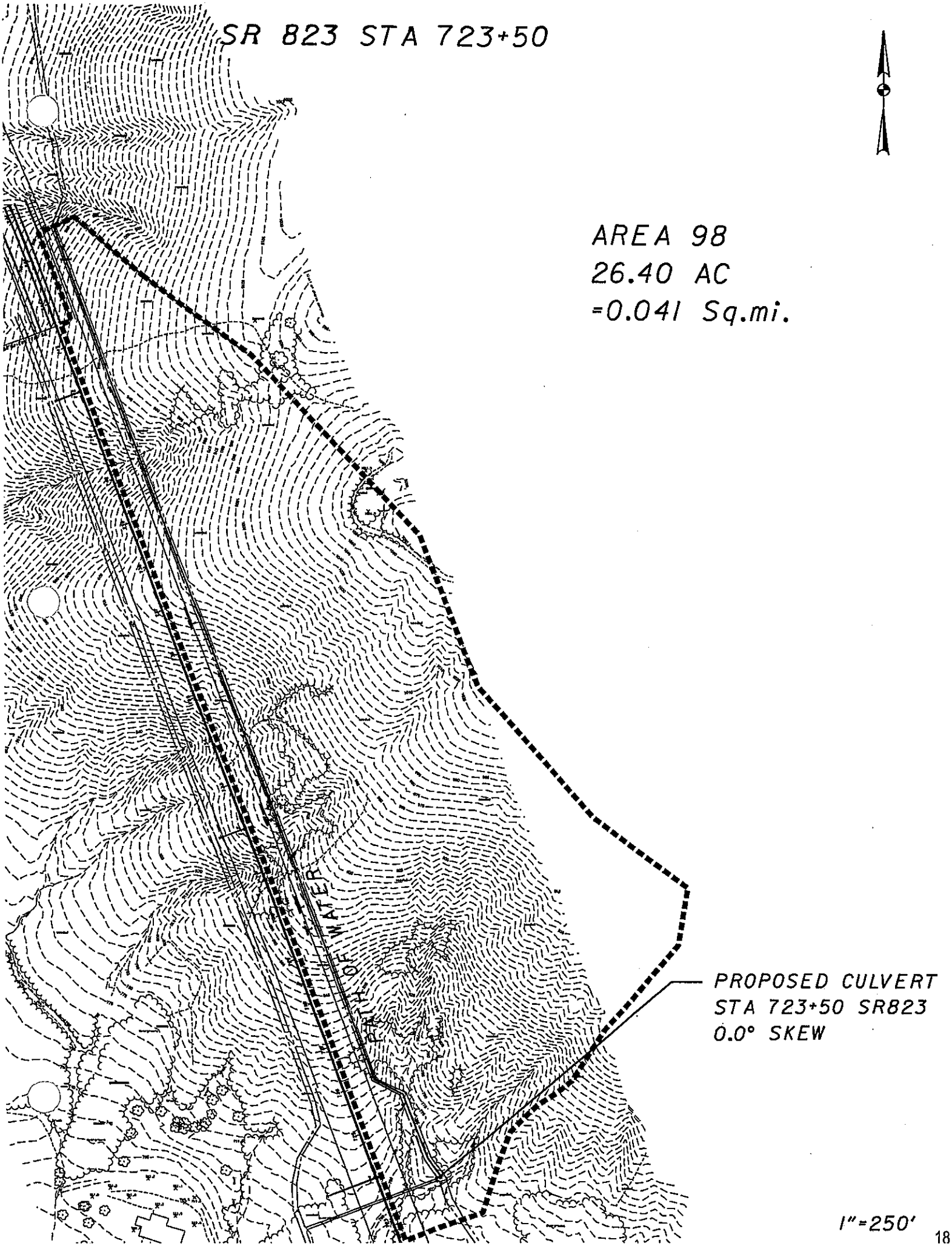
Normal Depth	0.89	ft
Flow Area	9.54	ft^2
Wetted Perimeter	13.65	ft
Top Width	13.36	ft
Critical Depth	1.26	ft
Critical Slope	0.02451	ft/ft
Velocity	8.63	ft/s
Velocity Head	1.16	ft
Specific Energy	2.05	ft
Froude Number	1.80	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.89	ft
Critical Depth	1.26	ft
Channel Slope	0.08700	ft/ft
Critical Slope	0.02451	ft/ft


SR 823 STA 723+50
AREA 98
26.40 AC
=0.041 Sq.mi.
PROPOSED CULVERT
STA 723+50 SR823
0.0° SKEW
1"=250'

CULVERT ANALYSIS

PID : 79977 **Date :** 05/02/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 98, Sta. 723+50 **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 748.30 **Outlet Invert Elevation (ft.) :** 745.20
Pipe Quantity : 1

Culvert Type : Circular Corrugated
Corrugation Type : Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations) **Pipe Length (ft.) :** 245.00 **Culvert Slope (ft./ft.) :** 0.0127
Pipe Size : 60 in.
Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
68.13	2.85	751.72	N/A	1 - C	7.97	2.25	2.33	0.0232	INLET	0.00	745.20
81.35	3.11	752.09	N/A	1 - C	8.34	2.49	2.55	0.0232	INLET	0.00	745.20

UNIVERSAL CULVERT DESIGN

PID : 79977 **Date :** 04/25/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 98, SR823 Sta. 723+50 **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 748.30 **Outlet Invert Elevation (ft.) :** 745.20 **Tailwater Elevation (ft.) :** 746.30 **Overflow Elevation (ft.) :** 778.26

Allowable Headwater Elevation (ft.) : 777.26 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 245.00 **Culvert Slope (ft./ft.) :** 0.0127 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 68.13 @ 50 yrs. **Flood Discharge (cfs) :** 81.35 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
68.13	1	36 in.	753.27	751.91	2 - E	12.88	2.10	2.63	0.0120	INLET	0.00	D	0.00
68.13	1	33 in.	754.28	753.76	2 - E	12.26	2.43	2.58	0.0120	INLET	0.00	D - 1	0.00
68.13	1	30 in.	755.94	756.98	2 - F	13.98	2.50	2.43	0.0120	OUTLET**	0.00	D - 2	0.00
68.13	1	42 in.	752.31	N/A	1 - C	13.08	1.86	2.59	0.0120	INLET	0.00	D + 1	0.00
81.35	1	36 in.	754.48	753.65	2 - E	13.11	2.46	2.78	0.0120	INLET	0.00	F	0.00
81.35	1	33 in.	755.98	756.31	2 - F	13.84	2.75	2.66	0.0120	OUTLET**	0.00	F - 1	0.00
81.35	1	30 in.	758.39	760.97	2 - F	16.62	2.50	2.47	0.0120	OUTLET**	0.00	F - 2	0.00
81.35	1	42 in.	752.96	751.05	2 - E	13.63	2.08	2.82	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
68.13	1	42 in.	752.96	753.44	2 - F	8.94	3.50	2.59	0.0237	OUTLET**	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
68.13	1	36 in.	754.84	759.49	2 - F	10.37	3.00	2.63	0.0241	OUTLET**	0.00	D - 1	0.00
68.13	1	33 in.	756.49	765.64	2 - F	11.78	2.75	2.58	0.0241	OUTLET**	0.00	D - 2	0.00
68.13	1	48 in.	752.21	752.72	1 - A	8.27	2.61	2.49	0.0235	OUTLET*	0.00	D + 1	0.00
81.35	1	42 in.	754.05	755.76	2 - F	9.81	3.50	2.82	0.0237	OUTLET**	0.00	F	0.00
81.35	1	36 in.	756.73	764.45	2 - F	11.89	3.00	2.78	0.0241	OUTLET**	0.00	F - 1	0.00
81.35	1	33 in.	758.93	773.25	2 - F	13.84	2.75	2.66	0.0241	OUTLET**	0.00	F - 2	0.00
81.35	1	48 in.	752.84	753.21	2 - F	8.90	3.00	2.73	0.0235	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
68.13	1	48 in.	752.21	752.63	1 - A	8.27	2.94	2.49	0.0275	OUTLET*	0.00	D	0.00
68.13	1	42 in.	752.96	754.83	2 - F	8.94	3.50	2.59	0.0278	OUTLET**	0.00	D - 1	0.00
68.13	1	36 in.	754.84	762.63	2 - F	10.37	3.00	2.63	0.0281	OUTLET**	0.00	D - 2	0.00
68.13	1	54 in.	751.89	752.39	1 - A	7.88	2.63	2.41	0.0273	OUTLET*	0.00	D + 1	0.00
81.35	1	48 in.	752.84	753.23	2 - F	8.90	4.00	2.73	0.0275	OUTLET*	0.00	F	0.00
81.35	1	42 in.	754.05	757.75	2 - F	9.81	3.50	2.82	0.0278	OUTLET**	0.00	F - 1	0.00
81.35	1	36 in.	756.73	768.93	2 - F	11.89	3.00	2.78	0.0281	OUTLET**	0.00	F - 2	0.00
81.35	1	54 in.	752.33	752.83	1 - A	8.39	2.97	2.64	0.0273	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
68.13	1	60 in.	751.72	752.15	1 - A	7.60	2.77	2.33	0.0332	OUTLET*	0.00	D	0.00
68.13	1	66 in.	751.59	752.02	1 - A	7.40	2.61	2.26	0.0330	OUTLET*	0.00	D + 1	0.00
81.35	1	60 in.	752.09	752.58	1 - A	8.06	3.11	2.55	0.0332	OUTLET*	0.00	F	0.00
81.35	1	66 in.	751.93	752.40	1 - A	7.82	2.90	2.48	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
68.13	1	60 in.	751.72	752.28	1 - A	7.60	2.40	2.33	0.0260	OUTLET*	0.00	D	0.00
68.13	1	66 in.	751.59	752.16	1 - A	7.40	2.28	2.26	0.0260	OUTLET*	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
81.35	1	60 in.	752.09	752.69	1 - A	8.06	2.66	2.55	0.0260	OUTLET*	0.00	F	0.00
81.35	1	66 in.	751.93	752.55	1 - A	7.82	2.52	2.48	0.0260	OUTLET*	0.00	F + 1	0.00

SR823 STA. 723+50
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
1148333.00	SQ. FT.	
0.041	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
2750.00	FT.	**TOTAL CHANNEL LENGTH**
275.00	FT.	L_{10} = 10% of the Distance along channel
778	FT.	**Elev$_{10}$** = Elevation at point L_{10}
2337.50	FT.	L_{85} = 85% of the Distance along channel
926	FT.	**Elev$_{85}$** = Elevation at point L_{85}
2062.50	FT.	**Length** = L_{85} - L_{10}
378.88	FT./MI.	**SLOPE** = (Elev$_{10}$-Elev$_{85}$)/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	12.86	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	27.01	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	38.72	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	54.77	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	68.13	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	81.35	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$
Q_{100}	105.755	CFS	$= 1.3\ Q_{100}$

Worksheet for SR 823 STA 723+50

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.02000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	68.13	ft^3/s

Results

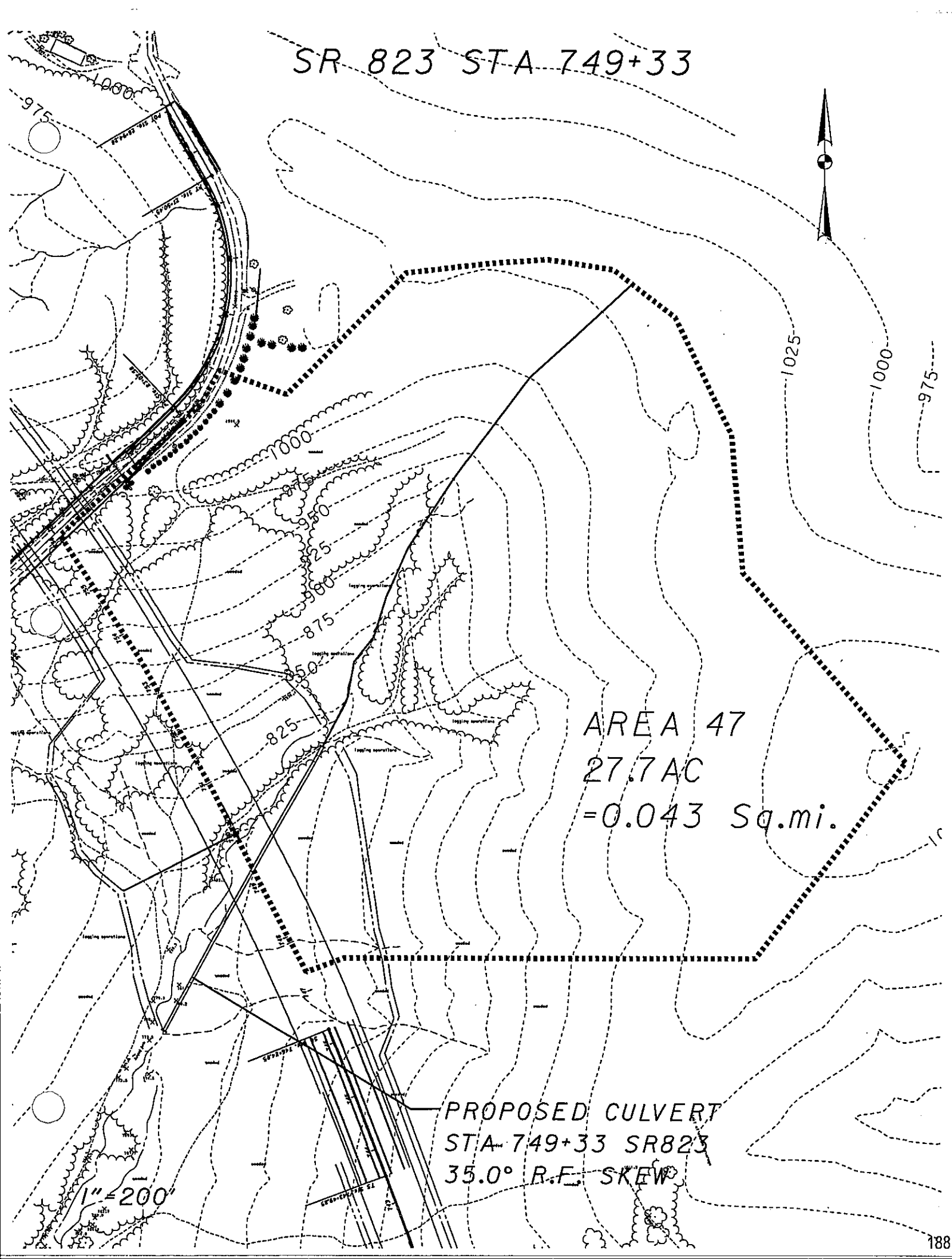
Normal Depth	1.10	ft
Flow Area	14.09	ft^2
Wetted Perimeter	15.96	ft
Top Width	15.52	ft
Critical Depth	1.03	ft
Critical Slope	0.02544	ft/ft
Velocity	4.83	ft/s
Velocity Head	0.36	ft
Specific Energy	1.47	ft
Froude Number	0.89	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.10	ft
Critical Depth	1.03	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.02544	ft/ft


SR 823 STA 749+33
AREA 47
27.7AC
=0.043 Sq.mi.
PROPOSED CULVERT
STA 749+33 SR823
35.0° R.F. SKEW
1"=200'

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 05/09/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 47, Sta. 749+33, 35.0 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 815.89 **Outlet Invert Elevation (ft.) :** 774.03 **Tailwater Elevation (ft.) :** 775.22 **Overflow Elevation (ft.) :** 853.00

Allowable Headwater Elevation (ft.) : 851.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 568.00 **Culvert Slope (ft./ft.) :** 0.0737 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 100.20 @ 50 yrs. **Flood Discharge (cfs) :** 121.00 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
100.20	1	48 in.	820.66	N/A	1 - C	27.56	1.33	3.03	0.0120	INLET	0.00	D	0.00
100.20	1	42 in.	821.69	784.11	2 - E	27.78	1.40	3.07	0.0120	INLET	0.00	D - 1	0.00
100.20	1	36 in.	824.16	791.58	2 - E	27.88	1.52	2.90	0.0120	INLET	0.00	D - 2	0.00
100.20	1	54 in.	820.24	N/A	1 - C	27.27	1.27	2.94	0.0120	INLET	0.00	D + 1	0.00
121.00	1	48 in.	821.55	782.83	2 - E	29.00	1.47	3.31	0.0120	INLET	0.00	F	0.00
121.00	1	42 in.	823.22	787.32	2 - E	29.19	1.56	3.25	0.0120	INLET	0.00	F - 1	0.00
121.00	1	36 in.	826.89	798.30	2 - E	29.19	1.70	2.95	0.0120	INLET	0.00	F - 2	0.00
121.00	1	54 in.	820.84	N/A	1 - C	28.76	1.40	3.24	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
100.20	1	48 in.	821.53	788.40	2 - E	16.86	1.92	3.03	0.0235	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
100.20	1	42 in.	823.52	799.13	2 - E	16.68	2.09	3.07	0.0237	INLET	0.00	D - 1	0.00
100.20	1	36 in.	827.32	826.71	2 - E	15.73	2.53	2.90	0.0241	INLET	0.00	D - 2	0.00
100.20	1	54 in.	820.62	N/A	1 - C	16.89	1.80	2.94	0.0233	INLET	0.00	D + 1	0.00
121.00	1	48 in.	823.03	793.52	2 - E	17.67	2.14	3.31	0.0235	INLET	0.00	F	0.00
121.00	1	42 in.	825.89	809.23	2 - E	17.33	2.38	3.25	0.0237	INLET	0.00	F - 1	0.00
121.00	1	36 in.	831.57	849.53	2 - F	17.18	3.00	2.95	0.0241	OUTLET**	0.00	F - 2	0.00
121.00	1	54 in.	821.54	786.48	2 - E	17.75	2.00	3.24	0.0233	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
100.20	1	48 in.	821.53	791.72	2 - E	14.97	2.10	3.03	0.0275	INLET	0.00	D	0.00
100.20	1	42 in.	823.52	806.13	2 - E	14.69	2.34	3.07	0.0278	INLET	0.00	D - 1	0.00
100.20	1	36 in.	827.32	842.46	2 - F	14.33	3.00	2.90	0.0281	OUTLET**	0.00	D - 2	0.00
100.20	1	54 in.	820.62	N/A	1 - C	15.04	1.96	2.94	0.0273	INLET	0.00	D + 1	0.00
121.00	1	48 in.	823.03	798.35	2 - E	15.65	2.36	3.31	0.0275	INLET	0.00	F	0.00
121.00	1	42 in.	825.89	819.43	2 - E	15.10	2.72	3.25	0.0278	INLET	0.00	F - 1	0.00
107.90	1	36 in.	831.57	872.50	2 - F	15.37	3.00	2.92	0.0281	OUTLET**	13.10	F - 2	0.00
121.00	1	54 in.	821.54	789.04	2 - E	15.79	2.19	3.24	0.0273	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
100.20	1	60 in.	820.21	N/A	1 - C	12.97	2.08	2.85	0.0332	INLET	0.00	D	0.00
100.20	1	66 in.	819.98	N/A	1 - C	12.95	1.99	2.77	0.0330	INLET	0.00	D + 1	0.00
121.00	1	60 in.	820.84	N/A	1 - C	13.62	2.31	3.14	0.0332	INLET	0.00	F	0.00
121.00	1	66 in.	820.49	N/A	1 - C	13.63	2.20	3.05	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
100.20	1	60 in.	820.21	N/A	1 - C	15.49	1.82	2.85	0.0260	INLET	0.00	D	0.00
100.20	1	66 in.	819.98	N/A	1 - C	15.39	1.75	2.77	0.0260	INLET	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
121.00	1	60 in.	820.84	N/A	1 - C	16.31	2.02	3.14	0.0260	INLET	0.00	F	0.00
121.00	1	66 in.	820.49	N/A	1 - C	16.22	1.93	3.05	0.0260	INLET	0.00	F + 1	0.00

SR 823 STA 749+33.00
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
1206153.00	SQ. FT.	
0.043	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1000.00	FT.	**TOTAL CHANNEL LENGTH**
100.00	FT.	L_{10} = 10% of the Distance along channel
823	FT.	$Elev_{10}$ = Elevation at point L_{10}
850.00	FT.	L_{85} = 85% of the Distance along channel
1013	FT.	$Elev_{85}$ = Elevation at point L_{85}
750.00	FT.	**Length** = $L_{85} - L_{10}$
1337.60	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	16.60	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	37.06	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	54.68	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	79.32	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	100.16	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	120.96	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 749+33

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.05000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	100.20	ft^3/s

Results

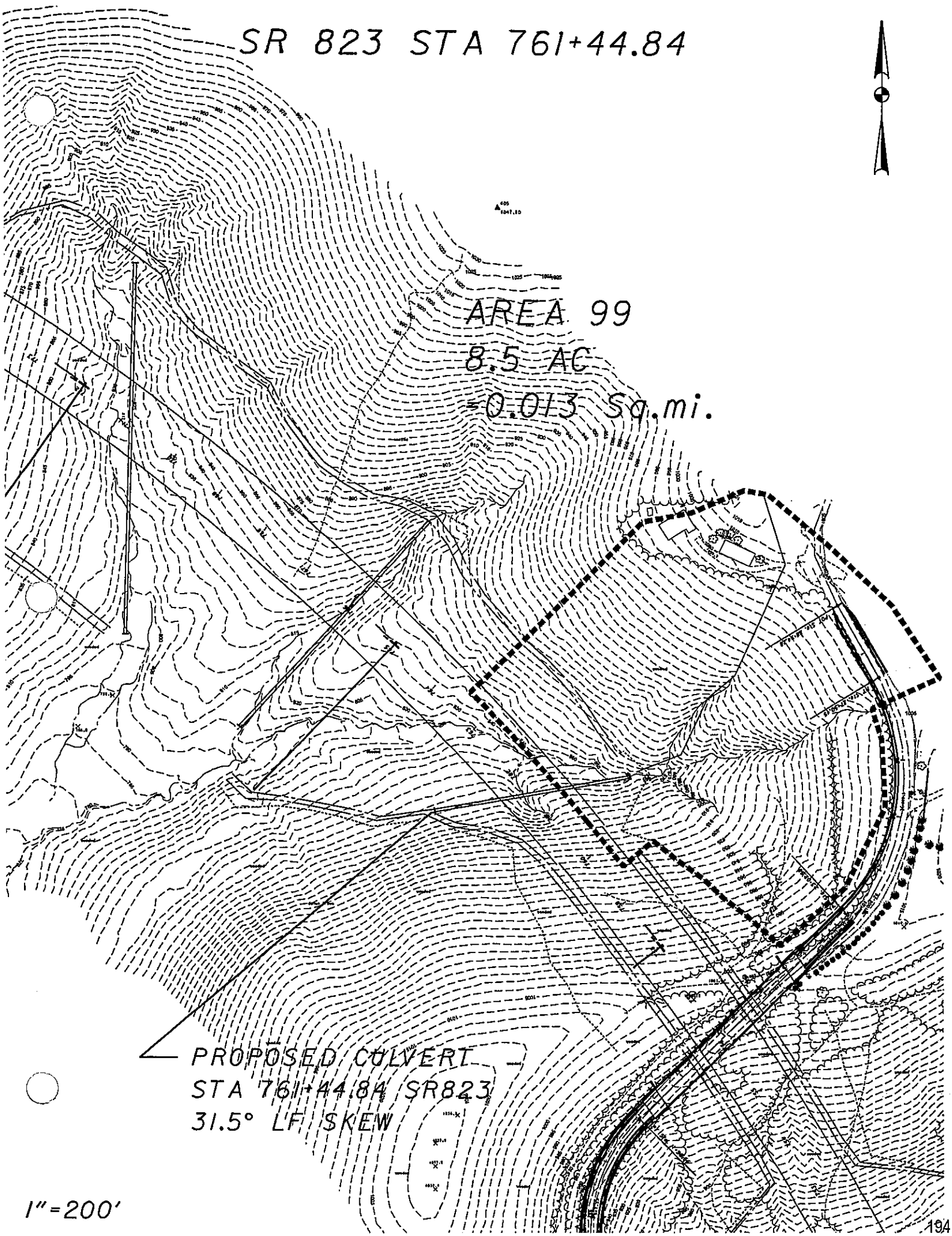
Normal Depth	1.16	ft
Flow Area	13.27	ft^2
Wetted Perimeter	15.32	ft
Top Width	14.94	ft
Critical Depth	1.41	ft
Critical Slope	0.02381	ft/ft
Velocity	7.55	ft/s
Velocity Head	0.89	ft
Specific Energy	2.04	ft
Froude Number	1.41	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.16	ft
Critical Depth	1.41	ft
Channel Slope	0.05000	ft/ft
Critical Slope	0.02381	ft/ft


SR 823 STA 761+44.84
AREA 99
8.5 AC
=0.013 Sq.mi.
PROPOSED CULVERT
STA 761+44.84 SR823
31.5° LF SKEW
1"=200'

CULVERT ANALYSIS

PID : 79977 **Date :** 05/02/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 99, Sta. 761+44.84, 31.5 skew **Designer :** DL

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 862.90 **Outlet Invert Elevation (ft.) :** 859.16
Pipe Quantity : 1

Culvert Type : Circular Corrugated
Corrugation Type : Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert) **Pipe Length (ft.) :** 348.00 **Culvert Slope (ft./ft.) :** 0.0107
Pipe Size : 60 in.
Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
42.35	4.94	865.51	865.91	1 - A	6.57	1.92	1.82	0.0260	OUTLET*	0.00	859.16
50.88	5.07	865.80	866.23	1 - A	6.94	2.13	2.00	0.0260	OUTLET*	0.00	859.16

UNIVERSAL CULVERT DESIGN

PID : 79977 **Date :** 05/02/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 99, Sta. 761+44.84, 31.5 skew. **Designer :** dl

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 862.90 **Outlet Invert Elevation (ft.) :** 859.16 **Tailwater Elevation (ft.) :** 859.72 **Overflow Elevation (ft.) :** 905.89

Allowable Headwater Elevation (ft.) : 904.89 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 348.00 **Culvert Slope (ft./ft.) :** 0.0107 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 33.90 @ 50 yrs. **Flood Discharge (cfs) :** 40.80 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
33.90	1	27 in.	866.72	866.17	2 - E	9.97	1.79	1.99	0.0120	INLET	0.00	D	0.00
33.90	1	24 in.	867.88	869.91	2 - F	10.96	2.00	1.91	0.0120	OUTLET**	0.00	D - 1	0.00
33.90	1	21 in.	870.16	878.10	2 - F	14.13	1.75	1.73	0.0120	OUTLET**	0.00	D - 2	0.00
33.90	1	30 in.	866.13	864.30	2 - E	10.26	1.59	1.98	0.0120	INLET	0.00	D + 1	0.00
40.80	1	27 in.	867.72	868.42	2 - F	10.56	2.25	2.10	0.0120	OUTLET**	0.00	F	0.00
40.80	1	24 in.	869.44	873.87	2 - F	13.06	2.00	1.96	0.0120	OUTLET**	0.00	F - 1	0.00
40.80	1	21 in.	873.34	885.82	2 - F	16.98	1.75	1.74	0.0120	OUTLET**	0.00	F - 2	0.00
40.80	1	30 in.	866.78	865.69	2 - E	10.60	1.83	2.15	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
33.90	1	33 in.	866.21	867.35	2 - F	7.58	2.75	1.94	0.0241	OUTLET**	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
33.90	1	30 in.	866.84	871.13	2 - F	8.13	2.50	1.98	0.0244	OUTLET**	0.00	D - 1	0.00
33.90	1	27 in.	867.95	878.15	2 - F	9.12	2.25	1.99	0.0245	OUTLET**	0.00	D - 2	0.00
33.90	1	36 in.	865.88	866.18	1 - A	7.22	2.24	1.89	0.0241	OUTLET*	0.00	D + 1	0.00
40.80	1	33 in.	866.96	870.07	2 - F	8.29	2.75	2.12	0.0241	OUTLET**	0.00	F	0.00
40.80	1	30 in.	867.93	875.58	2 - F	9.10	2.50	2.15	0.0244	OUTLET**	0.00	F - 1	0.00
40.80	1	27 in.	869.50	885.77	2 - F	10.56	2.25	2.10	0.0245	OUTLET**	0.00	F - 2	0.00
40.80	1	36 in.	866.40	867.13	2 - F	7.80	3.00	2.08	0.0241	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
33.90	1	36 in.	865.88	866.31	1 - A	7.22	2.67	1.89	0.0281	OUTLET*	0.00	D	0.00
33.90	1	42 in.	865.58	865.91	1 - A	6.78	2.15	1.80	0.0278	OUTLET*	0.00	D + 1	0.00
40.80	1	36 in.	866.40	868.73	2 - F	7.80	3.00	2.08	0.0281	OUTLET**	0.00	F	0.00
40.80	1	42 in.	865.91	866.29	1 - A	7.24	2.45	1.99	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
33.90	1	60 in.	865.20	865.51	1 - A	6.16	1.95	1.62	0.0332	OUTLET*	0.00	D	0.00
33.90	1	66 in.	865.10	865.42	1 - A	6.03	1.86	1.58	0.0330	OUTLET*	0.00	D + 1	0.00
40.80	1	60 in.	865.46	865.79	1 - A	6.50	2.16	1.78	0.0332	OUTLET*	0.00	F	0.00
40.80	1	66 in.	865.35	865.69	1 - A	6.36	2.06	1.73	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
33.90	1	60 in.	865.20	865.57	1 - A	6.16	1.71	1.62	0.0260	OUTLET*	0.00	D	0.00
33.90	1	66 in.	865.10	865.49	1 - A	6.03	1.65	1.58	0.0260	OUTLET*	0.00	D + 1	0.00
40.80	1	60 in.	865.46	865.85	1 - A	6.50	1.89	1.78	0.0260	OUTLET*	0.00	F	0.00
40.80	1	66 in.	865.35	865.76	1 - A	6.36	1.81	1.73	0.0260	OUTLET*	0.00	F + 1	0.00

SR823 STA. 761+44.84
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
368858.00	SQ. FT.	
0.013	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
589.00	FT.	**TOTAL CHANNEL LENGTH**
58.90	FT.	L_{10} = 10% of the Distance along channel
877	FT.	$Elev_{10}$ = Elevation at point L_{10}
500.65	FT.	L_{85} = 85% of the Distance along channel
1010	FT.	$Elev_{85}$ = Elevation at point L_{85}
1027.43	FT.	**Length** = $L_{85} - L_{10}$
683.49	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge # = Frequency of Storm

Q_2	5.86	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	12.85	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	18.78	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	27.00	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	33.94	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	40.79	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 761+44.84

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.08400	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	42.35	ft^3/s

Results

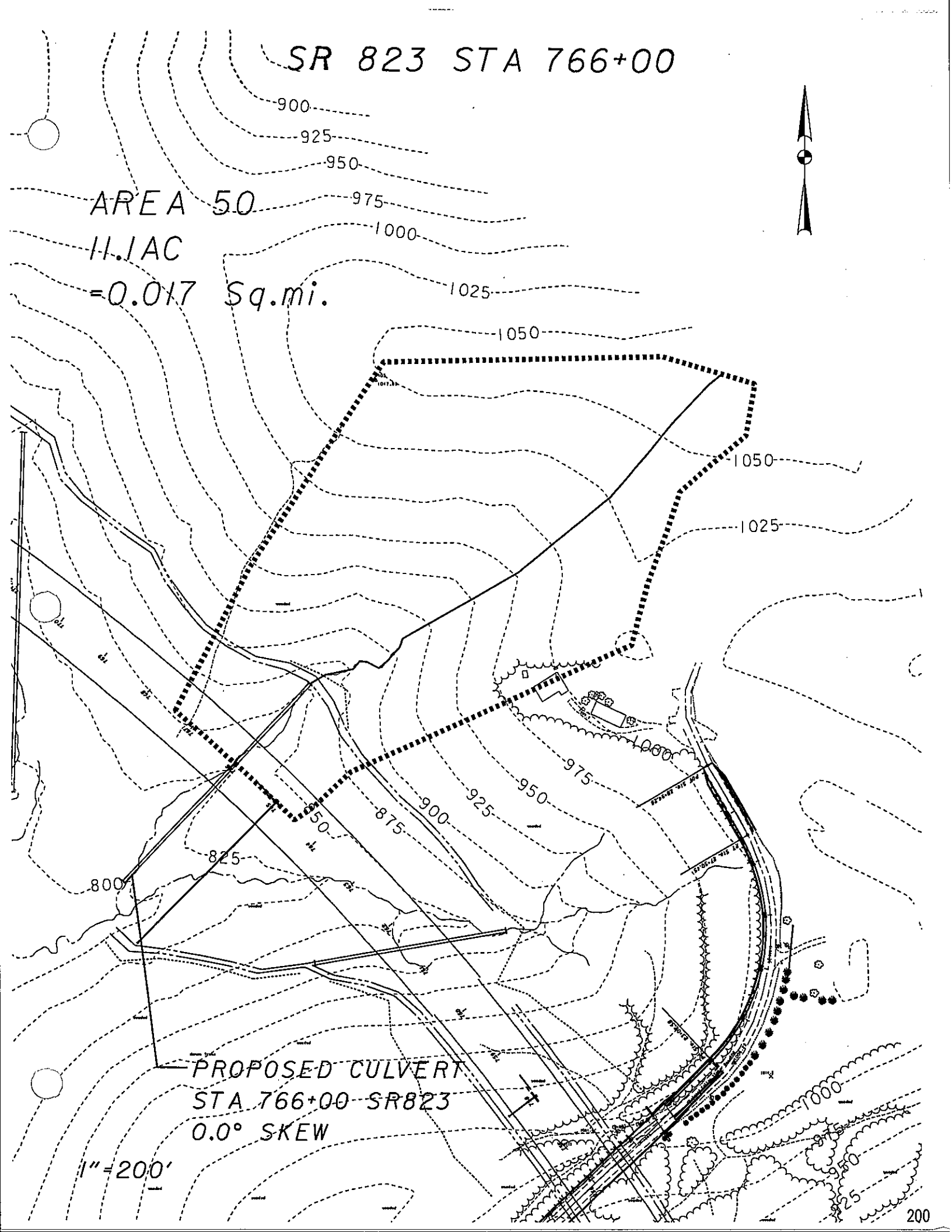
Normal Depth	0.56	ft
Flow Area	6.25	ft^2
Wetted Perimeter	12.51	ft
Top Width	12.25	ft
Critical Depth	0.78	ft
Critical Slope	0.02742	ft/ft
Velocity	6.77	ft/s
Velocity Head	0.71	ft
Specific Energy	1.28	ft
Froude Number	1.67	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.56	ft
Critical Depth	0.78	ft
Channel Slope	0.08400	ft/ft
Critical Slope	0.02742	ft/ft


SR 823 STA 766+00
AREA 50
11.1AC
=0.017 Sq.mi.
900
925
950
975
1000
1025
1050
1050
1025
1000
975
950
925
900
875
850
825
800
PROPOSED CULVERT
STA 766+00 SR823
0.0° SKEW
1"=200'
1000
975
950
925

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 04/04/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 50, Sta. 766+00 **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 848.42 **Outlet Invert Elevation (ft.) :** 798.50 **Tailwater Elevation (ft.) :** 799.13 **Overflow Elevation (ft.) :** 918.00

Allowable Headwater Elevation (ft.) : 916.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 484.00 **Culvert Slope (ft./ft.) :** 0.1031 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 49.40 @ 50 yrs. **Flood Discharge (cfs) :** 59.70 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
49.40	1	33 in.	852.48	805.90	2 - E	26.28	0.97	2.32	0.0120	INLET	0.00	D	0.00
49.40	1	30 in.	853.29	808.73	2 - E	26.41	1.02	2.29	0.0120	INLET	0.00	D - 1	0.00
49.40	1	27 in.	854.73	814.02	2 - E	26.51	1.07	2.18	0.0120	INLET	0.00	D - 2	0.00
49.40	1	36 in.	852.04	804.30	2 - E	26.09	0.94	2.29	0.0120	INLET	0.00	D + 1	0.00
59.70	1	33 in.	853.46	808.22	2 - E	27.66	1.08	2.48	0.0120	INLET	0.00	F	0.00
59.70	1	30 in.	854.72	812.39	2 - E	27.79	1.13	2.39	0.0120	INLET	0.00	F - 1	0.00
59.70	1	27 in.	856.84	820.17	2 - E	27.80	1.20	2.21	0.0120	INLET	0.00	F - 2	0.00
59.70	1	36 in.	852.72	805.86	2 - E	27.51	1.04	2.50	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
49.40	1	36 in.	852.71	811.66	2 - E	15.70	1.37	2.29	0.0241	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
49.40	1	33 in.	853.61	817.50	2 - E	15.71	1.44	2.32	0.0241	INLET	0.00	D - 1	0.00
49.40	1	30 in.	855.02	828.48	2 - E	15.48	1.55	2.29	0.0244	INLET	0.00	D - 2	0.00
49.40	1	42 in.	851.87	N/A	1 - C	15.78	1.26	2.20	0.0237	INLET	0.00	D + 1	0.00
59.70	1	36 in.	853.87	816.60	2 - E	16.47	1.53	2.50	0.0241	INLET	0.00	F	0.00
59.70	1	33 in.	855.19	825.17	2 - E	16.43	1.62	2.48	0.0241	INLET	0.00	F - 1	0.00
59.70	1	30 in.	857.11	841.23	2 - E	16.05	1.77	2.39	0.0244	INLET	0.00	F - 2	0.00
59.70	1	42 in.	852.49	N/A	1 - C	16.60	1.40	2.42	0.0237	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
49.40	1	36 in.	852.71	814.92	2 - E	14.00	1.50	2.29	0.0281	INLET	0.00	D	0.00
49.40	1	42 in.	851.87	N/A	1 - C	14.06	1.38	2.20	0.0278	INLET	0.00	D + 1	0.00
59.70	1	36 in.	853.87	821.37	2 - E	14.66	1.68	2.50	0.0281	INLET	0.00	F	0.00
59.70	1	42 in.	852.49	N/A	1 - C	14.78	1.53	2.42	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
49.40	1	60 in.	851.27	N/A	1 - C	12.01	1.31	1.97	0.0332	INLET	0.00	D	0.00
49.40	1	66 in.	851.16	N/A	1 - C	11.94	1.27	1.91	0.0330	INLET	0.00	D + 1	0.00
59.70	1	60 in.	851.59	N/A	1 - C	12.68	1.45	2.17	0.0332	INLET	0.00	F	0.00
59.70	1	66 in.	851.47	N/A	1 - C	12.62	1.39	2.11	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
49.40	1	60 in.	851.27	N/A	1 - C	14.30	1.16	1.97	0.0260	INLET	0.00	D	0.00
49.40	1	66 in.	851.16	N/A	1 - C	14.15	1.12	1.91	0.0260	INLET	0.00	D + 1	0.00
59.70	1	60 in.	851.59	N/A	1 - C	15.10	1.28	2.17	0.0260	INLET	0.00	F	0.00
59.70	1	66 in.	851.47	N/A	1 - C	14.95	1.24	2.11	0.0260	INLET	0.00	F + 1	0.00

SR 823 STA 766+00.00
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
485212.00	SQ. FT.	
0.017	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
960.00	FT.	**TOTAL CHANNEL LENGTH**
96.00	FT.	L_{10} = 10% of the Distance along channel
880	FT.	**Elev$_{10}$** = Elevation at point L_{10}
816.00	FT.	L_{85} = 85% of the Distance along channel
1051	FT.	**Elev$_{85}$** = Elevation at point L_{85}
720.00	FT.	**Length** = $L_{85} - L_{10}$
1254.00	FT./MI.	**SLOPE** = (Elev$_{10}$-Elev$_{85}$)/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	8.06	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	18.14	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	26.85	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	39.03	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	49.38	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	59.66	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 766+00

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.11000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	49.40	ft^3/s

Results

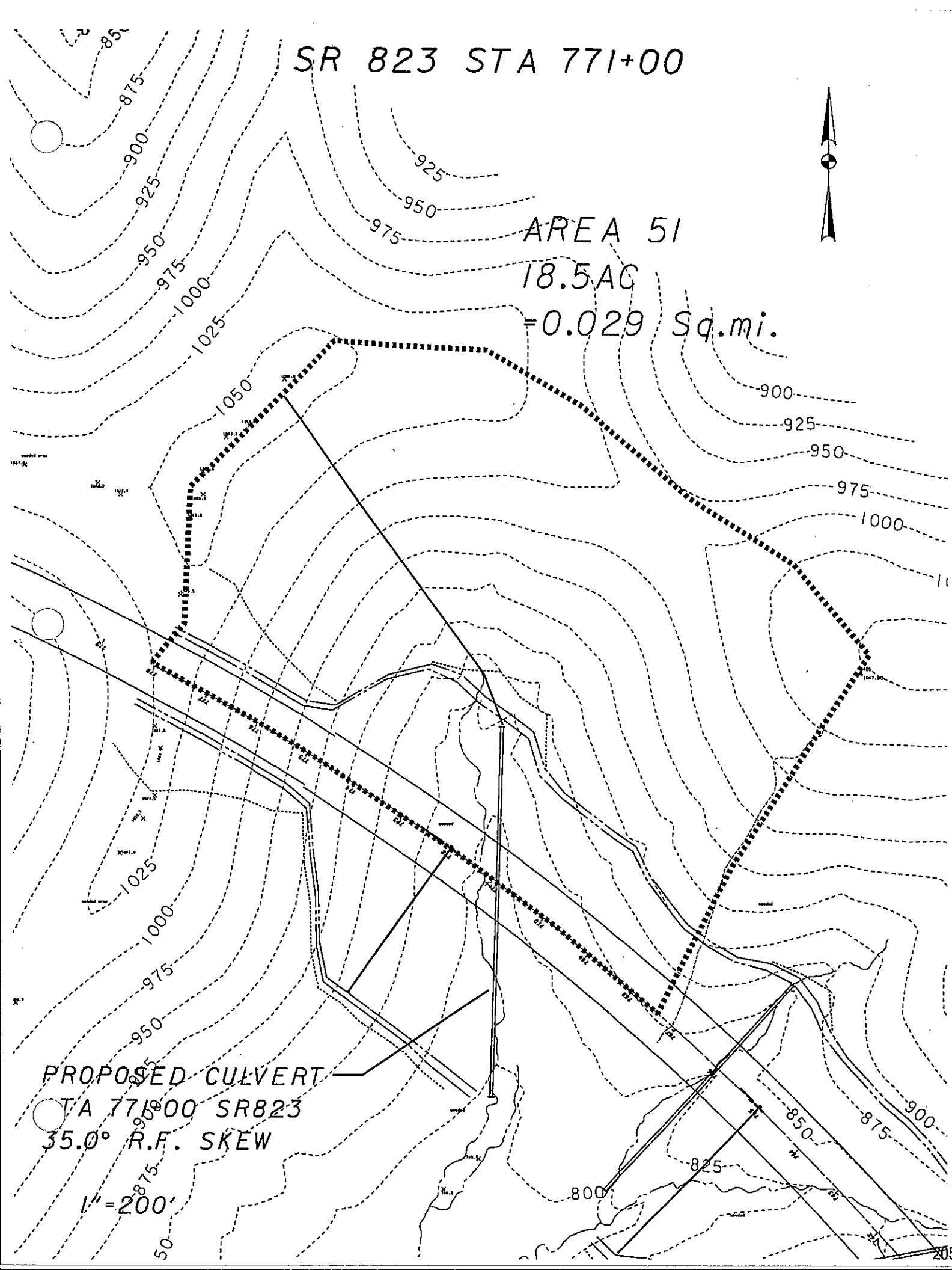
Normal Depth	0.63	ft
Flow Area	6.21	ft^2
Wetted Perimeter	11.97	ft
Top Width	11.77	ft
Critical Depth	0.94	ft
Critical Slope	0.02652	ft/ft
Velocity	7.95	ft/s
Velocity Head	0.98	ft
Specific Energy	1.61	ft
Froude Number	1.93	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.63	ft
Critical Depth	0.94	ft
Channel Slope	0.11000	ft/ft
Critical Slope	0.02652	ft/ft


SR 823 STA 771+00
AREA 51
18.5AC
=0.029 Sq.mi.
PROPOSED CULVERT
TA 771+00 SR823
35.0° R.F. SKEW
1"=200'

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 04/05/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 51, Sta. 771+00, 35 skew **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 842.50 **Outlet Invert Elevation (ft.) :** 796.23 **Tailwater Elevation (ft.) :** 797.17 **Overflow Elevation (ft.) :** 938.80

Allowable Headwater Elevation (ft.) : 936.80 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 648.00 **Culvert Slope (ft./ft.) :** 0.0714 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 80.80 @ 50 yrs. **Flood Discharge (cfs) :** 97.90 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
80.80	1	42 in.	847.13	804.24	2 - E	25.90	1.26	2.81	0.0120	INLET	0.00	D	0.00
80.80	1	36 in.	848.63	809.61	2 - E	26.08	1.35	2.78	0.0120	INLET	0.00	D - 1	0.00
80.80	1	33 in.	850.10	815.20	2 - E	26.12	1.42	2.66	0.0120	INLET	0.00	D - 2	0.00
80.80	1	48 in.	846.57	N/A	1 - C	25.65	1.19	2.72	0.0120	INLET	0.00	D + 1	0.00
97.90	1	42 in.	848.14	806.63	2 - E	27.27	1.40	3.04	0.0120	INLET	0.00	F	0.00
97.90	1	36 in.	850.49	814.58	2 - E	27.41	1.51	2.89	0.0120	INLET	0.00	F - 1	0.00
97.90	1	33 in.	852.68	822.83	2 - E	27.33	1.60	2.71	0.0120	INLET	0.00	F - 2	0.00
97.90	1	48 in.	847.18	N/A	1 - C	27.03	1.32	3.00	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
80.80	1	48 in.	847.01	N/A	1 - C	15.74	1.71	2.72	0.0235	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
80.80	1	42 in.	848.20	815.28	2 - E	15.68	1.85	2.81	0.0237	INLET	0.00	D - 1	0.00
80.80	1	36 in.	850.85	835.47	2 - E	15.24	2.11	2.78	0.0241	INLET	0.00	D - 2	0.00
80.80	1	54 in.	846.51	N/A	1 - C	15.75	1.61	2.63	0.0233	INLET	0.00	D + 1	0.00
97.90	1	48 in.	848.00	811.30	2 - E	16.56	1.91	3.00	0.0235	INLET	0.00	F	0.00
97.90	1	42 in.	849.88	822.83	2 - E	16.39	2.08	3.04	0.0237	INLET	0.00	F - 1	0.00
97.90	1	36 in.	853.54	852.54	2 - E	15.49	2.51	2.89	0.0241	INLET	0.00	F - 2	0.00
97.90	1	54 in.	847.14	N/A	1 - C	16.59	1.79	2.91	0.0233	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
80.80	1	48 in.	847.01	N/A	1 - C	14.02	1.87	2.72	0.0275	INLET	0.00	D	0.00
80.80	1	42 in.	848.20	820.47	2 - E	13.87	2.04	2.81	0.0278	INLET	0.00	D - 1	0.00
80.80	1	36 in.	850.85	847.16	2 - E	13.30	2.41	2.78	0.0281	INLET	0.00	D - 2	0.00
80.80	1	54 in.	846.51	N/A	1 - C	14.03	1.76	2.63	0.0273	INLET	0.00	D + 1	0.00
97.90	1	48 in.	848.00	814.91	2 - E	14.71	2.09	3.00	0.0275	INLET	0.00	F	0.00
97.90	1	42 in.	849.88	830.46	2 - E	14.45	2.32	3.04	0.0278	INLET	0.00	F - 1	0.00
97.90	1	36 in.	853.54	869.69	2 - F	14.02	3.00	2.89	0.0281	OUTLET**	0.00	F - 2	0.00
97.90	1	54 in.	847.14	N/A	1 - C	14.77	1.96	2.91	0.0273	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
80.80	1	60 in.	846.27	N/A	1 - C	12.09	1.87	2.55	0.0332	INLET	0.00	D	0.00
80.80	1	66 in.	846.12	N/A	1 - C	12.06	1.79	2.47	0.0330	INLET	0.00	D + 1	0.00
97.90	1	60 in.	846.75	N/A	1 - C	12.73	2.07	2.81	0.0332	INLET	0.00	F	0.00
97.90	1	66 in.	846.54	N/A	1 - C	12.73	1.98	2.73	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
80.80	1	60 in.	846.27	N/A	1 - C	14.43	1.64	2.55	0.0260	INLET	0.00	D	0.00
80.80	1	66 in.	846.12	N/A	1 - C	14.32	1.58	2.47	0.0260	INLET	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
97.90	1	60 in.	846.75	N/A	1 - C	15.22	1.81	2.81	0.0260	INLET	0.00	F	0.00
97.90	1	66 in.	846.54	N/A	1 - C	15.12	1.74	2.73	0.0260	INLET	0.00	F + 1	0.00

SR 823 STA 771+00.00
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
806664.00	SQ. FT.	
0.029	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
684.00	FT.	**TOTAL CHANNEL LENGTH**
68.40	FT.	L_{10} = 10% of the Distance along channel
850	FT.	$Elev_{10}$ = Elevation at point L_{10}
581.40	FT.	L_{85} = 85% of the Distance along channel
1030	FT.	$Elev_{85}$ = Elevation at point L_{85}
513.00	FT.	**Length** = $L_{85} - L_{10}$
1852.63	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	12.82	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	29.23	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	43.54	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	63.67	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	80.81	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	97.92	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 771+00

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.07100	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	80.80	ft^3/s

Results

Normal Depth	0.94	ft
Flow Area	10.11	ft^2
Wetted Perimeter	13.92	ft
Top Width	13.61	ft
Critical Depth	1.25	ft
Critical Slope	0.02458	ft/ft
Velocity	7.99	ft/s
Velocity Head	0.99	ft
Specific Energy	1.93	ft
Froude Number	1.64	
Flow Type	Supercritical	

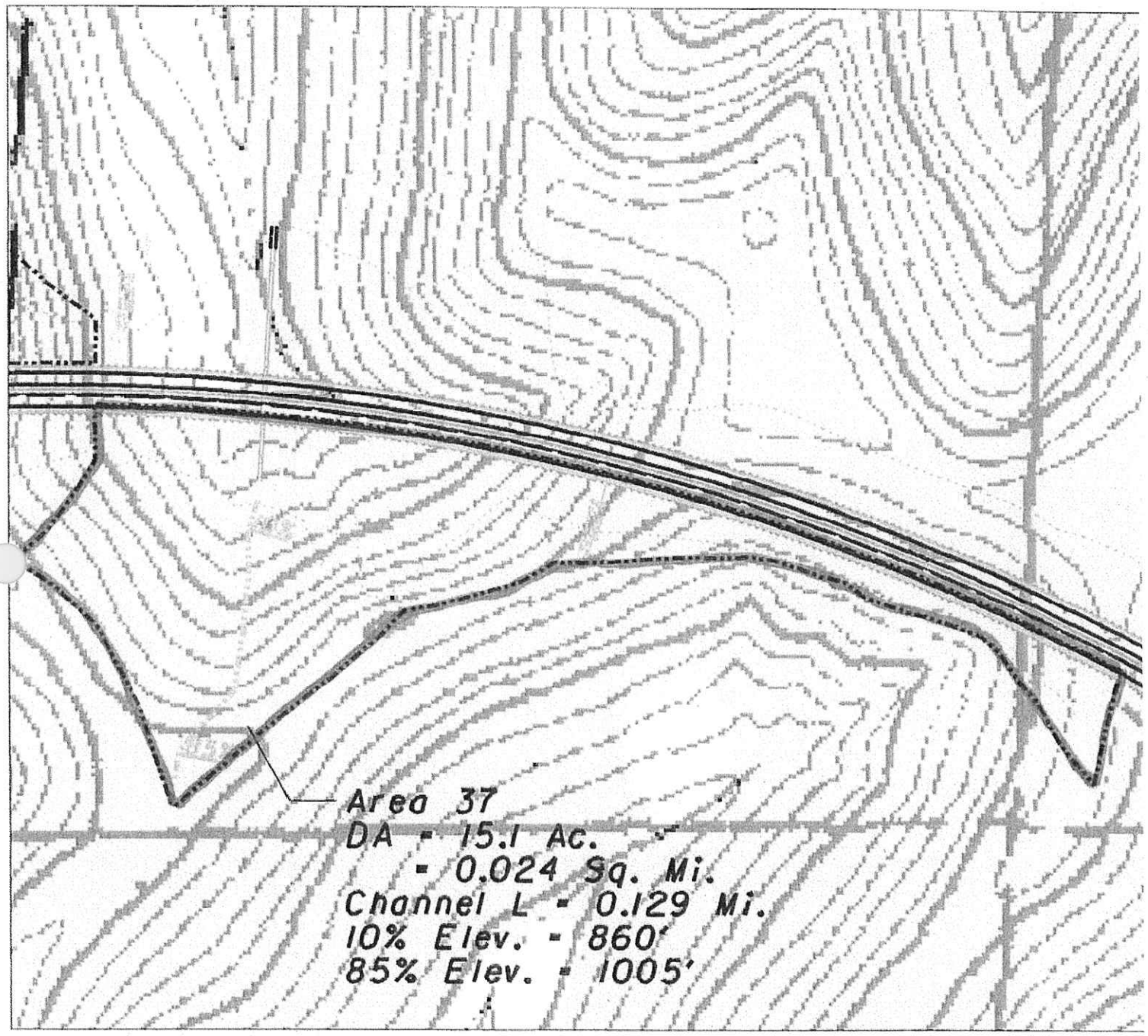
GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.94	ft
Critical Depth	1.25	ft
Channel Slope	0.07100	ft/ft
Critical Slope	0.02458	ft/ft

1"=300'



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66" STA. 796+06.29

CULVERT ANALYSIS

PID : 19415 **Date :** 08/31/2006 **Project :** Portsmouth Bypass **Location :** SR 823 - Station 796+06.29

Designer : CTS

Description : Proposed Culvert

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 839.88 **Outlet Invert Elevation (ft.) :** 771.66

Pipe Quantity : 1

Culvert Type : Circular Corrugated **Pipe Length (ft.) :** 488.00 **Culvert Slope (ft./ft.) :** 0.1398

Corrugation Type : Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)

Pipe Size : 66 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
66.00	67.59	843.11	N/A	1 - C	18.65	1.14	2.22	0.0231	INLET	0.00	775.52
80.00	67.79	843.48	776.89	1 - C	19.72	1.25	2.46	0.0231	INLET	0.00	775.69

1" = 300'

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72" STA. 815+00.28

CULVERT ANALYSIS

PID : 19415 **Date :** 09/08/2006 **Project :** Portsmouth Bypass **Location :** SR 823 - Station 815+00.28

Description : Proposed Culvert **Designer :** CTS

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0. **Inlet Invert Elevation (ft.) :** 756.28 **Outlet Invert Elevation (ft.) :** 725.40

Pipe Quantity : 1

Culvert Type : Circular Corrugated **Pipe Length (ft.) :** 688.00 **Culvert Slope (ft./ft.) :** 0.0449

Corrugation Type : Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)

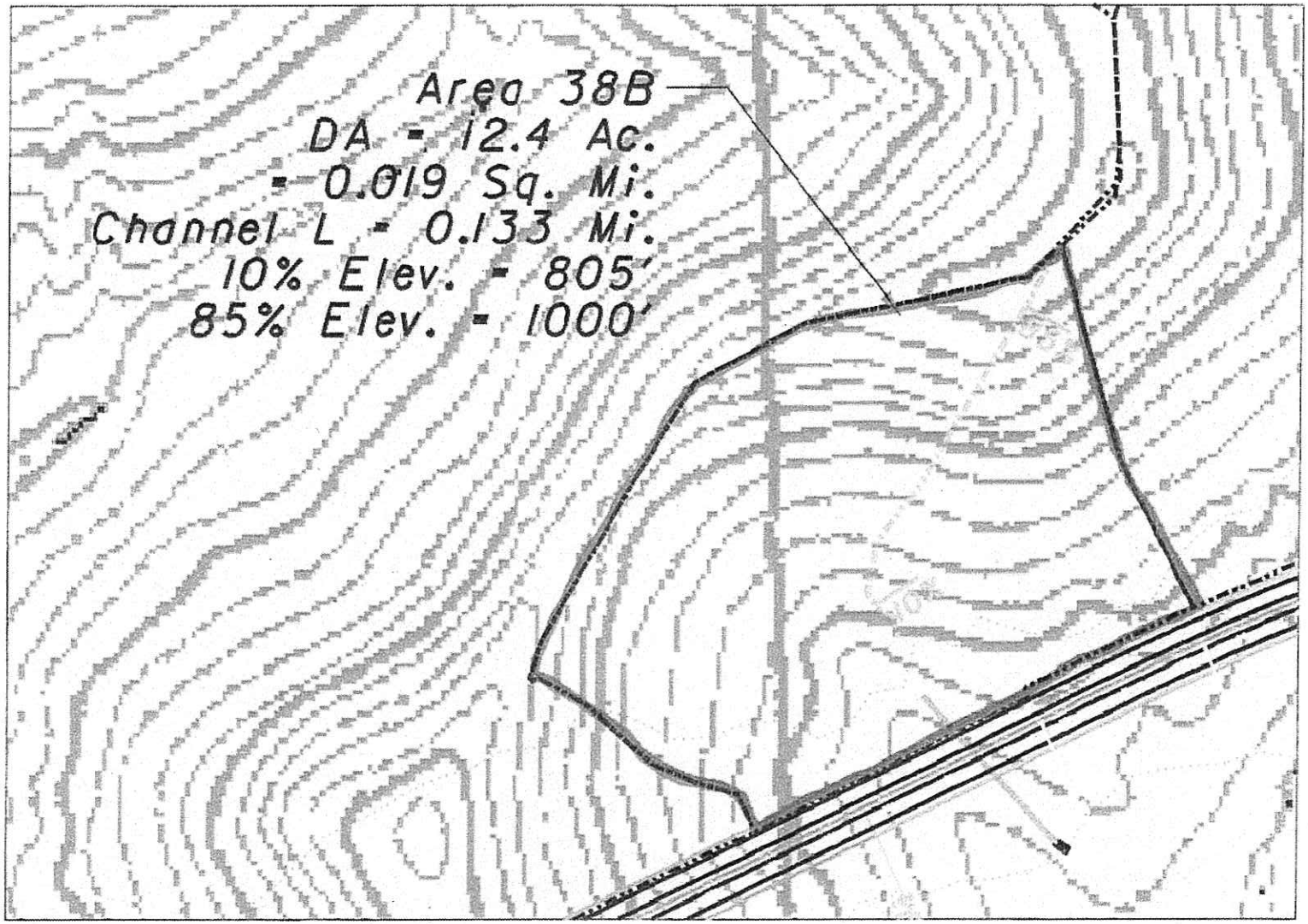
Pipe Size : 72 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
139.00	31.05	761.05	733.00	1 - C	15.34	2.14	3.20	0.0229	INLET	0.00	730.00
167.00	31.46	761.66	734.53	1 - C	16.13	2.36	3.52	0.0229	INLET	0.00	730.20

1" = 250'



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60" STA. 823+45.11

CULVERT ANALYSIS

PID : 19415 **Date :** 09/08/2006 **Project :** Portsmouth Bypass **Location :** SR 823 - Station 823+45.11

Description : Proposed Culvert **Designer :** CTS

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 761.05 **Outlet Invert Elevation (ft.) :** 731.83

Pipe Quantity : 1

Culvert Type : Circular Corrugated **Pipe Length (ft.) :** 304.00 **Culvert Slope (ft./ft.) :** 0.0961

Corrugation Type : Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)

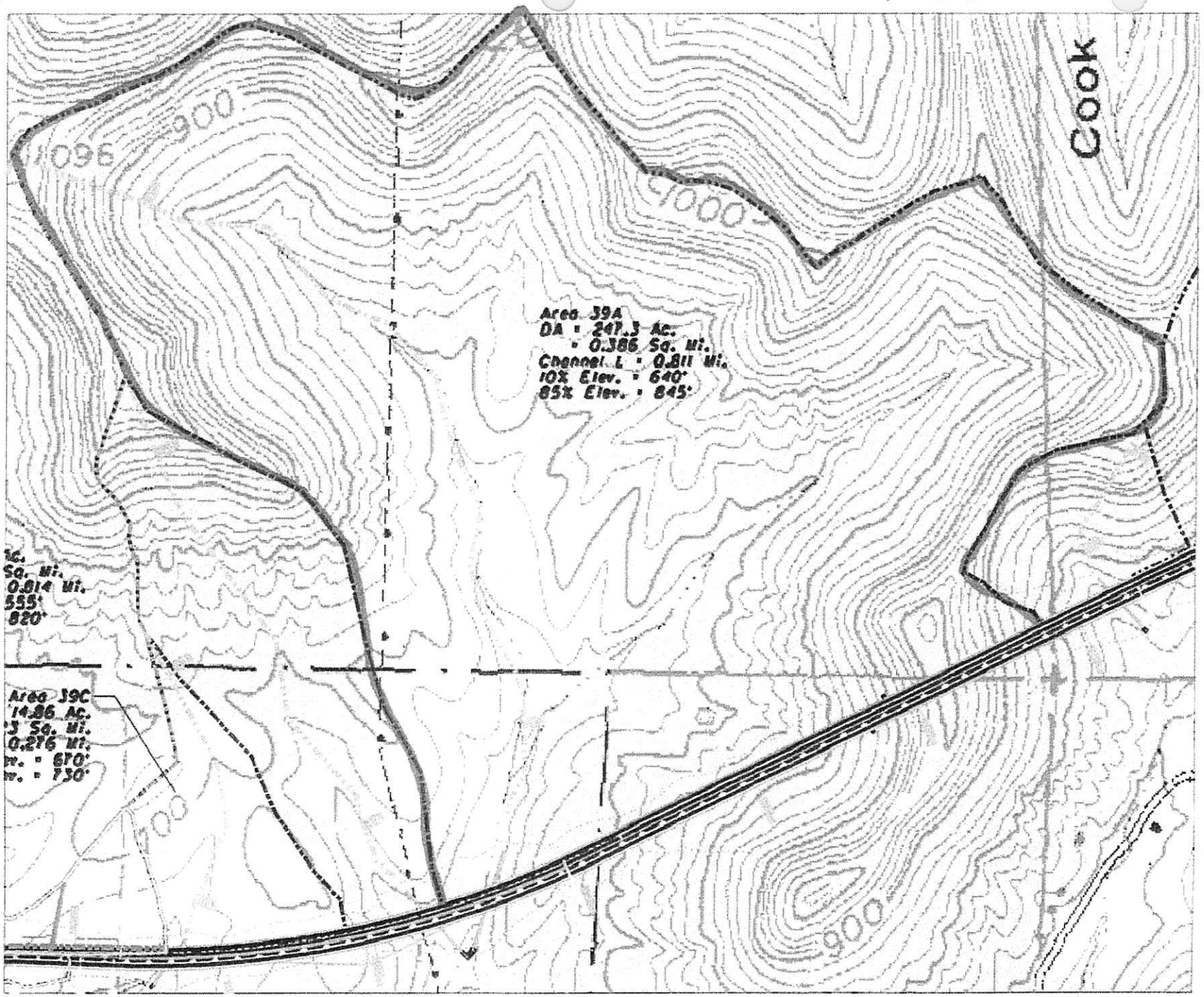
Pipe Size : 60 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
60.00	28.81	764.23	N/A	1 - C	15.99	1.23	2.18	0.0232	INLET	0.00	735.40
72.00	29.05	764.58	N/A	1 - C	16.86	1.35	2.40	0.0232	INLET	0.00	735.50

1" = 600'



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108" STA. 854+39.64

CULVERT ANALYSIS

PID : 19415 **Date :** 09/08/2006 **Project :** Portsmouth Bypass **Location :** SR 823 - Station 854+39.64

Description : Proposed Culvert **Designer :** CTS

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 620.18 **Outlet Invert Elevation (ft.) :** 610.64

Pipe Quantity : 1

Culvert Type : Circular Corrugated **Pipe Length (ft.) :** 448.00 **Culvert Slope (ft./ft.) :** 0.0213

Corrugation Type : Corrugated Metal Pipe (3 x 1 in. corrugations)

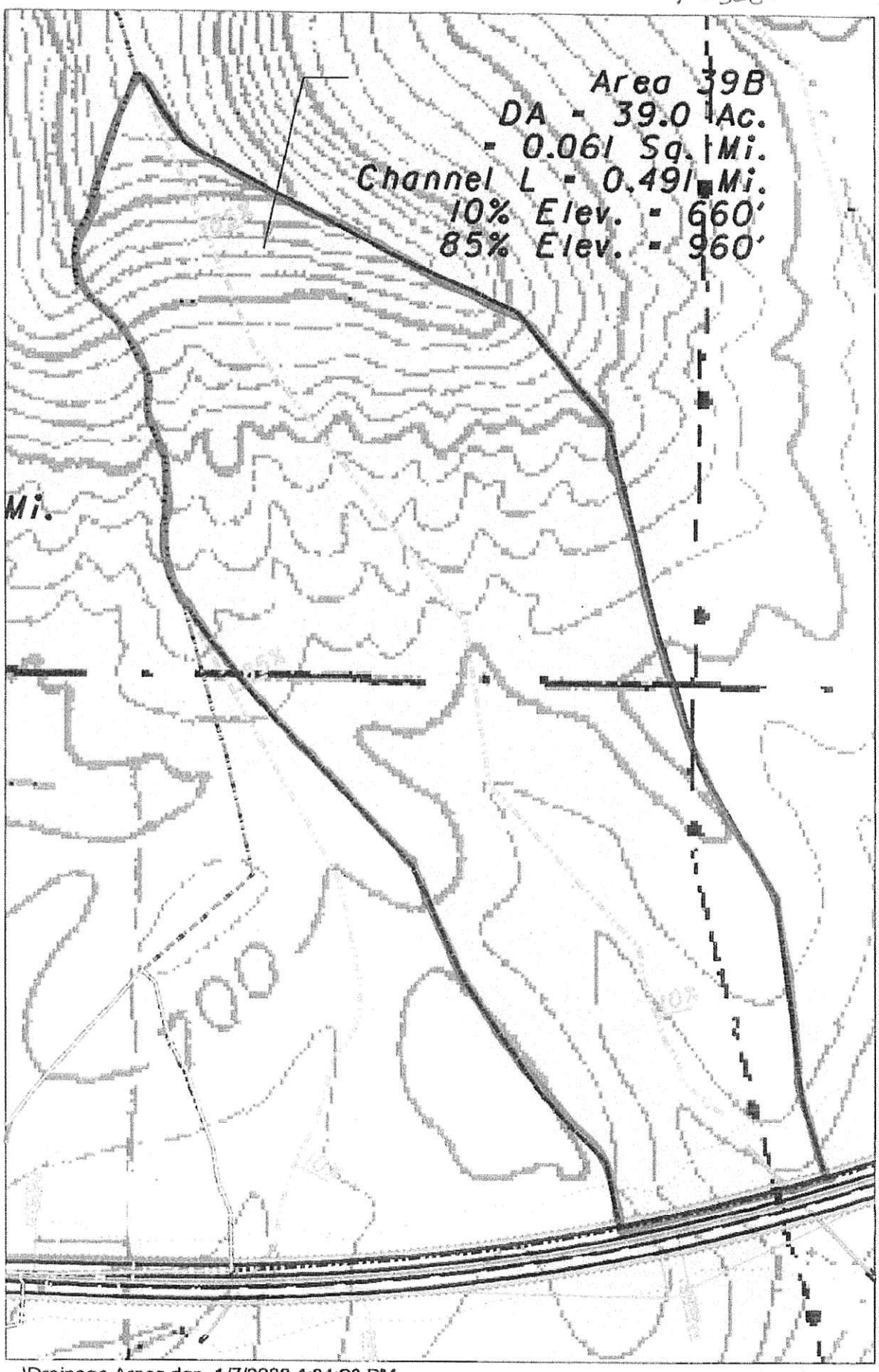
Pipe Size : 108 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
359.00	9.56	627.06	619.92	1 - C	13.43	3.93	4.63	0.0261	INLET	0.00	617.50
427.00	10.15	627.85	621.13	1 - C	14.05	4.34	5.08	0.0261	INLET	0.00	617.70

1"=300'



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66" STA. 857+16.45

CULVERT ANALYSIS

PID : 19415 **Date :** 09/08/2006 **Project :** Portsmouth Bypass **Location :** SR 823 - Station 857+16.45

Description : Proposed Culvert **Designer :** CTS

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 628.13 **Outlet Invert Elevation (ft.) :** 611.05

Pipe Quantity : 1

Culvert Type : Circular Corrugated **Pipe Length (ft.) :** 368.00 **Culvert Slope (ft./ft.) :** 0.0464

Corrugation Type : Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)

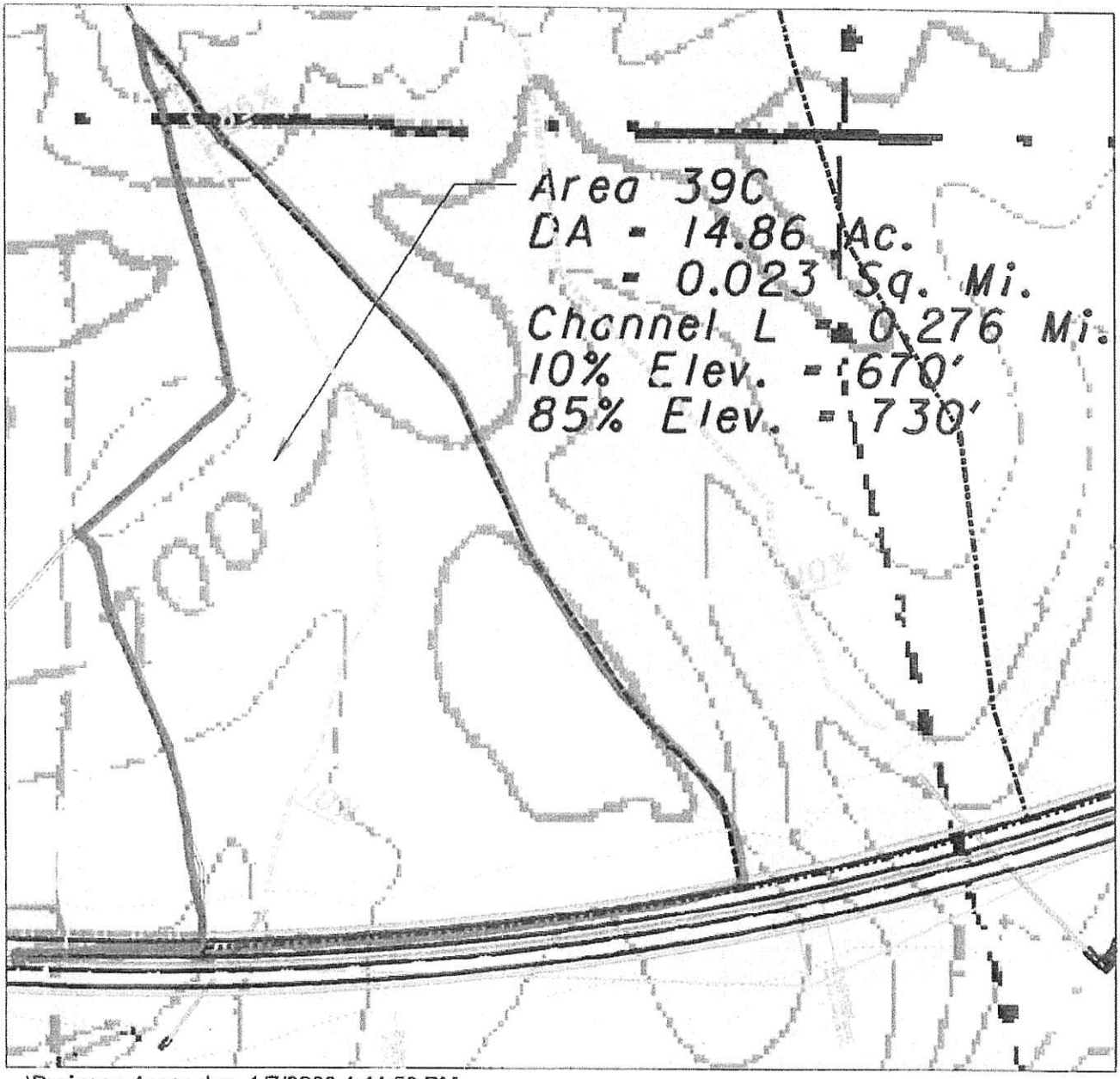
Pipe Size : 66 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
113.00	17.23	632.53	617.28	1 - C	14.66	1.98	2.95	0.0231	INLET	0.00	615.30
136.00	17.68	633.10	N/A	1 - C	15.42	2.19	3.25	0.0231	INLET	0.00	615.40

1" = 250'



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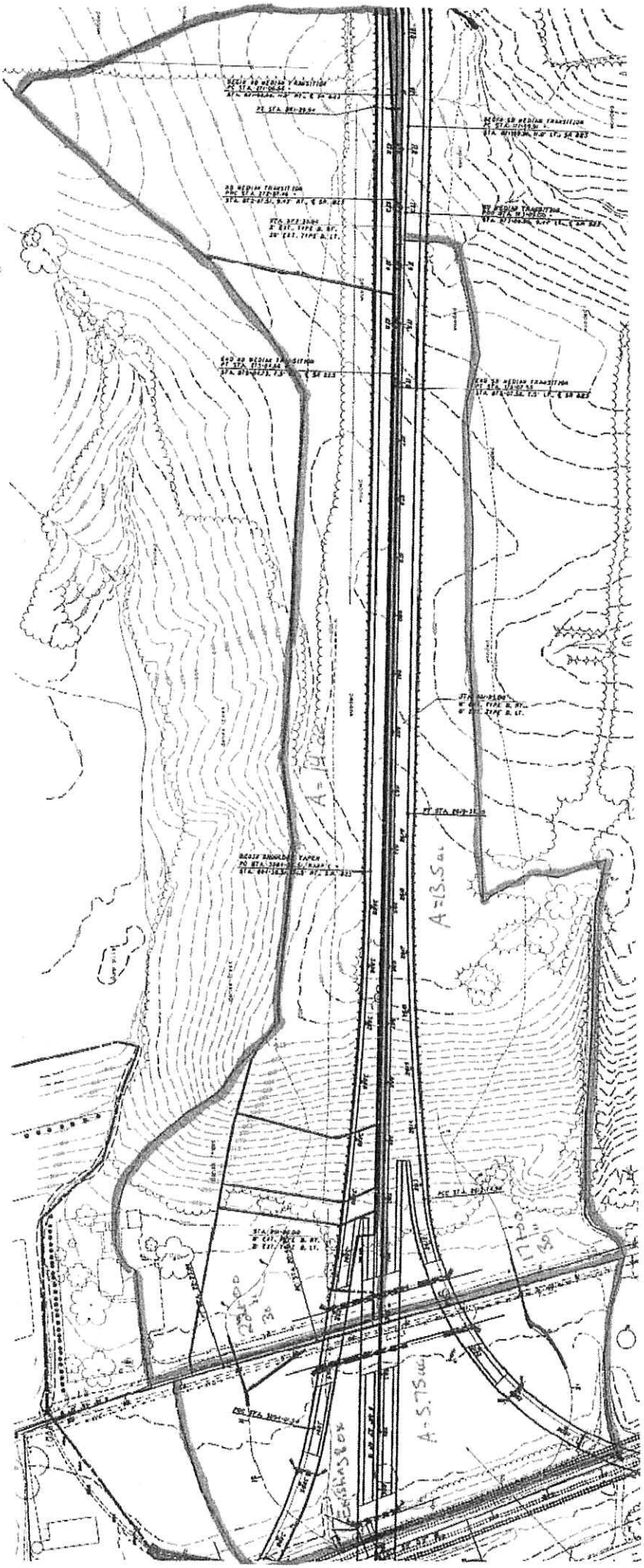
42" STA. BG8+91.27



CULVERT ANALYSIS

PID : 19415 **Date :** 09/08/2006 **Project :** Portsmouth Bypass **Location :** SR 823 - Station 868+91.27

Designer : CTS

Description : Proposed Culvert

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 650.23 **Outlet Invert Elevation (ft.) :** 631.40

Pipe Quantity : 1

Culvert Type : Circular Corrugated **Pipe Length (ft.) :** 248.00 **Culvert Slope (ft./ft.) :** 0.0759

Corrugation Type : Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)

Pipe Size : 42 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
50.00	19.41	653.71	637.12	1 - C	14.16	1.38	2.21	0.0237	INLET	0.00	634.30
59.00	19.85	654.25	638.33	1 - C	14.81	1.51	2.41	0.0237	INLET	0.00	634.40

CULVERT ANALYSIS

PID : 19415 **Date :** 05/24/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Description : Existing Culvert under RR Tracks - Sta. 585+50 with dual 48" culverts **Designer :** APG

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 1 **Inlet Invert Elevation (ft.) :** 537.93 **Outlet Invert Elevation (ft.) :** 537.34

Pipe Quantity : 1

Culvert Type : Box **Pipe Length (ft.) :** 65.00 **Culvert Slope (ft./ft.) :** 0.0091

Corrugation Type :

Pipe Size : 7.0 x 5.0 ft.

Design Manning 'n' : 0.0150

Entrance Type : 0 degree (Extension of sides) **Loss Coef. Ke :** 0.5000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
144.00	0.46	541.71	542.48	1 - B	4.40	1.90	2.36	0.0150	OUTLET	0.00	542.02

CULVERT ANALYSIS

PID : 19415 **Date :** 05/24/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Description : Existing Culvert under RR Tracks - Sta. 585+50 without 48" dual culverts **Designer :** APG

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 1 **Inlet Invert Elevation (ft.) :** 537.93 **Outlet Invert Elevation (ft.) :** 537.34

Pipe Quantity : 1

Culvert Type : Box **Pipe Length (ft.) :** 65.00 **Culvert Slope (ft./ft.) :** 0.0091

Corrugation Type :

Pipe Size : 7.0 x 5.0 ft.

Design Manning 'n' : (default)

Entrance Type : 0 degree (Extension of sides) **Loss Coef. Ke :** 0.5000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
408.00	5.79	547.99	545.71	2 - E	17.01	3.43	4.72	0.0120	INLET	0.00	540.00

↑ Exceeds NS RR requirements, Therefore, need additional culvert under RR

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 05/14/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Designer : APG

Description : Culvert under Fairgrounds Road at Sta 17+00

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 560.00 **Outlet Invert Elevation (ft.) :** 557.00 **Tailwater Elevation (ft.) :** 558.00 **Overflow Elevation (ft.) :** 567.98

Allowable Headwater Elevation (ft.) : 566.78 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 100.00 **Culvert Slope (ft./ft.) :** 0.0300 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 38.40 @ 25 yrs. **Flood Discharge (cfs) :** 46.50 @ 100 yrs.

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH				**Entrance Type :** Full Headwall								**Entrance Loss (Ke) :** 0.20		
	38.40	1	30 in.	563.61	561.18	2 - E	15.67	1.25	2.09	0.0120	INLET	0.00	D	0.00
	38.40	1	27 in.	564.38	562.20	2 - E	15.62	1.34	2.07	0.0120	INLET	0.00	D - 1	0.00
	38.40	1	24 in.	565.79	564.20	2 - E	15.31	1.49	1.94	0.0120	INLET	0.00	D - 2	0.00
	38.40	1	33 in.	563.20	N/A	1 - C	15.63	1.19	2.06	0.0120	INLET	0.00	D + 1	0.00
	46.50	1	30 in.	564.46	562.14	2 - E	16.41	1.40	2.25	0.0120	INLET	0.00	F	0.00
	46.50	1	27 in.	565.64	563.66	2 - E	16.24	1.52	2.16	0.0120	INLET	0.00	F - 1	0.00
	46.50	1	24 in.	567.75	566.65	2 - E	14.80	2.00	1.97	0.0120	INLET	0.00	F - 2	0.00
	46.50	1	33 in.	563.79	561.30	2 - E	16.44	1.32	2.26	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED				**Entrance Type :** Full Headwall								**Entrance Loss (Ke) :** 0.25		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)														
	38.40	1	30 in.	564.05	563.55	2 - E	8.79	2.08	2.09	0.0244	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
38.40	1	27 in.	565.10	566.40	2 - F	10.04	2.25	2.07	0.0245	OUTLET**	0.00	D - 1	0.00
31.70	1	24 in.	567.11	572.21	2 - F	10.33	2.00	1.89	0.0247	OUTLET**	6.70	D - 2	0.00
38.40	1	33 in.	563.49	562.02	2 - E	9.20	1.82	2.06	0.0241	INLET	0.00	D + 1	0.00
46.50	1	30 in.	565.14	565.62	2 - F	9.99	2.50	2.25	0.0244	OUTLET**	0.00	F	0.00
42.30	1	27 in.	566.79	569.82	2 - F	10.89	2.25	2.12	0.0245	OUTLET**	4.20	F - 1	0.00
31.70	1	24 in.	569.79	578.41	2 - F	10.33	2.00	1.89	0.0247	OUTLET**	14.80	F - 2	0.00
46.50	1	33 in.	564.23	563.33	2 - E	9.46	2.12	2.26	0.0241	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
38.40	1	36 in.	563.17	N/A	1 - C	8.23	1.88	2.02	0.0281	INLET	0.00	D	0.00
38.40	1	42 in.	562.83	N/A	1 - C	8.34	1.69	1.93	0.0278	INLET	0.00	D + 1	0.00
46.50	1	36 in.	563.72	562.71	2 - E	8.52	2.16	2.22	0.0281	INLET	0.00	F	0.00
46.50	1	42 in.	563.21	N/A	1 - C	8.75	1.89	2.13	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
38.40	1	60 in.	562.39	N/A	1 - C	7.19	1.58	1.73	0.0332	INLET	0.00	D	0.00
38.40	1	66 in.	562.32	N/A	1 - C	7.16	1.52	1.68	0.0330	INLET	0.00	D + 1	0.00
46.50	1	60 in.	562.67	N/A	1 - C	7.59	1.75	1.91	0.0332	INLET	0.00	F	0.00
46.50	1	66 in.	562.57	N/A	1 - C	7.56	1.68	1.86	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
38.40	1	60 in.	562.39	N/A	1 - C	8.57	1.40	1.73	0.0260	INLET	0.00	D	0.00
38.40	1	66 in.	562.32	N/A	1 - C	8.48	1.35	1.68	0.0260	INLET	0.00	D + 1	0.00
46.50	1	60 in.	562.67	N/A	1 - C	9.05	1.54	1.91	0.0260	INLET	0.00	F	0.00
46.50	1	66 in.	562.57	N/A	1 - C	8.97	1.49	1.86	0.0260	INLET	0.00	F + 1	0.00

UNIVERSAL CULVERT DESIGN

PID : 19415 Date : 05/14/2007 Project : SCI-823-0.00 Location : Portsmouth Bypass Designer : APG

Description : Culvert under Fairgrounds Road at Sta 22+00

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 560.00 Outlet Invert Elevation (ft.) : 557.00 Tailwater Elevation (ft.) : 559.36 Overflow Elevation (ft.) : 565.62

Allowable Headwater Elevation (ft.) : 565.62 or Diameter + 2 ft. *(whichever is less)*

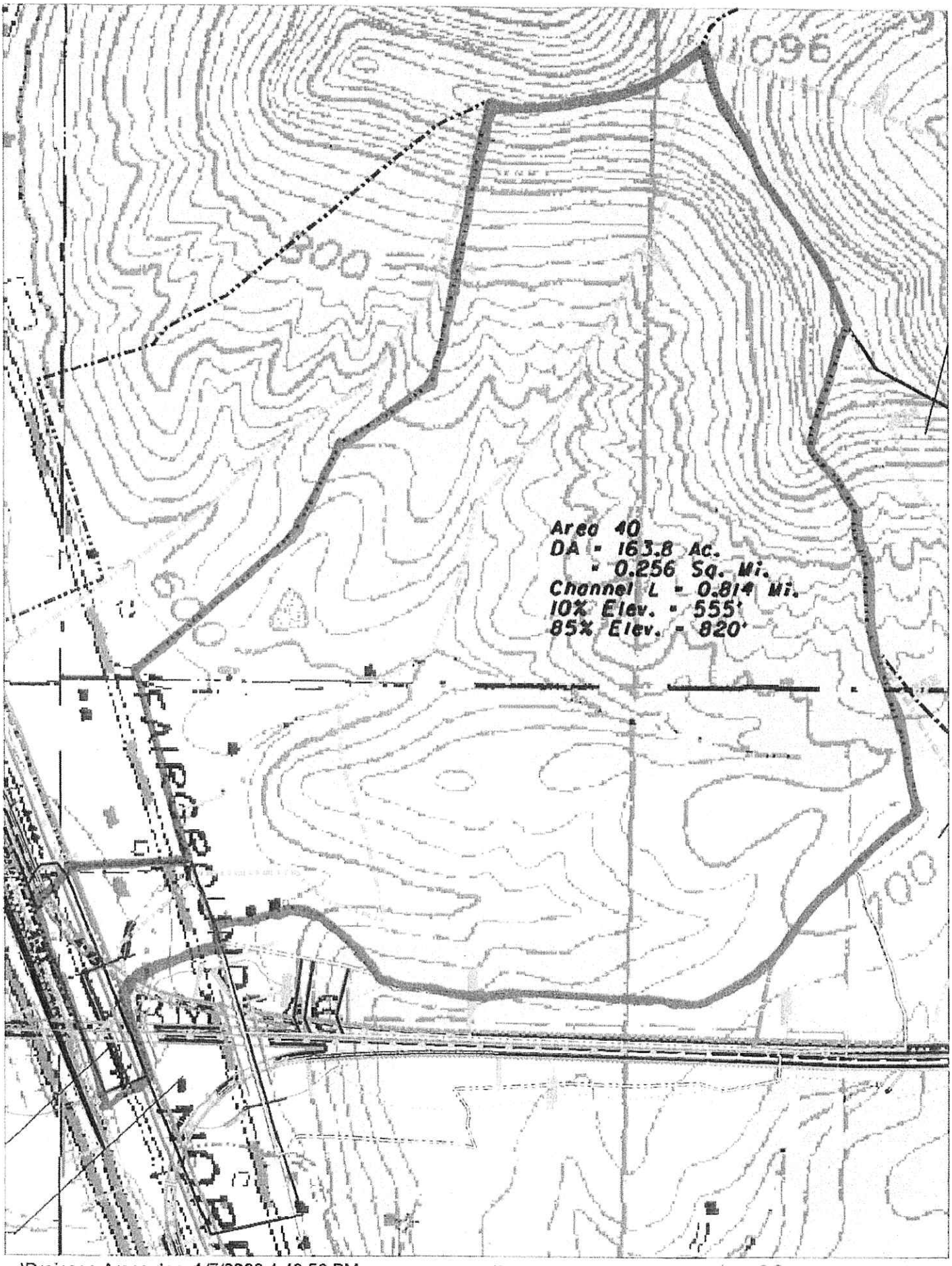
Pipe Length (ft.) : 100.00 Culvert Slope (ft./ft.) : 0.0300 Design Manning 'n' : 0.0120

Design Discharge (cfs) : 45.00 @ 25 yrs. Flood Discharge (cfs) : 56.00 @ 100 yrs.

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH				Entrance Type : Half Headwall							Entrance Loss (Ke) : 0.20			
	45.00	1	30 in.	564.34	561.95	2 - E	16.28	1.37	2.23	0.0120	INLET	0.00	D	0.00
	45.00	1	27 in.	565.52	563.54	2 - H	16.14	1.49	2.15	0.0120	INLET	0.00	D - 1	0.00
	36.80	1	24 in.	567.63	566.54	2 - H	15.21	1.44	1.93	0.0120	INLET	8.20	D - 2	0.00
	45.00	1	33 in.	563.70	561.17	2 - E	16.30	1.30	2.22	0.0120	INLET	0.00	D + 1	0.00
	55.00	1	30 in.	565.76	563.44	2 - E	17.03	1.56	2.35	0.0120	INLET	1.00	F	0.00
	45.50	1	27 in.	567.62	565.83	2 - H	16.17	1.50	2.15	0.0120	INLET	10.50	F - 1	0.00
	36.80	1	24 in.	571.47	570.47	2 - H	15.21	1.44	1.93	0.0120	INLET	19.20	F - 2	0.00
	56.00	1	33 in.	564.67	562.20	2 - E	17.22	1.48	2.43	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED				Entrance Type : Half Headwall							Entrance Loss (Ke) : 0.90			
	Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
	45.00	1	33 in.	564.58	563.65	2 - E	9.43	2.06	2.22	0.0241	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
43.50	1	30 in.	565.77	566.06	2 - F	9.06	2.50	2.20	0.0244	OUTLET	1.50	D - 1	0.00
33.50	1	27 in.	567.61	570.60	2 - G	8.43	2.25	1.98	0.0245	OUTLET	11.50	D - 2	0.00
45.00	1	36 in.	563.87	562.34	2 - E	9.60	1.89	2.18	0.0241	INLET	0.00	D + 1	0.00
52.30	1	33 in.	566.18	566.04	2 - E	9.39	2.44	2.37	0.0241	INLET	3.70	F	0.00
43.50	1	30 in.	567.92	569.80	2 - F	9.06	2.50	2.20	0.0244	OUTLET	12.50	F - 1	0.00
33.50	1	27 in.	570.69	576.76	2 - G	8.43	2.25	1.98	0.0245	OUTLET	22.50	F - 2	0.00
56.00	1	36 in.	565.01	563.97	2 - E	9.97	2.22	2.43	0.0241	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
45.00	1	36 in.	563.87	562.90	2 - E	8.48	2.11	2.18	0.0281	INLET	0.00	D	0.00
45.00	1	42 in.	563.22	N/A	1 - C	8.68	1.86	2.09	0.0278	INLET	0.00	D + 1	0.00
56.00	1	36 in.	565.01	564.77	2 - E	8.57	2.61	2.43	0.0281	INLET	0.00	F	0.00
56.00	1	42 in.	563.83	N/A	1 - C	9.13	2.13	2.34	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
45.00	1	60 in.	562.70	N/A	1 - C	7.52	1.72	1.88	0.0332	INLET	0.00	D	0.00
45.00	1	66 in.	562.59	N/A	1 - C	7.49	1.65	1.82	0.0330	INLET	0.00	D + 1	0.00
56.00	1	60 in.	563.06	N/A	1 - C	7.99	1.93	2.10	0.0332	INLET	0.00	F	0.00
56.00	1	66 in.	562.94	N/A	1 - C	7.96	1.85	2.04	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
45.00	1	60 in.	562.70	N/A	1 - C	8.96	1.51	1.88	0.0260	INLET	0.00	D	0.00
45.00	1	66 in.	562.59	N/A	1 - C	8.88	1.46	1.82	0.0260	INLET	0.00	D + 1	0.00
56.00	1	60 in.	563.06	N/A	1 - C	9.53	1.70	2.10	0.0260	INLET	0.00	F	0.00
56.00	1	66 in.	562.94	N/A	1 - C	9.45	1.64	2.04	0.0260	INLET	0.00	F + 1	0.00



Dual 48" STA. 587+75, NS RR

10'x5' Box Culvert STA. 609+50, US 23

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 06/04/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Designer : APG

Description : Replacement Culvert under US 23 replacing culvert at 609+50

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 531.00 **Outlet Invert Elevation (ft.) :** 530.00 **Tailwater Elevation (ft.) :** 534.00 **Overflow Elevation (ft.) :** 539.45

Allowable Headwater Elevation (ft.) : 537.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 168.00 **Culvert Slope (ft./ft.) :** 0.0060 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 388.00 @ 50 yrs. **Flood Discharge (cfs) :** 439.00 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : BOX			**Entrance Type :** 0 degree (Extension of sides)							**Entrance Loss (Ke) :** 0.50			
388.00	1	10 x 6 ft.	536.99	N/A	1 - C	14.03	2.76	3.60	0.0120	INLET	0.00	D	0.00
388.00	1	10 x 5 ft.	537.50	536.04	2 - E	14.04	2.76	3.60	0.0120	INLET	0.00	D - 1	0.00
388.00	1	8 x 7 ft.	537.95	N/A	1 - C	14.31	3.39	4.18	0.0120	INLET	0.00	D - 2	0.00
388.00	1	10 x 7 ft.	536.85	N/A	1 - C	14.04	2.76	3.60	0.0120	INLET	0.00	D + 1	0.00
439.00	1	10 x 6 ft.	537.75	N/A	1 - C	14.56	3.02	3.91	0.0120	INLET	0.00	F	0.00
439.00	1	10 x 5 ft.	538.33	536.68	2 - E	14.56	3.02	3.91	0.0120	INLET	0.00	F - 1	0.00
439.00	1	8 x 7 ft.	538.81	N/A	1 - C	14.79	3.71	4.54	0.0120	INLET	0.00	F - 2	0.00
439.00	1	10 x 7 ft.	537.44	N/A	1 - C	14.56	3.02	3.91	0.0120	INLET	0.00	F + 1	0.00

CULVERT ANALYSIS

PID : 19415 Date : 06/04/2007 Project : SCI-823-0.00 Location : US 23

Designer : APG

Description : Proposed culvert at STA. 609+50

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 Use HW : 0 Inlet Invert Elevation (ft.) : 531.00 Outlet Invert Elevation (ft.) : 530.00

Pipe Quantity : 1

Culvert Type : Box Pipe Length (ft.) : 168.00 Culvert Slope (ft./ft.) : 0.0060

Corrugation Type :

Pipe Size : 10 x 5 ft.

Design Manning 'n' : (default)

Entrance Type : 30 - 75 degrees Wingwalls Loss Coef. Ke : 0.2000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
388.00	2.51	536.81	N/A	1 - C	14.04	2.76	3.60	0.0120	INLET	0.00	534.30
439.00	3.02	537.48	536.32	2 - E	14.56	3.02	3.91	0.0120	INLET	0.00	534.46

UNIVERSAL CULVERT DESIGN

PID : 19415 **Date :** 06/11/2007 **Project :** SCI-823-0.00 **Location :** Portsmouth Bypass

Designer : APG

Description : Proposed Dual Cell Culverts under RR at Sta 587+75 -- Culvert #1

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 538.20 **Outlet Invert Elevation (ft.) :** 537.00 **Tailwater Elevation (ft.) :** 541.41 **Overflow Elevation (ft.) :** 549.75

Allowable Headwater Elevation (ft.) : 546.00 **or** Diameter + 4 ft. *(whichever is less)*

Pipe Length (ft.) : 120.00 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 141.00 @ 100 yrs. **Flood Discharge (cfs) :** N/A @ 100 yrs.

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH				**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.20			
	141.00	1	48 in.	544.88	544.74	2 - H	14.03	2.98	3.52	0.0120	INLET	0.00	D	0.00
	141.00	1	42 in.	547.25	547.41	2 - G	14.66	3.50	3.36	0.0120	OUTLET	0.00	D - 1	0.00
	117.70	1	36 in.	552.50	553.37	2 - G	16.65	3.00	2.94	0.0120	OUTLET	23.30	D - 2	0.00
	141.00	1	54 in.	543.79	543.40	2 - E	14.32	2.67	3.49	0.0120	INLET	0.00	D + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED				**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.90			
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)														
	141.00	1	54 in.	544.91	545.70	2 - F	8.91	4.50	3.49	0.0233	OUTLET	0.00	D	0.00
	141.00	1	48 in.	547.01	548.88	2 - G	11.22	4.00	3.52	0.0235	OUTLET	0.00	D - 1	0.00
	108.30	1	42 in.	550.70	555.54	2 - G	11.26	3.50	3.15	0.0237	OUTLET	32.70	D - 2	0.00
	141.00	1	60 in.	543.84	544.05	1 - B	7.69	3.95	3.40	0.0232	OUTLET	0.00	D + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)														

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
141.00	1	60 in.	543.84	544.45	2 - F	7.69	5.00	3.40	0.0271	OUTLET	0.00	D	0.00
141.00	1	54 in.	544.91	546.43	2 - F	8.91	4.50	3.49	0.0273	OUTLET	0.00	D - 1	0.00
136.80	1	48 in.	547.01	550.27	2 - G	10.89	4.00	3.48	0.0275	OUTLET	4.20	D - 2	0.00
141.00	1	66 in.	543.30	543.35	1 - B	6.91	3.96	3.31	0.0269	OUTLET	0.00	D + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
141.00	1	60 in.	543.84	545.21	2 - F	7.69	5.00	3.40	0.0332	OUTLET	0.00	D	0.00
141.00	1	66 in.	543.30	543.80	1 - A	6.91	5.02	3.31	0.0330	OUTLET	0.00	D + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
141.00	1	60 in.	543.84	544.33	2 - F	7.69	5.00	3.40	0.0260	OUTLET	0.00	D	0.00
141.00	1	66 in.	543.30	543.29	1 - C	7.92	3.86	3.31	0.0260	INLET	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

PID : 19415 Date : 06/11/2007 Project : SCI-823-0.00 Location : Portsmouth Bypass

Designer : APG

Description : Proposed Dual Cell Culverts under RR at Sta 587+75 -- Culvert #2

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 538.20 Outlet Invert Elevation (ft.) : 537.00 Tailwater Elevation (ft.) : 541.41 Overflow Elevation (ft.) : 549.75

Allowable Headwater Elevation (ft.) : 546.00 or Diameter + 4 ft. *(whichever is less)*

Pipe Length (ft.) : 120.00 Culvert Slope (ft./ft.) : 0.0100 Design Manning 'n' : 0.0120

Design Discharge (cfs) : 141.00 @ 100 yrs. Flood Discharge (cfs) : N/A @ 100 yrs.

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			Entrance Type : Half Headwall								Entrance Loss (Ke) : 0.20			
	141.00	1	48 in.	544.88	544.74	2 - H	14.03	2.98	3.52	0.0120	INLET	0.00	D	0.00
	141.00	1	42 in.	547.25	547.41	2 - G	14.66	3.50	3.36	0.0120	OUTLET	0.00	D - 1	0.00
	117.70	1	36 in.	552.50	553.37	2 - G	16.65	3.00	2.94	0.0120	OUTLET	23.30	D - 2	0.00
	141.00	1	54 in.	543.79	543.40	2 - E	14.32	2.67	3.49	0.0120	INLET	0.00	D + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			Entrance Type : Half Headwall								Entrance Loss (Ke) : 0.90			
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)														
	141.00	1	54 in.	544.91	545.70	2 - F	8.91	4.50	3.49	0.0233	OUTLET	0.00	D	0.00
	141.00	1	48 in.	547.01	548.88	2 - G	11.22	4.00	3.52	0.0235	OUTLET	0.00	D - 1	0.00
	108.30	1	42 in.	550.70	555.54	2 - G	11.26	3.50	3.15	0.0237	OUTLET	32.70	D - 2	0.00
	141.00	1	60 in.	543.84	544.05	1 - B	7.69	3.95	3.40	0.0232	OUTLET	0.00	D + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)														

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
141.00	1	60 in.	543.84	544.45	2 - F	7.69	5.00	3.40	0.0271	OUTLET	0.00	D	0.00
141.00	1	54 in.	544.91	546.43	2 - F	8.91	4.50	3.49	0.0273	OUTLET	0.00	D - 1	0.00
136.80	1	48 in.	547.01	550.27	2 - G	10.89	4.00	3.48	0.0275	OUTLET	4.20	D - 2	0.00
141.00	1	66 in.	543.30	543.35	1 - B	6.91	3.96	3.31	0.0269	OUTLET	0.00	D + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
141.00	1	60 in.	543.84	545.21	2 - F	7.69	5.00	3.40	0.0332	OUTLET	0.00	D	0.00
141.00	1	66 in.	543.30	543.80	1 - A	6.91	5.02	3.31	0.0330	OUTLET	0.00	D + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
141.00	1	60 in.	543.84	544.33	2 - F	7.69	5.00	3.40	0.0260	OUTLET	0.00	D	0.00
141.00	1	66 in.	543.30	543.29	1 - C	7.92	3.86	3.31	0.0260	INLET	0.00	D + 1	0.00

CULVERT ANALYSIS

PID : 19415 **Date :** 06/08/2007 **Project :** SCI-823-0.00 **Location :** US 23

Description : Replace existing 48" culvert under US 23 STA. 619+73.23 **Designer :** ADW

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 529.00 **Outlet Invert Elevation (ft.) :** 527.02

Pipe Quantity : 1

Culvert Type : Circular Smooth **Pipe Length (ft.) :** 268.00 **Culvert Slope (ft./ft.) :** 0.0074

Corrugation Type :

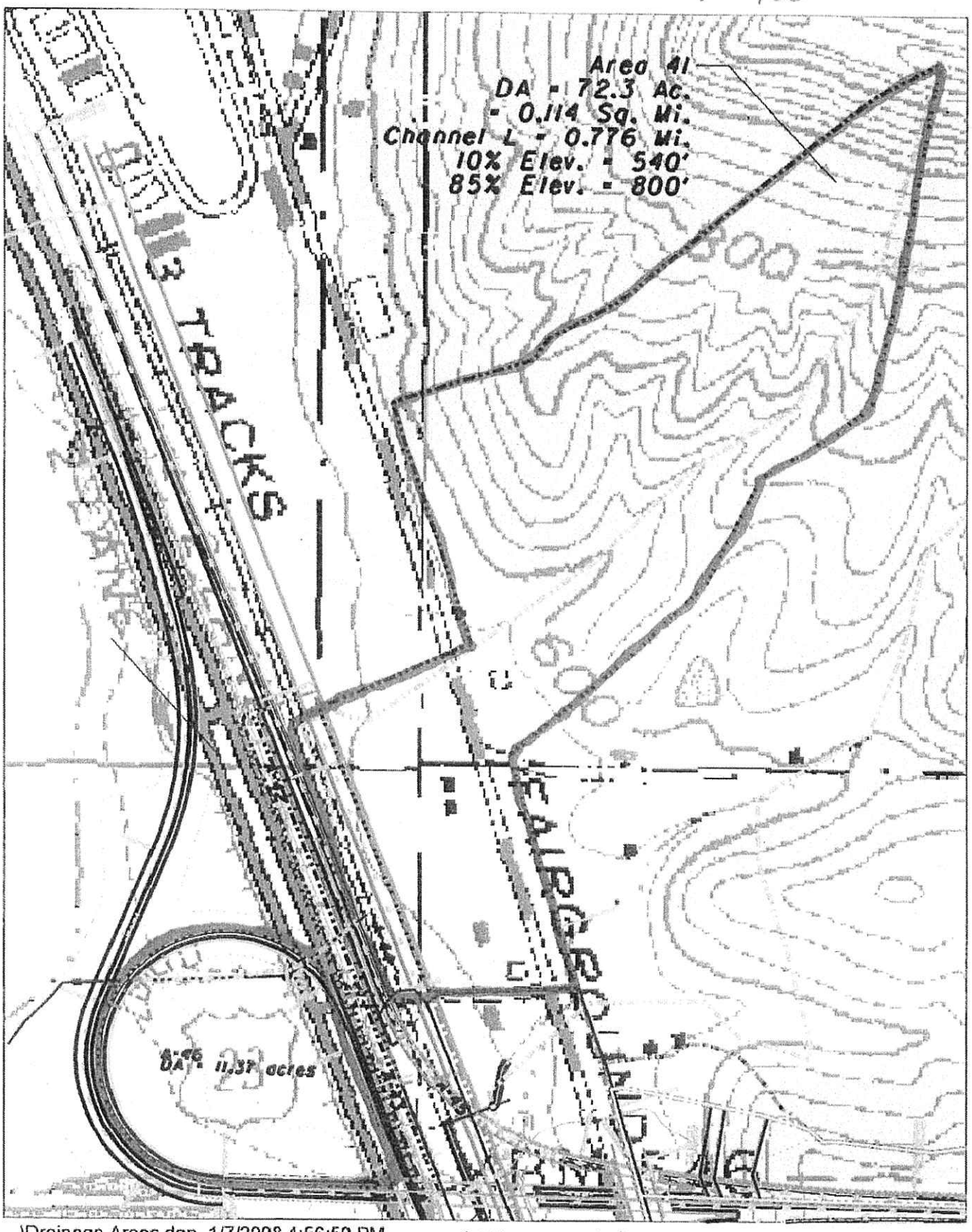
Pipe Size : 66 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.2000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
167.00	2.77	534.35	N/A	1 - C	13.38	2.86	3.61	0.0120	INLET	0.00	531.49
188.00	3.10	534.79	N/A	1 - C	13.76	3.07	3.84	0.0120	INLET	0.00	531.60

1"=400'



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66" STA. 619+73.23, US 23 and
72" STA. 1912+50, Ramp A

CULVERT ANALYSIS

PID : 19415 Date : 05/16/2007 Project : SCI-823-0.00 Location : Ramp A

Description : Culvert under Ramps A and D at STA. 1912+50 Designer : APG

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 Use HW : 0 Inlet Invert Elevation (ft.) : 524.31 Outlet Invert Elevation (ft.) : 522.98

Pipe Quantity : 1

Culvert Type : Circular Smooth Pipe Length (ft.) : 190.00 Culvert Slope (ft./ft.) : 0.0070

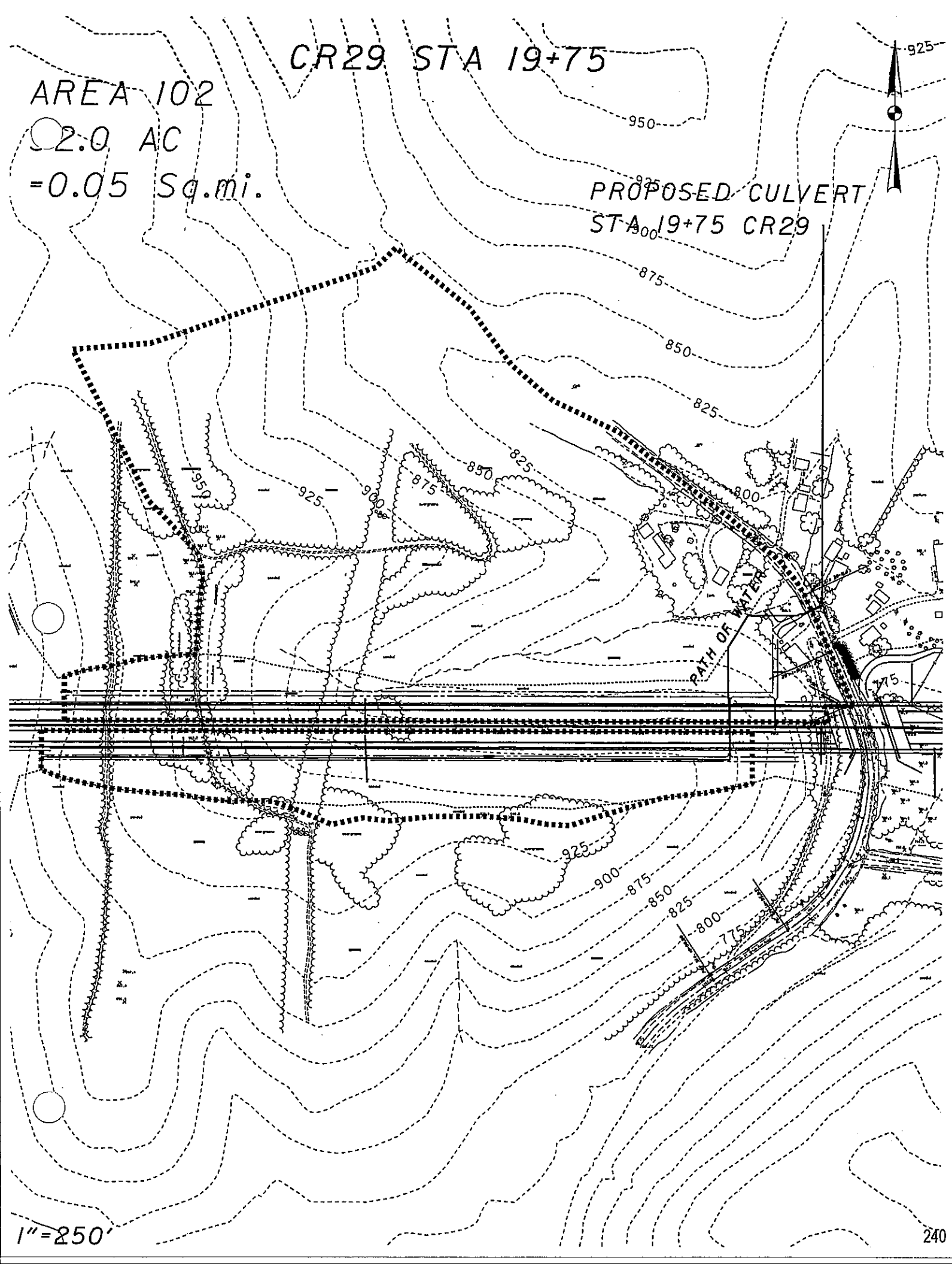
Corrugation Type :

Pipe Size : 72 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall Loss Coef. Ke : 0.2000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
205.00	2.16	530.10	529.30	1 - C	13.80	3.12	3.91	0.0120	INLET	0.00	527.94
233.00	2.54	530.61	529.82	1 - C	14.23	3.37	4.18	0.0120	INLET	0.00	528.07


CR29 STA 19+75
AREA 102
2.0 AC
=0.05 Sq.mi.
PROPOSED CULVERT
STA 19+75 CR29
PATH OF WATER
950
925
900
875
850
825
800
775
1"=250'

CULVERT ANALYSIS

PID : 79977 **Date :** 06/18/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 102, CR 29, STA. 19+75 **Designer :** DL

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 775.02 **Outlet Invert Elevation (ft.) :** 774.50
Pipe Quantity : 1

Culvert Type : Circular Smooth **Pipe Length (ft.) :** 52.00 **Culvert Slope (ft./ft.) :** 0.0100
Corrugation Type :
Pipe Size : 36 in.
Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.2000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
38.14	1.01	778.01	N/A	1 - C	10.36	1.55	2.01	0.0120	INLET	0.00	774.50
53.19	1.69	778.87	778.52	2 - E	11.17	1.91	2.37	0.0120	INLET	0.00	774.50

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 06/14/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 102, BLUE RUN ROAD, CR 29, STA. 19+75 **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 775.02 **Outlet Invert Elevation (ft.) :** 774.50 **Tailwater Elevation (ft.) :** 775.88 **Overflow Elevation (ft.) :** 779.90

Allowable Headwater Elevation (ft.) : 778.90 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 52.00 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 38.14 @ 10 yrs. **Flood Discharge (cfs) :** 53.19 @ 25 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
38.14	1	30 in.	778.63	778.30	2 - E	10.18	1.78	2.09	0.0120	INLET	0.00	D	0.00
38.14	1	27 in.	779.43	779.04	2 - E	9.59	2.25	2.06	0.0120	INLET	0.00	D - 1	0.00
33.34	1	24 in.	780.93	780.47	2 - E	10.61	2.00	1.91	0.0120	INLET	4.80	D - 2	0.00
38.14	1	33 in.	778.23	N/A	1 - C	10.32	1.64	2.06	0.0120	INLET	0.00	D + 1	0.00
49.39	1	30 in.	780.39	779.85	2 - E	10.06	2.50	2.29	0.0120	INLET	3.80	F	0.00
41.09	1	27 in.	782.06	781.36	2 - E	10.33	2.25	2.11	0.0120	INLET	12.10	F - 1	0.00
33.39	1	24 in.	785.30	784.27	2 - E	10.63	2.00	1.91	0.0120	INLET	19.80	F - 2	0.00
53.19	1	33 in.	779.42	779.01	2 - E	10.95	2.10	2.39	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
38.14	1	36 in.	778.31	778.58	1 - A	7.58	2.67	2.01	0.0241	OUTLET*	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
	38.14	1	33 in.	778.77	779.04	2 - F	8.01	2.75	2.06	0.0241	OUTLET**	0.00	D - 1	0.00
	36.74	1	30 in.	779.61	780.15	2 - F	8.51	2.50	2.05	0.0244	OUTLET**	1.40	D - 2	0.00
	38.14	1	42 in.	777.90	778.28	1 - A	7.06	2.14	1.92	0.0237	OUTLET*	0.00	D + 1	0.00
	52.39	1	36 in.	779.71	779.99	2 - F	8.81	3.00	2.35	0.0241	OUTLET**	0.80	F	0.00
	44.49	1	33 in.	780.76	781.23	2 - F	8.69	2.75	2.21	0.0241	OUTLET**	8.70	F - 1	0.00
	36.69	1	30 in.	782.37	783.45	2 - F	8.51	2.50	2.05	0.0244	OUTLET**	16.50	F - 2	0.00
	53.19	1	42 in.	778.68	779.03	1 - A	8.00	2.76	2.28	0.0237	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)														
	38.14	1	36 in.	778.31	778.64	2 - F	7.58	3.00	2.01	0.0281	OUTLET*	0.00	D	0.00
	38.14	1	42 in.	777.90	778.27	1 - A	7.06	2.39	1.92	0.0278	OUTLET*	0.00	D + 1	0.00
	49.29	1	36 in.	779.71	780.39	2 - F	8.53	3.00	2.29	0.0281	OUTLET**	3.90	F	0.00
	53.19	1	42 in.	778.68	779.06	1 - A	8.00	3.20	2.28	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)														
Diameter exceeds 1.25 HWA	38.14	1	60 in.	777.48	777.80	1 - A	6.37	2.12	1.72	0.0332	OUTLET*	0.00	D	0.00
	38.14	1	66 in.	777.37	777.70	1 - A	6.24	2.02	1.67	0.0330	OUTLET*	0.00	D + 1	0.00
	53.19	1	60 in.	777.99	778.38	1 - A	7.03	2.56	2.05	0.0332	OUTLET*	0.00	F	0.00
	53.19	1	66 in.	777.88	778.25	1 - A	6.87	2.43	1.99	0.0330	OUTLET*	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	19.07	2	60 in.	776.66	776.93	1 - A	4.32	1.46	1.20	0.0332	OUTLET*	0.00	D	0.00
	19.07	2	66 in.	776.60	776.88	1 - A	4.08	1.41	1.17	0.0330	OUTLET*	0.00	D + 1	0.00
	26.60	2	60 in.	777.01	777.31	1 - A	5.74	1.74	1.43	0.0332	OUTLET*	0.00	F	0.00
	26.60	2	66 in.	776.93	777.23	1 - A	5.64	1.67	1.39	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)														
Diameter exceeds 1.25 HWA	38.14	1	60 in.	777.48	777.85	1 - A	6.37	1.85	1.72	0.0260	OUTLET*	0.00	D	0.00
	38.14	1	66 in.	777.37	777.76	1 - A	6.24	1.78	1.67	0.0260	OUTLET*	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
	53.19	1	60 in.	777.99	778.41	1 - A	7.03	2.22	2.05	0.0260	OUTLET*	0.00	F	0.00
	53.19	1	66 in.	777.88	778.30	1 - A	6.87	2.13	1.99	0.0260	OUTLET*	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	19.07	2	60 in.	776.66	776.99	1 - B	4.32	1.29	1.20	0.0260	OUTLET*	0.00	D	0.00
	19.07	2	66 in.	776.60	776.93	1 - B	4.08	1.25	1.17	0.0260	OUTLET*	0.00	D + 1	0.00
	26.60	2	60 in.	777.01	777.35	1 - A	5.74	1.53	1.43	0.0260	OUTLET*	0.00	F	0.00
	26.60	2	66 in.	776.93	777.28	1 - A	5.64	1.48	1.39	0.0260	OUTLET*	0.00	F + 1	0.00

EXISTING PIPE SIZE IS 24"

PROPOSED → 36"

BLUE RUN ROAD, CR29, 19+75.00
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
1394755.00	SQ. FT.	
0.050	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
2000.00	FT.	**TOTAL CHANNEL LENGTH**
200.00	FT.	L_{10} = 10% of the Distance along channel
814	FT.	$Elev_{10}$ = Elevation at point L_{10}
1700.00	FT.	L_{85} = 85% of the Distance along channel
869	FT.	$Elev_{85}$ = Elevation at point L_{85}
1500.00	FT.	**Length** = $L_{85} - L_{10}$
193.74	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})/Length$
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	13.34	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	27.04	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	38.14	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	53.19	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	65.59	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	77.84	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for BLUE RUN 19+75

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.00960	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	5.00	ft
Discharge	38.14	ft^3/s

Results

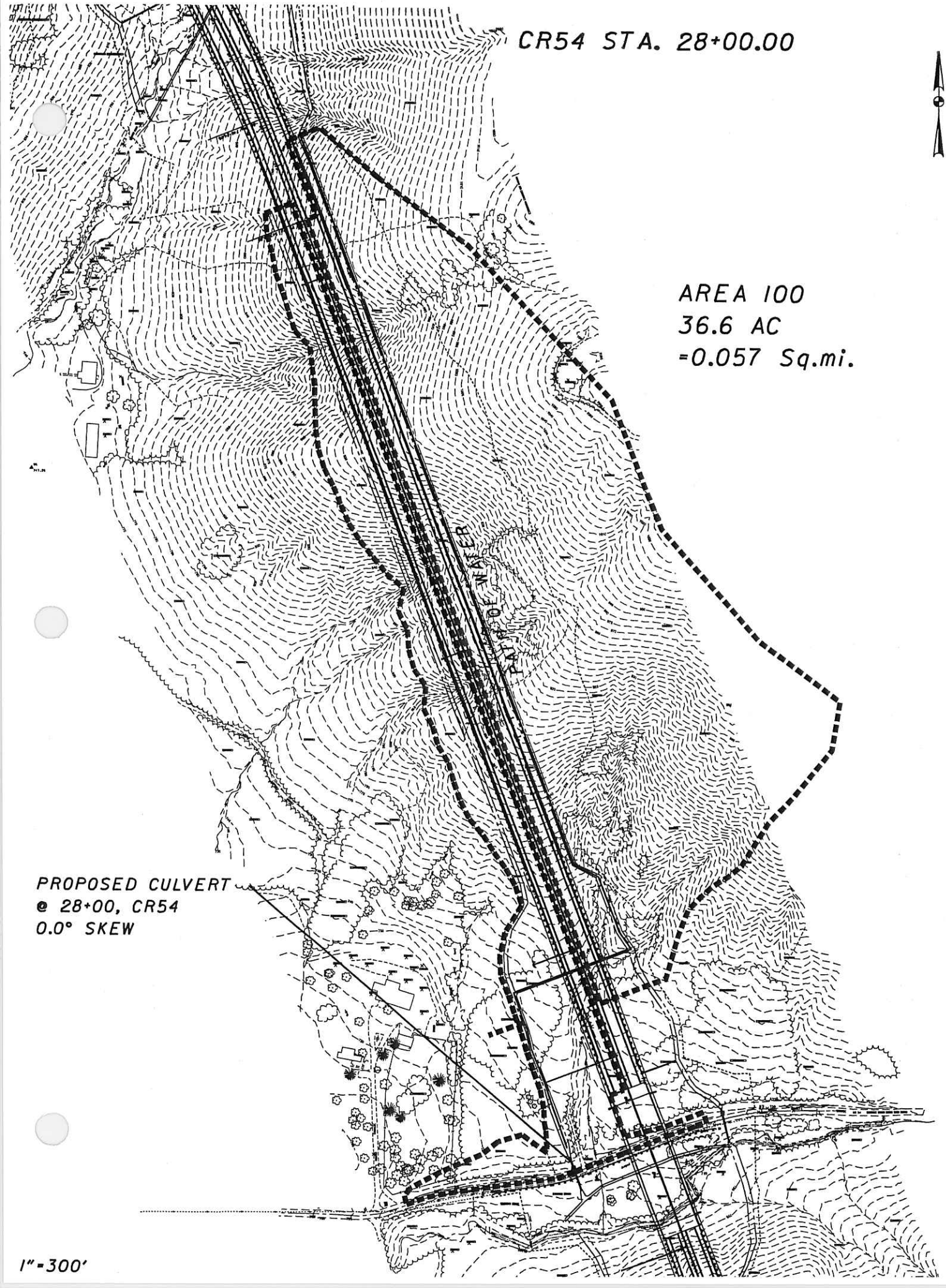
Normal Depth	1.38	ft
Flow Area	10.76	ft^2
Wetted Perimeter	11.19	ft
Top Width	10.54	ft
Critical Depth	1.05	ft
Critical Slope	0.02681	ft/ft
Velocity	3.54	ft/s
Velocity Head	0.20	ft
Specific Energy	1.58	ft
Froude Number	0.62	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.38	ft
Critical Depth	1.05	ft
Channel Slope	0.00960	ft/ft
Critical Slope	0.02681	ft/ft


CR54 STA. 28+00.00
AREA 100
36.6 AC
=0.057 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
@ 28+00, CR54
0.0° SKEW
1"=300'

UNIVERSAL CULVERT DESIGN

PID : 79977 **Date :** 06/12/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 100, Sta.28+00 MORIS LN BLUE RUN RD, CR54 **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 704.54 **Outlet Invert Elevation (ft.) :** 703.64 **Tailwater Elevation (ft.) :** 704.60 **Overflow Elevation (ft.) :** 715.02

Allowable Headwater Elevation (ft.) : 714.02 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 90.00 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 44.87 @ 10 yrs. **Flood Discharge (cfs) :** 62.87 @ 25 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
44.87	1	30 in.	708.87	708.48	2 - E	10.31	2.07	2.22	0.0120	INLET	0.00	D	0.00
44.87	1	27 in.	710.04	709.81	2 - E	11.28	2.25	2.14	0.0120	INLET	0.00	D - 1	0.00
44.87	1	24 in.	712.14	712.43	2 - F	14.33	2.00	1.97	0.0120	OUTLET**	0.00	D - 2	0.00
44.87	1	33 in.	708.23	707.74	2 - E	10.67	1.83	2.22	0.0120	INLET	0.00	D + 1	0.00
62.87	1	30 in.	711.33	710.95	2 - E	12.81	2.50	2.41	0.0120	INLET	0.00	F	0.00
62.87	1	27 in.	713.71	713.68	2 - E	15.81	2.25	2.22	0.0120	INLET	0.00	F - 1	0.00
52.67	1	24 in.	720.07	718.99	2 - F	16.77	2.00	1.98	0.0120	OUTLET**	10.20	F - 2	0.00
62.87	1	33 in.	709.92	709.45	2 - E	10.58	2.75	2.52	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
44.87	1	36 in.	708.40	708.82	2 - F	8.15	3.00	2.18	0.0241	OUTLET**	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

PID : 79977 **Date :** 11/27/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 101, Sta.32+00 MORIS LN BLUE RUN RD, CR54 **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 723.00 **Outlet Invert Elevation (ft.) :** 716.73 **Tailwater Elevation (ft.) :** 717.50 **Overflow Elevation (ft.) :** 727.00

Allowable Headwater Elevation (ft.) : 726.00 **or** Diameter + 2 ft. *(whichever is less)*

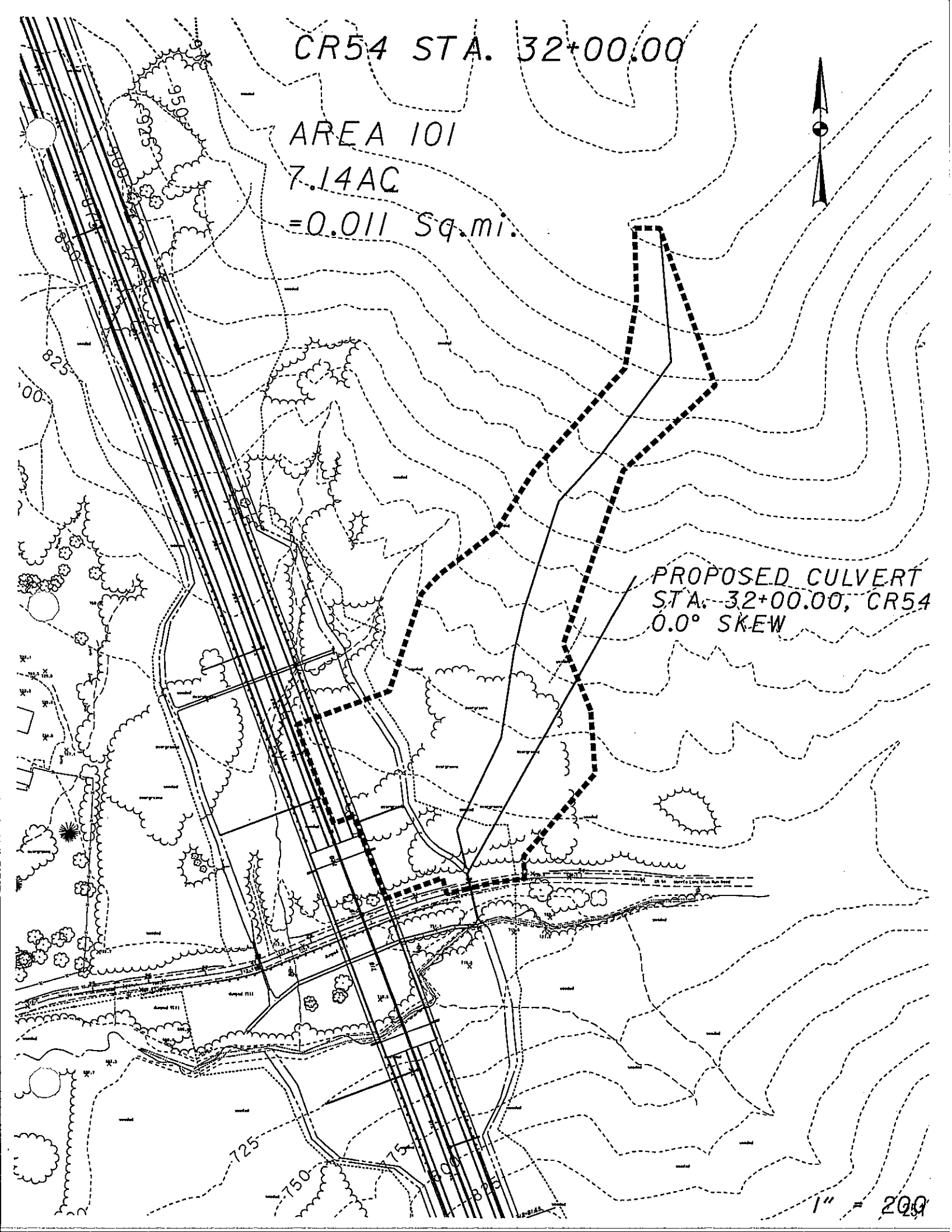
Pipe Length (ft.) : 86.50 **Culvert Slope (ft./ft.) :** 0.0725 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 26.95 @ 10 yrs. **Flood Discharge (cfs) :** 33.47 @ 25 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
26.95	1	27 in.	726.00	720.17	2 - E	19.84	0.84	1.81	0.0120	INLET	0.00	D	0.00
26.95	1	24 in.	726.67	721.05	2 - E	19.95	0.89	1.81	0.0120	INLET	0.00	D - 1	0.00
22.75	1	21 in.	728.07	722.91	2 - E	19.13	0.87	1.65	0.0120	INLET	4.20	D - 2	0.00
26.95	1	30 in.	725.68	N/A	1 - C	19.69	0.81	1.77	0.0120	INLET	0.00	D + 1	0.00
33.47	1	27 in.	726.76	721.02	2 - E	21.01	0.95	1.98	0.0120	INLET	0.00	F	0.00
28.77	1	24 in.	727.89	722.40	2 - E	20.31	0.92	1.84	0.0120	INLET	4.70	F - 1	0.00
22.77	1	21 in.	730.10	725.35	2 - E	19.15	0.87	1.65	0.0120	INLET	10.70	F - 2	0.00
33.47	1	30 in.	726.19	720.32	2 - E	20.91	0.90	1.97	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
26.95	1	33 in.	725.70	N/A	1 - C	11.79	1.12	1.72	0.0241	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
	26.95	1	30 in.	726.04	721.06	2 - E	11.72	1.19	1.77	0.0244	INLET	0.00	D - 1	0.00
	26.95	1	27 in.	726.70	722.43	2 - E	11.67	1.27	1.81	0.0245	INLET	0.00	D - 2	0.00
	26.95	1	36 in.	725.53	N/A	1 - C	11.74	1.08	1.68	0.0241	INLET	0.00	D + 1	0.00
	33.47	1	33 in.	726.27	N/A	1 - C	12.49	1.27	1.93	0.0241	INLET	0.00	F	0.00
	33.47	1	30 in.	726.87	722.35	2 - E	12.37	1.35	1.97	0.0244	INLET	0.00	F - 1	0.00
	28.57	1	27 in.	727.96	724.50	2 - E	11.83	1.32	1.86	0.0245	INLET	4.90	F - 2	0.00
	33.47	1	36 in.	725.95	N/A	1 - C	12.45	1.22	1.88	0.0241	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)														
	26.95	1	36 in.	725.53	N/A	1 - C	10.49	1.18	1.68	0.0281	INLET	0.00	D	0.00
	26.95	1	42 in.	725.35	N/A	1 - C	10.46	1.10	1.60	0.0278	INLET	0.00	D + 1	0.00
	33.47	1	36 in.	725.95	N/A	1 - C	11.12	1.32	1.88	0.0281	INLET	0.00	F	0.00
	33.47	1	42 in.	725.66	N/A	1 - C	11.12	1.23	1.79	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)														
Diameter exceeds 1.25 HWA	26.95	1	60 in.	725.01	N/A	1 - C	8.90	1.06	1.44	0.0332	INLET	0.00	D	0.00
	26.95	1	66 in.	724.92	N/A	1 - C	8.83	1.02	1.40	0.0330	INLET	0.00	D + 1	0.00
	33.47	1	60 in.	725.28	N/A	1 - C	9.47	1.18	1.61	0.0332	INLET	0.00	F	0.00
	33.47	1	66 in.	725.18	N/A	1 - C	9.41	1.14	1.57	0.0330	INLET	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	13.48	2	60 in.	724.35	N/A	1 - C	7.24	0.75	1.01	0.0332	INLET	0.00	D	0.00
	13.48	2	66 in.	724.31	N/A	1 - C	7.19	0.73	0.98	0.0330	INLET	0.00	D + 1	0.00
	16.74	2	60 in.	724.52	N/A	1 - C	7.73	0.84	1.13	0.0332	INLET	0.00	F	0.00
	16.74	2	66 in.	724.47	N/A	1 - C	7.67	0.81	1.10	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)														
Diameter exceeds 1.25 HWA	26.95	1	60 in.	725.01	N/A	1 - C	10.56	0.94	1.44	0.0260	INLET	0.00	D	0.00
	26.95	1	66 in.	724.92	N/A	1 - C	10.45	0.91	1.40	0.0260	INLET	0.00	D + 1	0.00


CR54 STA. 32+00.00
AREA 101
7.14AC
=0.011 Sq.mi.
PROPOSED CULVERT
STA. 32+00.00, CR54
0.0° SKEW
1" = 200'

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
44.87	1	33 in.	709.11	710.03	2 - F	8.73	2.75	2.22	0.0241	OUTLET**	0.00	D - 1	0.00
44.87	1	30 in.	710.29	712.24	2 - F	9.73	2.50	2.22	0.0244	OUTLET**	0.00	D - 2	0.00
44.87	1	42 in.	707.75	708.13	1 - A	7.49	2.40	2.09	0.0237	OUTLET*	0.00	D + 1	0.00
62.87	1	36 in.	710.39	711.49	2 - F	9.81	3.00	2.55	0.0241	OUTLET**	0.00	F	0.00
62.87	1	33 in.	711.84	713.93	2 - F	11.02	2.75	2.52	0.0241	OUTLET**	0.00	F - 1	0.00
53.67	1	30 in.	713.93	718.35	2 - F	11.23	2.50	2.34	0.0244	OUTLET**	9.20	F - 2	0.00
62.87	1	42 in.	708.82	709.07	2 - F	8.60	3.50	2.49	0.0237	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
44.87	1	36 in.	708.40	709.32	2 - F	8.15	3.00	2.18	0.0281	OUTLET**	0.00	D	0.00
44.87	1	42 in.	707.75	708.16	1 - A	7.49	2.73	2.09	0.0278	OUTLET*	0.00	D + 1	0.00
62.87	1	36 in.	710.39	712.47	2 - F	9.81	3.00	2.55	0.0281	OUTLET**	0.00	F	0.00
62.87	1	42 in.	708.82	709.49	2 - F	8.60	3.50	2.49	0.0278	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
44.87	1	60 in.	707.24	707.58	1 - A	6.68	2.32	1.87	0.0332	OUTLET*	0.00	D	0.00
44.87	1	66 in.	707.13	707.48	1 - A	6.54	2.21	1.82	0.0330	OUTLET*	0.00	D + 1	0.00
62.87	1	60 in.	707.81	708.24	1 - A	7.41	2.84	2.23	0.0332	OUTLET*	0.00	F	0.00
62.87	1	66 in.	707.69	708.08	1 - A	7.22	2.67	2.17	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
44.87	1	60 in.	707.24	707.63	1 - A	6.68	2.02	1.87	0.0260	OUTLET*	0.00	D	0.00
44.87	1	66 in.	707.13	707.54	1 - A	6.54	1.94	1.82	0.0260	OUTLET*	0.00	D + 1	0.00
62.87	1	60 in.	707.81	708.26	1 - A	7.41	2.45	2.23	0.0260	OUTLET*	0.00	F	0.00
62.87	1	66 in.	707.69	708.14	1 - A	7.22	2.33	2.17	0.0260	OUTLET*	0.00	F + 1	0.00

MORRIS LANE BLUE RUN (CR 54) STA. 28+00
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
1592118.00	SQ. FT.	
0.057	SQ. MI.	**CONTDA =** Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE =** Storage Area
3468.64	FT.	**TOTAL CHANNEL LENGTH**
346.86	FT.	L_{10} = 10% of the Distance along channel
742	FT.	$Elev_{10}$ = Elevation at point L_{10}
2948.34	FT.	L_{85} = 85% of the Distance along channel
865	FT.	$Elev_{85}$ = Elevation at point L_{85}
2601.48	FT.	**Length =** $L_{85} - L_{10}$
249.28	FT./MI.	**SLOPE =** $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	15.45	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	31.65	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	44.87	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	62.87	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	77.73	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	92.44	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for MORRIS LANE BLUE RUN 28+00

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.03200	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	6.00	ft
Discharge	44.87	ft^3/s

Results

Normal Depth	1.01	ft
Flow Area	8.05	ft^2
Wetted Perimeter	10.50	ft
Top Width	10.02	ft
Critical Depth	1.06	ft
Critical Slope	0.02632	ft/ft
Velocity	5.57	ft/s
Velocity Head	0.48	ft
Specific Energy	1.49	ft
Froude Number	1.10	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.01	ft
Critical Depth	1.06	ft
Channel Slope	0.03200	ft/ft
Critical Slope	0.02632	ft/ft

UNIVERSAL CULVERT DESIGN

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
	33.47	1	60 in.	725.28	N/A	1 - C	11.27	1.04	1.61	0.0260	INLET	0.00	F	0.00
	33.47	1	66 in.	725.18	N/A	1 - C	11.13	1.01	1.57	0.0260	INLET	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	13.48	2	60 in.	724.35	N/A	1 - C	8.60	0.67	1.01	0.0260	INLET	0.00	D	0.00
	13.48	2	66 in.	724.31	N/A	1 - C	8.50	0.65	0.98	0.0260	INLET	0.00	D + 1	0.00
	16.74	2	60 in.	724.52	N/A	1 - C	9.17	0.74	1.13	0.0260	INLET	0.00	F	0.00
	16.74	2	66 in.	724.47	N/A	1 - C	9.07	0.72	1.10	0.0260	INLET	0.00	F + 1	0.00

PHASE-2 ; PORTSMOUTH BYPASS

DISCHARGE CALCULATIONS FOR 10 YEAR ←

25 YEAR FOR CULVERT @ 32+00 ON CR 54.

10 YEAR Q'

$Q = CiA$.

C = RUNOFF CO-EFFICIENT

= 0.7 (L&D VOL-2 TABLE 1101-2)

i = INTENSITY OF RAINFALL

= 5.39 in/hr (L&D VOL-2 FIG: 1101-2)

t = TIME OF CONCENTRATION = 10 MIN. (CONSERVATIVE)

A = AREA = 7.14 AC

$Q = CIA$.

$= 0.7 \times 5.39 \times 7.14$

Q = 26.94 cfs.

25 YEAR Q

$Q = CIA$

$C = 0.7$ (L+D VOL-2 TABLE 1101-2)

$I = 6.69$ in/hr (L+D VOL-2 FIG 1101-2)

t = TIME OF CONCENTRATION = 10 MIN (CONSERVATIVE)

A = AREA = 7.14 AC

$Q = CIA$

$= 0.7 \times 6.69 \times 7.14$

$Q = 33.44$ cfs

MORRIS LANE BLUE RUN (CR 54) STA. 32+00
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
311093.40	SQ. FT.	
0.011	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1242.00	FT.	**TOTAL CHANNEL LENGTH**
124.20	FT.	L_{10} = 10% of the Distance along channel
756	FT.	$Elev_{10}$ = Elevation at point L_{10}
1055.70	FT.	L_{85} = 85% of the Distance along channel
1005	FT.	$Elev_{85}$ = Elevation at point L_{85}
931.50	FT.	**Length** = $L_{85} - L_{10}$
1412.53	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	5.81	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	13.23	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	19.68	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	28.73	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	36.45	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	44.10	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Q_{10} (CIA) = 26.95 cfs

Q_{25} (CIA) = 33.47 cfs

USING GREATER OF THE 2 VALUES FOR 'Q'

Worksheet for MORRIS LANE BLUE RUN 32+00

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.03000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	6.00	ft
Discharge	26.95	ft^3/s

Results

Normal Depth	0.77	ft
Flow Area	5.80	ft^2
Wetted Perimeter	9.44	ft
Top Width	9.08	ft
Critical Depth	0.78	ft
Critical Slope	0.02842	ft/ft
Velocity	4.65	ft/s
Velocity Head	0.34	ft
Specific Energy	1.10	ft
Froude Number	1.03	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.77	ft
Critical Depth	0.78	ft
Channel Slope	0.03000	ft/ft
Critical Slope	0.02842	ft/ft

APPENDIX E

Ditch Calculations

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 561+50 TO STA. 540+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
561+50	543+00	L	1850.0	10.00	3.00	0.50	0.0288	6.96	6.96	0.78	5.43	Seed	2.57	5	0.030	33.51	3.88	0.61	13.97	0.34	11.19
												Jute Mat	2.50	5	0.040	35.02	3.20	0.71	13.59	0.40	11.39
												Temp. Mat	2.50	5	0.040	35.02	3.20	0.71	13.59	0.40	11.39
												Temp. Mat	2.96	10	0.040	34.52	3.41	0.79	16.07	0.44	11.53
543+00	542+50	L	88.00	10.00	2.00	2.00	0.2034*	0.13	7.09	0.76	5.53	Seed	2.49	5	0.030	35.22	7.10	2.38	13.78	0.19	10.75
												Jute Mat	2.49	5	0.040	35.26	5.94	2.82	13.77	0.22	10.89
												Temp. Mat	2.49	5	0.040	35.26	5.94	2.82	13.77	0.22	10.89
												Perm, Type 1	2.49	5	0.040	35.26	5.94	2.82	13.77	0.22	10.89
												Perm, Type 2	2.49	5	0.040	35.26	5.94	2.82	13.77	0.22	10.89
												Perm, Type 2	2.95	10	0.040	34.75	6.33	3.11	16.29	0.25	10.98
542+50	540+50	L	200.00	10.00	3.00	3.00	0.1300*	0.93	8.02	0.77	6.24	Seed	2.47	5	0.030	35.79	6.35	1.84	15.41	0.23	11.36
												Jute Mat	2.46	5	0.040	35.89	5.29	2.18	15.38	0.27	11.61
												Temp. Mat	2.46	5	0.040	35.89	5.29	2.18	15.38	0.27	11.61

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
											Perm, Type 1	2.46	5	0.040	35.89	5.29	2.18	15.38	0.27	11.61
											Perm, Type 2	2.46	5	0.040	35.89	5.29	2.18	15.38	0.27	11.61
											Perm, Type 2	2.92	10	0.040	35.34	5.63	2.41	18.21	0.30	11.78

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.31 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 561+50 TO STA. 540+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
561+50	543+00	R	1850.0	10.00	3.00	0.50	0.0309	5.37	5.37	0.73	3.92	Seed	2.59	5	0.030	33.22	3.52	0.53	10.14	0.27	10.96
												Jute Mat	2.51	5	0.040	34.85	2.91	0.62	9.84	0.32	11.12
												Temp. Mat	2.51	5	0.040	34.85	2.91	0.62	9.84	0.32	11.12
												Temp. Mat	2.97	10	0.040	34.30	3.10	0.68	11.65	0.35	11.24
543+00	540+50	R	250.00	10.00	2.00	2.00	0.1956*	1.04	6.41	0.75	4.70	Seed	2.48	5	0.030	35.48	6.58	2.09	11.67	0.17	10.69
												Jute Mat	2.48	5	0.040	35.60	5.50	2.48	11.64	0.20	10.81
												Temp. Mat	2.48	5	0.040	35.60	5.50	2.48	11.64	0.20	10.81
												Perm, Type 1	2.48	5	0.040	35.60	5.50	2.48	11.64	0.20	10.81
												Perm, Type 2	2.48	5	0.040	35.60	5.50	2.48	11.64	0.20	10.81
												Perm, Type 2	2.93	10	0.040	35.01	5.87	2.75	13.79	0.22	10.90

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 561+50 TO STA. 575+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat:	0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2:	3.00	Type 3:	5.00
RCP	Type B:	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
561+50	572+00	L	1050.0	10.00	3.00	0.50	0.0159	3.64	3.64	0.80	2.91	Seed	3.28	5	0.030	21.91	2.80	0.32	9.56	0.32	11.13
												Seed	3.77	10	0.040	22.70	2.46	0.41	10.98	0.42	11.46
572+00	573+50	L	150.00	10.00	3.00	3.00	0.1367*	0.36	4.00	0.77	3.19	Seed	3.25	5	0.030	22.36	5.56	1.51	10.36	0.18	11.06
												Jute Mat	3.24	5	0.040	22.44	4.64	1.79	10.34	0.21	11.26
												Temp. Mat	3.24	5	0.040	22.44	4.64	1.79	10.34	0.21	11.26
												Perm, Type 1	3.24	5	0.040	22.44	4.64	1.79	10.34	0.21	11.26
												Perm, Type 1	3.72	10	0.040	23.21	4.89	1.94	11.88	0.23	11.36
573+50	574+50	L	100.00	10.00	3.00	3.00	0.0200	0.31	4.31	0.75	3.42	Seed	3.20	5	0.030	22.98	3.09	0.40	10.95	0.32	11.94
												Jute Mat	3.19	5	0.040	23.09	2.57	0.48	10.92	0.38	12.29
												Temp. Mat	3.19	5	0.040	23.09	2.57	0.48	10.92	0.38	12.29
												Temp. Mat	3.67	10	0.040	23.82	2.70	0.52	12.57	0.41	12.48
574+50	575+00	L	50.00	10.00	3.00	3.00	0.1800*	1.00	5.31	0.87	4.29	Seed	3.18	5	0.030	23.21	6.73	2.16	13.66	0.19	11.15
												Jute Mat	3.18	5	0.040	23.24	5.62	2.56	13.65	0.23	11.37

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Temp. Mat	3.18	5	0.040	23.24	5.62	2.56	13.65	0.23	11.37
												Perm, Type 1	3.18	5	0.040	23.24	5.62	2.56	13.65	0.23	11.37
												Perm, Type 2	3.18	5	0.040	23.24	5.62	2.56	13.65	0.23	11.37
												Perm, Type 2	3.66	10	0.040	23.96	5.91	2.78	15.71	0.25	11.48

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 561+50 TO STA. 578+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN. SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
561+50	574+50	R	1350.0	10.00	3.00	0.50	0.0170	4.27	4.27	0.71	3.03	Seed	2.71	5	0.030	30.84	2.70	0.31	8.20	0.29	11.01
												Seed	3.11	10	0.040	31.86	2.37	0.40	9.42	0.37	11.30
574+50	575+00	R	50.00	10.00	2.00	2.00	0.2255*	9.45	13.71	0.70	9.64	Seed	2.70	5	0.030	30.93	9.33	3.73	26.05	0.27	11.06
												Jute Mat	2.70	5	0.040	30.94	7.79	4.43	26.04	0.31	11.26
												Temp. Mat	2.70	5	0.040	30.94	7.79	4.43	26.04	0.31	11.26
												Perm, Type 1	2.70	5	0.040	30.94	7.79	4.43	26.04	0.31	11.26
												Perm, Type 2	2.70	5	0.040	30.94	7.79	4.43	26.04	0.31	11.26
												Perm, Type 3	2.70	5	0.040	30.94	7.79	4.43	26.04	0.31	11.26
												Perm, Type 3	3.10	10	0.040	31.97	8.20	4.81	29.91	0.34	11.37
575+00	578+00	R	300.00	10.00	3.00	2.00	0.0133	3.60	17.31	0.71	12.19	Seed	2.64	5	0.030	32.18	4.00	0.57	32.16	0.69	13.43
												Jute Mat	2.62	5	0.040	32.45	3.30	0.67	32.00	0.81	14.04
												Temp. Mat	2.62	5	0.040	32.45	3.30	0.67	32.00	0.81	14.04
												Temp. Mat	3.02	10	0.040	33.40	3.45	0.73	36.83	0.87	14.37

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 581+50 TO STA. 582+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
581+50	582+00	R	50.00	10.00	3.00	0.50	0.0400	0.10	0.10	0.78	0.08	Seed	3.84	5	0.030	15.84	0.96	0.08	0.30	0.03	10.11
												Seed	4.48	10	0.040	15.94	0.86	0.10	0.35	0.04	10.14

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 596+50 TO STA. 582+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
596+50	582+00	R	1450.0	10.00	3.00	0.50	0.0412	12.72	12.72	0.74	9.41	Seed	2.85	5	0.030	28.23	5.53	1.16	26.85	0.45	11.58
												Jute Mat	2.80	5	0.040	29.09	4.57	1.36	26.38	0.53	11.85
												Temp. Mat	2.80	5	0.040	29.09	4.57	1.36	26.38	0.53	11.85
												Perm, Type 1	2.80	5	0.040	29.09	4.57	1.36	26.38	0.53	11.85
												Perm, Type 1	3.30	10	0.040	28.82	4.84	1.50	31.06	0.58	12.04

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 597+00 TO STA. 580+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat:	0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2:	3.00	Type 3:	5.00
RCP	Type B:	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
597+00	580+50	L	1650.0	10.00	3.00	0.50	0.0396	5.96	5.96	0.74	4.41	Seed	2.57	5	0.030	33.59	3.97	0.67	11.33	0.27	10.95
												Jute Mat	2.51	5	0.040	34.91	3.28	0.79	11.06	0.32	11.12
												Temp. Mat	2.51	5	0.040	34.91	3.28	0.79	11.06	0.32	11.12
												Temp. Mat	2.96	10	0.040	34.46	3.50	0.87	13.07	0.35	11.23

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 597+50 TO STA. 601+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat:	0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2:	3.00	Type 3:	5.00
RCP	Type B:	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
597+50	599+50	R	200.00	10.00	4.00	2.00	0.0075	4.78	4.78	0.71	3.40	Seed	3.78	5	0.030	16.38	2.38	0.22	12.84	0.47	12.83
												Seed	4.40	10	0.040	16.58	2.08	0.28	14.95	0.61	13.65
599+50	601+50	R	200.00	10.00	4.00	2.00	0.1675*	2.43	7.21	0.71	5.12	Seed	3.74	5	0.030	16.83	7.45	2.50	19.12	0.24	11.44
												Jute Mat	3.73	5	0.040	16.91	6.20	2.96	19.07	0.28	11.70
												Temp. Mat	3.73	5	0.040	16.91	6.20	2.96	19.07	0.28	11.70
												Perm, Type 1	3.73	5	0.040	16.91	6.20	2.96	19.07	0.28	11.70
												Perm, Type 2	3.73	5	0.040	16.91	6.20	2.96	19.07	0.28	11.70
												Perm, Type 2	4.34	10	0.040	17.09	6.56	3.24	22.22	0.31	11.86

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 608+00 TO STA. 600+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
608+00	603+00	L	500.00	10.00	3.00	0.50	0.0210	1.73	1.73	0.75	1.30	Seed	3.58	5	0.030	18.45	2.33	0.25	4.64	0.19	10.68
												Seed	4.14	10	0.040	18.89	2.05	0.33	5.37	0.25	10.88
603+00	600+00	L	300.00	10.00	4.00	2.00	0.3133*	2.02	3.75	0.72	2.75	Seed	3.51	5	0.030	19.16	7.01	2.59	9.67	0.13	10.80
												Jute Mat	3.50	5	0.040	19.30	5.86	3.07	9.63	0.16	10.94
												Temp. Mat	3.50	5	0.040	19.30	5.86	3.07	9.63	0.16	10.94
												Perm, Type 1	3.50	5	0.040	19.30	5.86	3.07	9.63	0.16	10.94
												Perm, Type 2	3.50	5	0.040	19.30	5.86	3.07	9.63	0.16	10.94
												Perm, Type 3	3.50	5	0.040	19.30	5.86	3.07	9.63	0.16	10.94
												Perm, Type 3	4.05	10	0.040	19.69	6.19	3.35	11.16	0.17	11.03

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 608+50 TO STA. 602+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN .INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
608+50	603+50	R	500.00	10.00	3.00	0.50	0.0156	1.62	1.62	0.75	1.21	Seed	3.54	5	0.030	18.89	2.06	0.20	4.29	0.20	10.70
												Seed	4.09	10	0.040	19.38	1.82	0.25	4.96	0.26	10.91
603+50	602+00	R	150.00	10.00	3.00	3.00	0.4800*	0.69	2.31	0.73	1.72	Seed	3.50	5	0.030	19.26	6.66	2.64	6.02	0.09	10.53
												Jute Mat	3.50	5	0.040	19.34	5.58	3.13	6.01	0.10	10.63
												Temp. Mat	3.50	5	0.040	19.34	5.58	3.13	6.01	0.10	10.63
												Perm, Type 1	3.50	5	0.040	19.34	5.58	3.13	6.01	0.10	10.63
												Perm, Type 2	3.50	5	0.040	19.34	5.58	3.13	6.01	0.10	10.63
												Perm, Type 3	3.50	5	0.040	19.34	5.58	3.13	6.01	0.10	10.63
												Perm, Type 3	4.04	10	0.040	19.80	5.91	3.41	6.95	0.11	10.68

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 608+50 TO STA. 610+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat:	0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2:	3.00	Type 3:	5.00
RCP	Type B:	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
608+50	609+50	R	200.00	10.00	3.00	2.00	0.0480	0.73	0.73	0.72	0.53	Seed	3.77	5	0.030	16.52	2.15	0.27	1.99	0.09	10.45
												Seed	4.39	10	0.040	16.71	1.91	0.35	2.31	0.12	10.59
609+50	610+00	R	50.00	10.00	2.00	2.00	0.1800*	0.43	1.17	0.72	0.84	Seed	3.74	5	0.030	16.74	3.86	0.90	3.14	0.08	10.32
												Jute Mat	3.74	5	0.040	16.78	3.23	1.07	3.14	0.10	10.38
												Temp. Mat	3.74	5	0.040	16.78	3.23	1.07	3.14	0.10	10.38
												Perm, Type 1	3.74	5	0.040	16.78	3.23	1.07	3.14	0.10	10.38
												Perm, Type 1	4.36	10	0.040	16.95	3.43	1.17	3.66	0.10	10.42
610+00	610+50	R	50.00	10.00	2.00	2.00	0.0600	0.37	1.54	0.72	1.11	Seed	3.71	5	0.030	17.05	3.06	0.49	4.12	0.13	10.52
												Jute Mat	3.71	5	0.040	17.11	2.57	0.58	4.11	0.16	10.62
												Temp. Mat	3.71	5	0.040	17.11	2.57	0.58	4.11	0.16	10.62
												Temp. Mat	4.32	10	0.040	17.26	2.72	0.64	4.79	0.17	10.68

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 611+50 TO STA. 610+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
611+50	611+00	R	50.00	10.00	3.00	2.00	0.0940	0.35	0.35	0.72	0.25	Seed	3.89	5	0.030	15.42	1.98	0.28	0.97	0.05	10.24
												Seed	4.54	10	0.040	15.46	1.77	0.37	1.13	0.06	10.32
611+00	610+50	R	50.00	10.00	2.00	2.00	0.2400*	0.62	0.97	0.71	0.69	Seed	3.86	5	0.030	15.63	3.95	1.00	2.67	0.07	10.27
												Jute Mat	3.86	5	0.040	15.67	3.32	1.19	2.67	0.08	10.32
												Temp. Mat	3.86	5	0.040	15.67	3.32	1.19	2.67	0.08	10.32
												Perm, Type 1	3.86	5	0.040	15.67	3.32	1.19	2.67	0.08	10.32
												Perm, Type 1	4.51	10	0.040	15.70	3.53	1.30	3.12	0.09	10.35

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 611+50 TO STA. 616+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
611+50	615+50	R	400.00	10.00	3.00	0.50	0.0140	1.13	1.13	0.76	0.86	Seed	3.56	5	0.030	18.67	1.75	0.15	3.07	0.17	10.59
												Seed	4.11	10	0.040	19.12	1.55	0.19	3.55	0.22	10.77
615+50	616+50	R	100.00	10.00	3.00	2.00	0.3810*	0.69	1.82	0.72	1.36	Seed	3.53	5	0.030	18.96	5.70	1.96	4.78	0.08	10.41
												Jute Mat	3.53	5	0.040	19.01	4.77	2.32	4.78	0.10	10.49
												Temp. Mat	3.53	5	0.040	19.01	4.77	2.32	4.78	0.10	10.49
												Perm, Type 1	3.53	5	0.040	19.01	4.77	2.32	4.78	0.10	10.49
												Perm, Type 2	3.53	5	0.040	19.01	4.77	2.32	4.78	0.10	10.49
												Perm, Type 2	4.08	10	0.040	19.45	5.05	2.53	5.53	0.11	10.53

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 612+50 TO STA. 618+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
612+50	615+50	L	300.00	10.00	3.00	0.50	0.0160	0.87	0.87	0.75	0.65	Seed	3.63	5	0.030	17.94	1.65	0.14	2.37	0.14	10.49
												Seed	4.20	10	0.040	18.30	1.47	0.18	2.74	0.18	10.63
615+50	618+50	L	300.00	10.00	4.00	3.00	0.3537*	2.73	3.60	0.72	2.62	Seed	3.56	5	0.030	18.63	7.15	2.76	9.32	0.12	10.87
												Jute Mat	3.55	5	0.040	18.77	5.97	3.26	9.29	0.15	11.04
												Temp. Mat	3.55	5	0.040	18.77	5.97	3.26	9.29	0.15	11.04
												Perm, Type 1	3.55	5	0.040	18.77	5.97	3.26	9.29	0.15	11.04
												Perm, Type 2	3.55	5	0.040	18.77	5.97	3.26	9.29	0.15	11.04
												Perm, Type 3	3.55	5	0.040	18.77	5.97	3.26	9.29	0.15	11.04
												Perm, Type 3	4.12	10	0.040	19.09	6.31	3.57	10.78	0.16	11.13

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 619+00 TO STA. 617+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
619+00	617+00	R	200.00	10.00	2.00	2.00	0.1450 *	1.70	1.70	0.72	1.23	Seed	3.85	5	0.030	15.78	4.23	0.99	4.72	0.11	10.44
												Jute Mat	3.83	5	0.040	15.93	3.54	1.17	4.70	0.13	10.52
												Temp. Mat	3.83	5	0.040	15.93	3.54	1.17	4.70	0.13	10.52
												Perm, Type 1	3.83	5	0.040	15.93	3.54	1.17	4.70	0.13	10.52
												Perm, Type 1	4.49	10	0.040	15.88	3.77	1.29	5.51	0.14	10.57

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 619+00 TO STA. 623+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
619+00	621+50	R	250.00	10.00	3.00	1.00	0.0412	0.72	0.72	0.75	0.54	Seed	3.72	5	0.030	16.97	2.06	0.25	2.00	0.10	10.38
												Seed	4.33	10	0.040	17.22	1.84	0.32	2.32	0.12	10.49
621+50	623+00	R	150.00	10.00	3.00	3.00	0.3513*	0.57	1.29	0.74	0.96	Seed	3.67	5	0.030	17.48	4.91	1.54	3.52	0.07	10.42
												Jute Mat	3.66	5	0.040	17.58	4.12	1.82	3.51	0.08	10.50
												Temp. Mat	3.66	5	0.040	17.58	4.12	1.82	3.51	0.08	10.50
												Perm, Type 1	3.66	5	0.040	17.58	4.12	1.82	3.51	0.08	10.50
												Perm, Type 1	4.26	10	0.040	17.79	4.37	1.99	4.08	0.09	10.55
623+00	623+50	R	50.00	10.00	2.00	3.00	0.0800	3.98	5.26	0.70	3.74	Seed	3.65	5	0.030	17.73	5.25	1.22	13.64	0.24	11.22
												Jute Mat	3.64	5	0.040	17.77	4.38	1.45	13.63	0.29	11.45
												Temp. Mat	3.64	5	0.040	17.77	4.38	1.45	13.63	0.29	11.45
												Perm, Type 1	3.64	5	0.040	17.77	4.38	1.45	13.63	0.29	11.45
												Perm, Type 1	4.24	10	0.040	17.97	4.63	1.59	15.87	0.32	11.59

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 625+00 TO STA. 623+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
625+00	623+50	R	150.00	10.00	2.00	2.00	0.3000 *	1.79	1.79	0.71	1.27	Seed	3.88	5	0.030	15.46	5.37	1.68	4.92	0.09	10.36
												Jute Mat	3.87	5	0.040	15.55	4.50	2.00	4.91	0.11	10.43
												Temp. Mat	3.87	5	0.040	15.55	4.50	2.00	4.91	0.11	10.43
												Perm, Type 1	3.87	5	0.040	15.55	4.50	2.00	4.91	0.11	10.43
												Perm, Type 1	4.54	10	0.040	15.52	4.79	2.20	5.75	0.12	10.47

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 625+00 TO STA. 635+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
625+00	633+50	R	850.00	10.00	3.00	0.50	0.0365	5.55	5.55	0.79	4.38	Seed	3.61	5	0.030	18.13	4.38	0.78	15.81	0.34	11.19
												Jute Mat	3.55	5	0.040	18.76	3.63	0.91	15.55	0.40	11.40
												Temp. Mat	3.55	5	0.040	18.76	3.63	0.91	15.55	0.40	11.40
												Temp. Mat	4.18	10	0.040	18.55	3.85	1.00	18.30	0.44	11.54
633+50	635+50	R	200.00	10.00	3.00	2.00	0.3320 *	1.25	6.80	0.72	5.28	Seed	3.52	5	0.030	19.12	9.20	3.99	18.58	0.19	10.96
												Jute Mat	3.51	5	0.040	19.19	7.68	4.73	18.54	0.23	11.14
												Temp. Mat	3.51	5	0.040	19.19	7.68	4.73	18.54	0.23	11.14
												Perm, Type 1	3.51	5	0.040	19.19	7.68	4.73	18.54	0.23	11.14
												Perm, Type 2	3.51	5	0.040	19.19	7.68	4.73	18.54	0.23	11.14
												Perm, Type 3	3.51	5	0.040	19.19	7.68	4.73	18.54	0.23	11.14
												Perm, Type 3	4.13	10	0.040	18.96	8.16	5.21	21.83	0.25	11.26

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 625+50 TO STA. 622+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
625+50	624+50	L	100.00	10.00	3.00	2.00	0.0700	0.67	0.67	0.71	0.48	Seed	3.85	5	0.030	15.71	2.34	0.34	1.83	0.08	10.38
												Seed	4.50	10	0.040	15.79	2.09	0.44	2.14	0.10	10.50
624+50	622+50	L	200.00	10.00	2.00	3.00	0.2400*	1.82	2.49	0.71	1.77	Seed	3.79	5	0.030	16.29	5.64	1.73	6.70	0.12	10.58
												Jute Mat	3.78	5	0.040	16.41	4.72	2.05	6.68	0.14	10.68
												Temp. Mat	3.78	5	0.040	16.41	4.72	2.05	6.68	0.14	10.68
												Perm, Type 1	3.78	5	0.040	16.41	4.72	2.05	6.68	0.14	10.68
												Perm, Type 2	3.78	5	0.040	16.41	4.72	2.05	6.68	0.14	10.68
												Perm, Type 2	4.42	10	0.040	16.46	5.01	2.25	7.81	0.15	10.75

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 626+50 TO STA. 636+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
626+50	633+50	L	700.00	10.00	3.00	0.50	0.0337	3.27	3.27	0.71	2.32	Seed	2.61	5	0.030	32.81	2.98	0.41	6.05	0.20	10.69
												Jute Mat	2.57	5	0.040	33.55	2.48	0.49	5.97	0.23	10.81
												Temp. Mat	2.57	5	0.040	33.55	2.48	0.49	5.97	0.23	10.81
												Temp. Mat	3.03	10	0.040	33.29	2.64	0.54	7.03	0.26	10.89
633+50	636+00	L	250.00	10.00	3.00	3.00	0.3980*	2.12	5.39	0.73	3.87	Seed	2.54	5	0.030	34.10	7.60	3.10	9.85	0.12	10.75
												Jute Mat	2.54	5	0.040	34.21	6.36	3.68	9.83	0.15	10.89
												Temp. Mat	2.54	5	0.040	34.21	6.36	3.68	9.83	0.15	10.89
												Perm, Type 1	2.54	5	0.040	34.21	6.36	3.68	9.83	0.15	10.89
												Perm, Type 2	2.54	5	0.040	34.21	6.36	3.68	9.83	0.15	10.89
												Perm, Type 3	2.54	5	0.040	34.21	6.36	3.68	9.83	0.15	10.89
												Perm, Type 3	2.99	10	0.040	33.91	6.77	4.05	11.58	0.16	10.98

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 643+00 TO STA. 636+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
643+00	637+50	R	550.00	10.00	3.00	0.50	0.0095	4.04	4.04	0.76	3.07	Seed	3.57	5	0.030	18.54	2.50	0.24	10.96	0.41	11.43
												Seed	4.12	10	0.040	19.02	2.19	0.31	12.66	0.53	11.85
637+50	636+00	R	150.00	10.00	3.00	3.00	0.3927*	1.37	5.41	0.72	4.06	Seed	3.54	5	0.030	18.82	8.75	3.85	14.37	0.16	10.94
												Jute Mat	3.54	5	0.040	18.88	7.30	4.56	14.35	0.19	11.12
												Temp. Mat	3.54	5	0.040	18.88	7.30	4.56	14.35	0.19	11.12
												Perm, Type 1	3.54	5	0.040	18.88	7.30	4.56	14.35	0.19	11.12
												Perm, Type 2	3.54	5	0.040	18.88	7.30	4.56	14.35	0.19	11.12
												Perm, Type 3	3.54	5	0.040	18.88	7.30	4.56	14.35	0.19	11.12
												Perm, Type 3	4.09	10	0.040	19.35	7.72	4.97	16.59	0.20	11.22

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 643+00 TO STA. 641+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
643+00	641+00	L	200.00	10.00	3.00	0.50	0.0060	0.64	0.64	0.72	0.46	Seed	3.62	5	0.030	18.02	1.07	0.06	1.67	0.15	10.53
												Seed	4.19	10	0.040	18.40	0.95	0.07	1.93	0.20	10.69

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 643+00 TO STA. 648+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
643+00	647+50	L	450.00	10.00	3.00	0.50	0.0087	0.95	0.95	0.72	0.68	Seed	3.42	5	0.030	20.22	1.37	0.09	2.34	0.17	10.58
												Seed	3.94	10	0.040	20.86	1.20	0.12	2.69	0.22	10.75
647+50	648+00	L	50.00	10.00	2.00	2.00	0.3120*	0.42	1.37	0.71	0.98	Seed	3.41	5	0.030	20.39	4.68	1.37	3.34	0.07	10.28
												Jute Mat	3.40	5	0.040	20.43	3.92	1.63	3.34	0.08	10.34
												Temp. Mat	3.40	5	0.040	20.43	3.92	1.63	3.34	0.08	10.34
												Perm, Type 1	3.40	5	0.040	20.43	3.92	1.63	3.34	0.08	10.34
												Perm, Type 1	3.92	10	0.040	21.06	4.14	1.78	3.85	0.09	10.37

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 643+00 TO STA. 658+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
643+00	657+00	R	1400.0	10.00	3.00	0.50	0.0244	15.26	15.26	0.49	7.48	Seed	3.28	5	0.030	21.93	4.52	0.76	24.53	0.50	11.75
												Jute Mat	3.20	5	0.040	22.94	3.73	0.89	23.96	0.58	12.04
												Temp. Mat	3.20	5	0.040	22.94	3.73	0.89	23.96	0.58	12.04
												Temp. Mat	3.78	10	0.040	22.63	3.95	0.98	28.24	0.64	12.25
657+00			150.00	10.00	3.00	3.00	0.5467	0.91	16.17	0.46	7.90		3.19	5	0.030	23.15	11.97		25.17	0.20	11.19

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 648+50 TO STA. 648+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
648+50	648+00	L	50.00	10.00	2.00	2.00	0.2800*	0.52	0.52	0.70	0.36	Seed	3.90	5	0.030	15.26	3.23	0.76	1.42	0.04	10.17
												Jute Mat	3.90	5	0.040	15.31	2.72	0.90	1.42	0.05	10.21
												Temp. Mat	3.90	5	0.040	15.31	2.72	0.90	1.42	0.05	10.21
												Temp. Mat	4.57	10	0.040	15.29	2.88	1.00	1.66	0.06	10.23

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 648+50 TO STA. 656+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
648+50	656+50	L	800.00	10.00	3.00	0.50	0.0322	2.98	2.98	0.72	2.15	Seed	3.53	5	0.030	19.00	3.20	0.46	7.57	0.23	10.80
												Jute Mat	3.46	5	0.040	19.79	2.65	0.54	7.42	0.27	10.94
												Temp. Mat	3.46	5	0.040	19.79	2.65	0.54	7.42	0.27	10.94
												Temp. Mat	4.07	10	0.040	19.51	2.82	0.59	8.74	0.29	11.03

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 661+50 TO STA. 659+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
661+50	659+00	L	250.00	10.00	2.00	2.00	0.2620*	2.82	2.82	0.70	1.97	Seed	3.86	5	0.030	15.68	6.11	1.99	7.61	0.12	10.49
												Jute Mat	3.84	5	0.040	15.81	5.11	2.36	7.59	0.14	10.58
												Temp. Mat	3.84	5	0.040	15.81	5.11	2.36	7.59	0.14	10.58
												Perm, Type 1	3.84	5	0.040	15.81	5.11	2.36	7.59	0.14	10.58
												Perm, Type 2	3.84	5	0.040	15.81	5.11	2.36	7.59	0.14	10.58
												Perm, Type 2	4.50	10	0.040	15.76	5.43	2.59	8.89	0.16	10.63

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 670+00 TO STA. 663+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat:	0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2:	3.00	Type 3:	5.00
RCP	Type B:	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
670+00	663+50	L	650.00	10.00	3.00	0.50	0.0275	3.35	3.35	0.71	2.38	Seed	3.59	5	0.030	18.29	3.18	0.44	8.55	0.26	10.90
												Jute Mat	3.53	5	0.040	18.93	2.64	0.52	8.40	0.30	11.06
												Temp. Mat	3.53	5	0.040	18.93	2.64	0.52	8.40	0.30	11.06
												Temp. Mat	4.16	10	0.040	18.71	2.81	0.57	9.89	0.33	11.16
663+50	663+00	L	50.00	10.00	3.00	1.00	0.1120*	0.18	3.53	0.71	2.51	Seed	3.52	5	0.030	19.10	4.97	1.20	8.82	0.17	10.69
												Jute Mat	3.51	5	0.040	19.13	4.16	1.42	8.81	0.20	10.81
												Temp. Mat	3.51	5	0.040	19.13	4.16	1.42	8.81	0.20	10.81
												Perm, Type 1	3.51	5	0.040	19.13	4.16	1.42	8.81	0.20	10.81
												Perm, Type 1	4.14	10	0.040	18.90	4.43	1.57	10.37	0.22	10.90

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 671+50 TO STA. 659+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat:	0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2:	3.00	Type 3:	5.00
RCP	Type B:	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
671+50	661+50	R	1000.0	10.00	3.00	0.50	0.0249	9.68	9.68	0.74	7.17	Seed	3.48	5	0.030	19.52	4.58	0.78	24.94	0.50	11.75
												Jute Mat	3.42	5	0.040	20.24	3.78	0.91	24.50	0.59	12.06
												Temp. Mat	3.42	5	0.040	20.24	3.78	0.91	24.50	0.59	12.06
												Temp. Mat	4.02	10	0.040	20.01	4.00	1.01	28.82	0.65	12.26
661+50	659+00	R	250.00	10.00	3.00	2.00	0.3128*	4.04	13.72	0.74	10.15	Seed	3.39	5	0.030	20.60	11.36	5.52	34.40	0.28	11.41
													3.38	5	0.040	20.68	9.46		34.33	0.33	11.67

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 671+50 TO STA. 673+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
671+50	672+00	R	50.00	10.00	4.00	2.00	0.0220	0.19	0.19	0.74	0.14	Seed	3.84	5	0.030	15.81	1.03	0.07	0.55	0.05	10.31
												Seed	4.49	10	0.040	15.90	0.92	0.09	0.64	0.07	10.41
672+00	673+00	R	100.00	10.00	2.00	2.00	0.1800*	0.67	0.87	0.72	0.63	Seed	3.79	5	0.030	16.29	3.47	0.76	2.38	0.07	10.27
												Jute Mat	3.78	5	0.040	16.38	2.90	0.90	2.38	0.08	10.32
												Temp. Mat	3.78	5	0.040	16.38	2.90	0.90	2.38	0.08	10.32
												Temp. Mat	4.42	10	0.040	16.44	3.08	1.00	2.78	0.09	10.35

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 679+50 TO STA. 672+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
679+50	675+00	L	450.00	10.00	3.00	0.50	0.0360	1.07	1.07	0.72	0.77	Seed	3.60	5	0.030	18.22	2.25	0.27	2.77	0.12	10.42
												Seed	4.17	10	0.040	18.62	2.00	0.35	3.21	0.16	10.55
675+00	672+50	L	250.00	10.00	2.00	2.00	0.4876*	1.71	2.78	0.77	2.09	Seed	3.55	5	0.030	18.79	7.30	3.02	7.40	0.10	10.40
												Jute Mat	3.54	5	0.040	18.90	6.12	3.59	7.38	0.12	10.47
												Temp. Mat	3.54	5	0.040	18.90	6.12	3.59	7.38	0.12	10.47
												Perm, Type 1	3.54	5	0.040	18.90	6.12	3.59	7.38	0.12	10.47
												Perm, Type 2	3.54	5	0.040	18.90	6.12	3.59	7.38	0.12	10.47
												Perm, Type 3	3.54	5	0.040	18.90	6.12	3.59	7.38	0.12	10.47
												Perm, Type 3	4.10	10	0.040	19.25	6.48	3.92	8.56	0.13	10.51

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 688+00 TO STA. 673+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
688+00	674+00	R	1400.0	10.00	3.00	0.50	0.0254	14.19	14.19	0.74	10.50	Seed	3.51	5	0.030	19.24	5.29	0.99	36.80	0.63	12.19
												Jute Mat	3.43	5	0.040	20.12	4.35	1.16	36.00	0.73	12.57
												Temp. Mat	3.43	5	0.040	20.12	4.35	1.16	36.00	0.73	12.57
												Perm, Type 1	3.43	5	0.040	20.12	4.35	1.16	36.00	0.73	12.57
												Perm, Type 1	4.04	10	0.040	19.85	4.60	1.28	42.40	0.81	12.83
674+00			50.00	10.00	2.00	3.00	0.5460	0.37	14.56	0.72	10.77		3.42	5	0.030	20.18	13.89		36.86	0.25	11.25

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 688+00 TO STA. 681+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
688+00	683+00	L	500.00	10.00	3.00	0.50	0.0106	1.37	1.37	0.72	0.99	Seed	3.46	5	0.030	19.74	1.67	0.13	3.41	0.20	10.69
												Seed	3.99	10	0.040	20.35	1.48	0.17	3.93	0.26	10.89
683+00	681+50	L	150.00	10.00	3.00	3.00	0.7813*	1.88	3.25	0.70	2.30	Seed	3.44	5	0.030	20.03	8.60	4.37	7.91	0.09	10.54
												Jute Mat	3.43	5	0.040	20.09	7.21	5.18	7.90	0.11	10.64
												Temp. Mat	3.43	5	0.040	20.09	7.21	5.18	7.90	0.11	10.64
												Perm, Type 1	3.43	5	0.040	20.09	7.21	5.18	7.90	0.11	10.64
												Perm, Type 2	3.43	5	0.040	20.09	7.21	5.18	7.90	0.11	10.64
												Perm, Type 3	3.43	5	0.040	20.09	7.21	5.18	7.90	0.11	10.64
													3.42	5	0.060	20.19	5.61		7.88	0.14	10.81

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 688+00 TO STA. 691+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
688+00	691+00	R	300.00	10.00	3.00	2.00	0.0220	4.77	4.77	0.71	3.39	Seed	3.78	5	0.030	16.45	3.41	0.47	12.78	0.35	11.73
												Jute Mat	3.75	5	0.040	16.74	2.83	0.56	12.68	0.41	12.03
												Temp. Mat	3.75	5	0.040	16.74	2.83	0.56	12.68	0.41	12.03
												Temp. Mat	4.39	10	0.040	16.64	2.99	0.61	14.88	0.45	12.24

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 688+00 TO STA. 693+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
688+00	689+50	L	150.00	10.00	3.00	0.50	0.0260	0.36	0.36	0.72	0.26	Seed	3.74	5	0.030	16.82	1.34	0.12	0.97	0.07	10.25
												Seed	4.35	10	0.040	17.03	1.21	0.15	1.13	0.09	10.32
689+50	691+00	L	150.00	10.00	3.00	2.00	0.4587*	1.21	1.57	0.71	1.12	Seed	3.69	5	0.030	17.26	5.69	2.04	4.13	0.07	10.36
												Jute Mat	3.68	5	0.040	17.34	4.77	2.42	4.12	0.08	10.42
												Temp. Mat	3.68	5	0.040	17.34	4.77	2.42	4.12	0.08	10.42
												Perm, Type 1	3.68	5	0.040	17.34	4.77	2.42	4.12	0.08	10.42
												Perm, Type 2	3.68	5	0.040	17.34	4.77	2.42	4.12	0.08	10.42
												Perm, Type 2	4.29	10	0.040	17.52	5.06	2.65	4.80	0.09	10.46
691+00	693+00	L	200.00	10.00	3.00	2.00	0.3410*	6.24	7.81	0.71	5.55	Seed	3.65	5	0.030	17.69	9.58	4.28	20.26	0.20	11.01
												Jute Mat	3.64	5	0.040	17.75	8.00	5.08	20.22	0.24	11.19
												Temp. Mat	3.64	5	0.040	17.75	8.00	5.08	20.22	0.24	11.19
												Perm, Type 1	3.64	5	0.040	17.75	8.00	5.08	20.22	0.24	11.19
												Perm, Type 2	3.64	5	0.040	17.75	8.00	5.08	20.22	0.24	11.19

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Perm, Type 3	3.64	5	0.040	17.75	8.00	5.08	20.22	0.24	11.19
													3.63	5	0.060	17.87	6.19		20.15	0.30	11.51

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 691+50 TO STA. 691+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
691+50	691+00	R	50.00	10.00	3.00	2.00	0.0600	0.19	0.19	0.74	0.14	Seed	3.87	5	0.030	15.60	1.39	0.15	0.55	0.04	10.19
												Seed	4.52	10	0.040	15.67	1.24	0.19	0.64	0.05	10.26

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 691+50 TO STA. 693+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
691+50	693+50	R	200.00	10.00	3.00	2.00	0.0950	3.01	3.01	0.71	2.13	Seed	3.85	5	0.030	15.72	4.58	1.02	8.22	0.17	10.86
												Jute Mat	3.84	5	0.040	15.86	3.82	1.21	8.19	0.20	11.02
												Temp. Mat	3.84	5	0.040	15.86	3.82	1.21	8.19	0.20	11.02
												Perm, Type 1	3.84	5	0.040	15.86	3.82	1.21	8.19	0.20	11.02
												Perm, Type 1	4.50	10	0.040	15.81	4.06	1.33	9.60	0.22	11.12

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 695+00 TO STA. 693+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
695+00	693+50	R	150.00	10.00	3.00	2.00	0.0950	4.44	4.44	0.71	3.15	Seed	3.88	5	0.030	15.47	5.32	1.29	12.23	0.22	11.09
												Jute Mat	3.87	5	0.040	15.56	4.44	1.53	12.20	0.26	11.29
												Temp. Mat	3.87	5	0.040	15.56	4.44	1.53	12.20	0.26	11.29
												Perm, Type 1	3.87	5	0.040	15.56	4.44	1.53	12.20	0.26	11.29
												Perm, Type 1	4.53	10	0.040	15.53	4.71	1.68	14.29	0.28	11.42

300

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 695+00 TO STA. 701+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
695+00	697+50	R	250.00	10.00	3.00	2.00	0.0424	1.34	1.34	0.73	0.98	Seed	3.76	5	0.030	16.56	2.63	0.36	3.68	0.14	10.68
												Seed	4.38	10	0.040	16.76	2.33	0.47	4.29	0.18	10.88
697+50	701+00	R	350.00	10.00	3.00	2.00	0.2171*	3.79	5.13	0.72	3.70	Seed	3.68	5	0.030	17.36	7.17	2.46	13.64	0.18	10.91
												Jute Mat	3.67	5	0.040	17.52	5.99	2.92	13.58	0.22	11.08
												Temp. Mat	3.67	5	0.040	17.52	5.99	2.92	13.58	0.22	11.08
												Perm, Type 1	3.67	5	0.040	17.52	5.99	2.92	13.58	0.22	11.08
												Perm, Type 2	3.67	5	0.040	17.52	5.99	2.92	13.58	0.22	11.08
												Perm, Type 2	4.27	10	0.040	17.67	6.34	3.19	15.83	0.24	11.18

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 702+50 TO STA. 697+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat: 0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2: 3.00	Type 3:	5.00
RCP	Type B:	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
702+50	702+00	L	50.00	10.00	3.00	2.00	0.0720	0.24	0.24	0.72	0.17	Seed	3.87	5	0.030	15.52	1.59	0.19	0.67	0.04	10.21
												Seed	4.53	10	0.040	15.58	1.42	0.24	0.78	0.05	10.27
702+00	697+50	L	450.00	10.00	3.00	2.00	0.2627*	4.23	4.47	0.74	3.30	Seed	3.77	5	0.030	16.53	7.35	2.67	12.44	0.16	10.81
												Jute Mat	3.75	5	0.040	16.73	6.13	3.16	12.37	0.19	10.96
												Temp. Mat	3.75	5	0.040	16.73	6.13	3.16	12.37	0.19	10.96
												Perm, Type 1	3.75	5	0.040	16.73	6.13	3.16	12.37	0.19	10.96
												Perm, Type 2	3.75	5	0.040	16.73	6.13	3.16	12.37	0.19	10.96
												Perm, Type 3	3.75	5	0.040	16.73	6.13	3.16	12.37	0.19	10.96
												Perm, Type 3	4.39	10	0.040	16.72	6.50	3.47	14.48	0.21	11.06

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 702+50 TO STA. 717+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
702+50	714+00	L	1150.0	10.00	3.00	1.00	0.0429	3.82	3.82	0.72	2.75	Seed	2.74	5	0.030	30.28	3.48	0.56	7.53	0.21	10.83
												Jute Mat	2.68	5	0.040	31.32	2.89	0.65	7.38	0.24	10.97
												Temp. Mat	2.68	5	0.040	31.32	2.89	0.65	7.38	0.24	10.97
												Temp. Mat	3.16	10	0.040	30.96	3.07	0.72	8.70	0.27	11.08
714+00	717+00	L	300.00	10.00	3.00	3.00	0.2850*	1.53	5.35	0.74	3.88	Seed	2.65	5	0.030	32.03	6.97	2.51	10.27	0.14	10.85
												Jute Mat	2.64	5	0.040	32.17	5.82	2.98	10.24	0.17	11.01
												Temp. Mat	2.64	5	0.040	32.17	5.82	2.98	10.24	0.17	11.01
												Perm, Type 1	2.64	5	0.040	32.17	5.82	2.98	10.24	0.17	11.01
												Perm, Type 2	2.64	5	0.040	32.17	5.82	2.98	10.24	0.17	11.01
												Perm, Type 2	3.11	10	0.040	31.77	6.20	3.29	12.09	0.18	11.11

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 703+00 TO STA. 701+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
703+00	702+00	R	100.00	10.00	2.00	2.00	0.1012*	0.83	0.83	0.85	0.71	Seed	3.87	5	0.030	15.54	3.06	0.56	2.74	0.09	10.35
												Jute Mat	3.86	5	0.040	15.64	2.57	0.66	2.73	0.10	10.42
												Temp. Mat	3.86	5	0.040	15.64	2.57	0.66	2.73	0.10	10.42
												Temp. Mat	4.52	10	0.040	15.60	2.74	0.72	3.20	0.11	10.46
702+00	701+00	R	100.00	10.00	2.00	2.00	0.3291*	0.45	1.28	0.74	1.04	Seed	3.83	5	0.030	15.97	5.08	1.58	3.97	0.08	10.31
												Jute Mat	3.82	5	0.040	16.03	4.26	1.88	3.96	0.09	10.37
												Temp. Mat	3.82	5	0.040	16.03	4.26	1.88	3.96	0.09	10.37
												Perm, Type 1	3.82	5	0.040	16.03	4.26	1.88	3.96	0.09	10.37
												Perm, Type 1	4.48	10	0.040	15.97	4.53	2.06	4.65	0.10	10.40

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 703+00 TO STA. 718+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
703+00	714+50	R	1150.0	10.00	3.00	1.00	0.0416	6.31	6.31	0.78	4.92	Seed	3.36	5	0.030	20.99	4.62	0.87	16.51	0.33	11.34
												Jute Mat	3.29	5	0.040	21.79	3.83	1.02	16.20	0.39	11.57
												Temp. Mat	3.29	5	0.040	21.79	3.83	1.02	16.20	0.39	11.57
												Perm, Type 1	3.29	5	0.040	21.79	3.83	1.02	16.20	0.39	11.57
												Perm, Type 1	3.88	10	0.040	21.53	4.06	1.12	19.07	0.43	11.73
714+50	716+50	R	200.00	10.00	3.00	3.00	0.3070*	1.44	7.75	0.76	6.01	Seed	3.26	5	0.030	22.16	9.10	3.89	19.62	0.20	11.22
												Jute Mat	3.26	5	0.040	22.23	7.59	4.61	19.58	0.24	11.44
												Temp. Mat	3.26	5	0.040	22.23	7.59	4.61	19.58	0.24	11.44
												Perm, Type 1	3.26	5	0.040	22.23	7.59	4.61	19.58	0.24	11.44
												Perm, Type 2	3.26	5	0.040	22.23	7.59	4.61	19.58	0.24	11.44
												Perm, Type 3	3.26	5	0.040	22.23	7.59	4.61	19.58	0.24	11.44
												Perm, Type 3	3.84	10	0.040	21.94	8.06	5.08	23.07	0.27	11.59
716+50	718+00	R	150.00	10.00	3.00	3.00	0.0487	6.65	14.40	0.70	10.67	Seed	3.23	5	0.030	22.63	6.19	1.48	34.42	0.49	12.91

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Jute Mat	3.22	5	0.040	22.72	5.12	1.74	34.36	0.57	13.44
												Temp. Mat	3.22	5	0.040	22.72	5.12	1.74	34.36	0.57	13.44
												Perm, Type 1	3.22	5	0.040	22.72	5.12	1.74	34.36	0.57	13.44
												Perm, Type 1	3.80	10	0.040	22.40	5.41	1.91	40.50	0.63	13.78

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 722+50 TO STA. 720+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
722+50	720+00	R	250.00	10.00	3.00	3.00	0.0920	5.03	5.03	0.72	3.62	Seed	3.85	5	0.030	15.75	5.49	1.36	13.93	0.24	11.42
												Jute Mat	3.83	5	0.040	15.90	4.57	1.61	13.87	0.28	11.68
												Temp. Mat	3.83	5	0.040	15.90	4.57	1.61	13.87	0.28	11.68
												Perm, Type 1	3.83	5	0.040	15.90	4.57	1.61	13.87	0.28	11.68
												Perm, Type 1	4.49	10	0.040	15.85	4.84	1.77	16.27	0.31	11.85

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 722+50 TO STA. 723+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat:	0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2:	3.00	Type 3:	5.00
RCP	Type B:	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
722+50	723+00	R	50.00	10.00	2.00	2.00	0.0200	0.17	0.17	0.75	0.13	Seed	3.84	5	0.030	15.86	0.95	0.06	0.49	0.05	10.20
												Seed	4.48	10	0.040	15.96	0.84	0.08	0.57	0.07	10.27
723+00	723+50	R	50.00	10.00	2.00	2.00	0.1720*	0.20	0.37	0.74	0.28	Seed	3.80	5	0.030	16.20	2.48	0.45	1.06	0.04	10.17
												Jute Mat	3.79	5	0.040	16.26	2.08	0.54	1.06	0.05	10.20
												Temp. Mat	3.79	5	0.040	16.26	2.08	0.54	1.06	0.05	10.20
												Temp. Mat	4.43	10	0.040	16.34	2.22	0.59	1.23	0.06	10.22

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 744+00 TO STA. 719+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
744+00	725+50	L	1850.0	10.00	3.00	1.00	0.0450	6.23	6.23	0.79	4.92	Seed	2.77	5	0.030	29.62	4.42	0.82	13.65	0.29	11.17
												Jute Mat	2.70	5	0.040	30.94	3.65	0.96	13.30	0.34	11.36
												Temp. Mat	2.70	5	0.040	30.94	3.65	0.96	13.30	0.34	11.36
												Temp. Mat	3.19	10	0.040	30.50	3.88	1.06	15.71	0.38	11.51
725+50	724+00	L	150.00	10.00	2.00	3.00	0.1933*	0.93	7.16	0.81	5.68	Seed	2.68	5	0.030	31.29	7.21	2.43	15.23	0.20	11.01
												Jute Mat	2.68	5	0.040	31.35	6.02	2.87	15.21	0.24	11.19
												Temp. Mat	2.68	5	0.040	31.35	6.02	2.87	15.21	0.24	11.19
												Perm, Type 1	2.68	5	0.040	31.35	6.02	2.87	15.21	0.24	11.19
												Perm, Type 2	2.68	5	0.040	31.35	6.02	2.87	15.21	0.24	11.19
												Perm, Type 2	3.17	10	0.040	30.89	6.41	3.17	17.97	0.26	11.32
724+00	723+50	L	50.00	10.00	2.00	3.00	0.0200	0.22	7.38	0.74	5.84	Seed	2.67	5	0.030	31.59	3.55	0.50	15.57	0.40	11.99
												Jute Mat	2.67	5	0.040	31.64	2.95	0.59	15.56	0.47	12.36
												Temp. Mat	2.67	5	0.040	31.64	2.95	0.59	15.56	0.47	12.36

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Temp. Mat	3.15	10	0.040	31.16	3.13	0.65	18.40	0.52	12.60
723+50	720+50	L	300.00	10.00	2.00	3.00	0.0367	29.87	37.25	0.73	27.64	Seed	2.63	5	0.030	32.31	7.37	1.88	72.74	0.82	14.10
												Jute Mat	2.62	5	0.040	32.46	6.07	2.21	72.54	0.96	14.82
												Temp. Mat	2.62	5	0.040	32.46	6.07	2.21	72.54	0.96	14.82
												Perm, Type 1	2.62	5	0.040	32.46	6.07	2.21	72.54	0.96	14.82
												Perm, Type 2	2.62	5	0.040	32.46	6.07	2.21	72.54	0.96	14.82
												Perm, Type 2	3.10	10	0.040	31.93	6.40	2.43	85.82	1.06	15.30
720+50			50.00	10.00	3.00	3.00	0.2574	0.25	37.50	0.73	27.83		2.62	5	0.030	32.52	13.83		72.93	0.46	12.78

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 745+50 TO STA. 723+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat: 0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2: 3.00	Type 3:	5.00
RCP	Type B:	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
745+50	726+00	R	1950.0	10.00	3.00	1.00	0.0446	16.93	16.93	0.73	12.36	Seed	2.99	5	0.030	25.93	6.33	1.47	37.02	0.53	12.12
												Jute Mat	2.93	5	0.040	26.95	5.21	1.72	36.22	0.62	12.47
												Temp. Mat	2.93	5	0.040	26.95	5.21	1.72	36.22	0.62	12.47
												Perm, Type 1	2.93	5	0.040	26.95	5.21	1.72	36.22	0.62	12.47
												Perm, Type 1	3.45	10	0.040	26.64	5.52	1.89	42.67	0.68	12.72
726+00	725+00	R	100.00	10.00	3.00	2.00	0.1630*	5.94	22.87	0.70	16.52	Seed	2.92	5	0.030	27.11	10.44	4.26	48.24	0.42	12.09
												Jute Mat	2.92	5	0.040	27.14	8.66	5.04	48.20	0.50	12.48
												Temp. Mat	2.92	5	0.040	27.14	8.66	5.04	48.20	0.50	12.48
												Perm, Type 1	2.92	5	0.040	27.14	8.66	5.04	48.20	0.50	12.48
												Perm, Type 2	2.92	5	0.040	27.14	8.66	5.04	48.20	0.50	12.48
												Perm, Type 3	2.92	5	0.040	27.14	8.66	5.04	48.20	0.50	12.48
													2.91	5	0.060	27.20	6.64		48.14	0.63	13.13

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 745+50 TO STA. 750+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat: 0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2: 3.00	Type 3:	5.00
RCP	Type B:	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
745+50	748+50	R	300.00	10.00	3.00	2.00	0.0323	6.64	6.64	0.70	4.65	Seed	3.81	5	0.030	16.14	4.34	0.75	17.70	0.37	11.87
												Jute Mat	3.78	5	0.040	16.37	3.59	0.89	17.59	0.44	12.20
												Temp. Mat	3.78	5	0.040	16.37	3.59	0.89	17.59	0.44	12.20
												Temp. Mat	4.44	10	0.040	16.30	3.80	0.97	20.63	0.48	12.42
748+50	750+50	R	200.00	10.00	3.00	2.00	0.1900*	7.40	14.04	0.71	9.90	Seed	3.75	5	0.030	16.70	9.98	4.06	37.12	0.34	11.71
												Jute Mat	3.74	5	0.040	16.77	8.29	4.81	37.05	0.41	12.03
												Temp. Mat	3.74	5	0.040	16.77	8.29	4.81	37.05	0.41	12.03
												Perm, Type 1	3.74	5	0.040	16.77	8.29	4.81	37.05	0.41	12.03
												Perm, Type 2	3.74	5	0.040	16.77	8.29	4.81	37.05	0.41	12.03
												Perm, Type 3	3.74	5	0.040	16.77	8.29	4.81	37.05	0.41	12.03
												Perm, Type 3	4.39	10	0.040	16.68	8.78	5.28	43.48	0.45	12.23

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 759+50 TO STA. 751+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat: 0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2: 3.00	Type 3:	5.00
RCP	Type B:	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
759+50	753+00	R	650.00	10.00	3.00	0.50	0.0183	3.07	3.07	0.71	2.18	Seed	3.54	5	0.030	18.86	2.70	0.31	7.73	0.27	10.96
												Seed	4.09	10	0.040	19.36	2.38	0.40	8.92	0.35	11.24
753+00	751+00	R	200.00	10.00	3.00	3.00	0.3550*	1.35	4.42	0.71	3.14	Seed	3.50	5	0.030	19.29	7.65	3.05	10.98	0.14	10.83
												Jute Mat	3.49	5	0.040	19.38	6.40	3.62	10.96	0.16	10.98
												Temp. Mat	3.49	5	0.040	19.38	6.40	3.62	10.96	0.16	10.98
												Perm, Type 1	3.49	5	0.040	19.38	6.40	3.62	10.96	0.16	10.98
												Perm, Type 2	3.49	5	0.040	19.38	6.40	3.62	10.96	0.16	10.98
												Perm, Type 3	3.49	5	0.040	19.38	6.40	3.62	10.96	0.16	10.98
												Perm, Type 3	4.04	10	0.040	19.85	6.75	3.94	12.67	0.18	11.07

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 760+50 TO STA. 747+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
760+50	753+50	L	700.00	10.00	3.00	0.50	0.0207	3.50	3.50	0.77	2.70	Seed	3.56	5	0.030	18.69	3.04	0.39	9.58	0.30	11.05
												Seed	4.11	10	0.040	19.18	2.68	0.50	11.07	0.39	11.36
753+50	752+50	L	150.00	10.00	3.00	2.00	0.2015*	1.84	5.34	0.71	4.00	Seed	3.52	5	0.030	19.04	7.09	2.39	14.11	0.19	10.95
												Jute Mat	3.52	5	0.040	19.11	5.93	2.83	14.08	0.22	11.12
												Temp. Mat	3.52	5	0.040	19.11	5.93	2.83	14.08	0.22	11.12
												Perm, Type 1	3.52	5	0.040	19.11	5.93	2.83	14.08	0.22	11.12
												Perm, Type 2	3.52	5	0.040	19.11	5.93	2.83	14.08	0.22	11.12
												Perm, Type 2	4.07	10	0.040	19.58	6.26	3.08	16.28	0.25	11.23
752+50	751+50	L	100.00	10.00	2.00	2.00	0.0500	1.00	6.35	0.72	4.73	Seed	3.49	5	0.030	19.45	4.90	0.99	16.48	0.32	11.26
												Jute Mat	3.48	5	0.040	19.52	4.08	1.17	16.45	0.37	11.50
												Temp. Mat	3.48	5	0.040	19.52	4.08	1.17	16.45	0.37	11.50
												Perm, Type 1	3.48	5	0.040	19.52	4.08	1.17	16.45	0.37	11.50
												Perm, Type 1	4.03	10	0.040	19.96	4.31	1.27	19.03	0.41	11.63

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
751+50	747+50	L	400.00	10.00	3.00	2.00	0.1638*	5.11	11.46	0.74	8.51	Seed	3.42	5	0.030	20.28	8.70	3.17	29.05	0.31	11.55
												Jute Mat	3.40	5	0.040	20.43	7.24	3.75	28.94	0.37	11.83
												Temp. Mat	3.40	5	0.040	20.43	7.24	3.75	28.94	0.37	11.83
												Perm, Type 1	3.40	5	0.040	20.43	7.24	3.75	28.94	0.37	11.83
												Perm, Type 2	3.40	5	0.040	20.43	7.24	3.75	28.94	0.37	11.83
												Perm, Type 3	3.40	5	0.040	20.43	7.24	3.75	28.94	0.37	11.83
												Perm, Type 3	3.94	10	0.040	20.83	7.63	4.08	33.53	0.40	12.00

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 760+50 TO STA. 765+50, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat:	0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2:	3.00	Type 3:	5.00
RCP	Type B:	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
760+50	762+50	L	200.00	10.00	2.00	2.00	0.1965*	1.38	1.38	0.72	0.99	Seed	3.85	5	0.030	15.77	4.28	1.08	3.82	0.09	10.35
												Jute Mat	3.83	5	0.040	15.92	3.58	1.28	3.81	0.10	10.42
												Temp. Mat	3.83	5	0.040	15.92	3.58	1.28	3.81	0.10	10.42
												Perm, Type 1	3.83	5	0.040	15.92	3.58	1.28	3.81	0.10	10.42
												Perm, Type 1	4.49	10	0.040	15.87	3.81	1.40	4.46	0.11	10.46
762+50	765+50	L	300.00	10.00	2.00	2.00	0.2167*	13.78	15.16	0.71	10.78	Seed	3.78	5	0.030	16.38	10.88	4.74	40.76	0.35	11.40
												Jute Mat	3.77	5	0.040	16.47	9.05	5.61	40.66	0.41	11.66
												Temp. Mat	3.77	5	0.040	16.47	9.05	5.61	40.66	0.41	11.66
												Perm, Type 1	3.77	5	0.040	16.47	9.05	5.61	40.66	0.41	11.66
												Perm, Type 2	3.77	5	0.040	16.47	9.05	5.61	40.66	0.41	11.66
												Perm, Type 3	3.77	5	0.040	16.47	9.05	5.61	40.66	0.41	11.66
													3.76	5	0.060	16.63	6.97		40.48	0.53	12.10

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 763+50 TO STA. 761+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
763+50	761+00	R	250.00	10.00	3.00	2.00	0.0720	2.79	2.79	0.70	1.96	Seed	3.82	5	0.030	16.02	4.05	0.79	7.47	0.18	10.88
												Jute Mat	3.80	5	0.040	16.22	3.38	0.94	7.43	0.21	11.04
												Temp. Mat	3.80	5	0.040	16.22	3.38	0.94	7.43	0.21	11.04
												Temp. Mat	4.46	10	0.040	16.15	3.59	1.03	8.71	0.23	11.15

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 763+50 TO STA. 766+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
763+50	764+50	R	100.00	10.00	3.00	2.00	0.0600	0.69	0.69	0.71	0.49	Seed	3.85	5	0.030	15.73	2.25	0.31	1.88	0.08	10.41
												Seed	4.50	10	0.040	15.82	2.01	0.40	2.20	0.11	10.53
764+50	766+00	R	150.00	10.00	2.00	2.00	0.2633*	0.87	1.56	0.71	1.11	Seed	3.80	5	0.030	16.25	4.85	1.40	4.21	0.09	10.34
												Jute Mat	3.79	5	0.040	16.34	4.07	1.66	4.20	0.10	10.40
												Temp. Mat	3.79	5	0.040	16.34	4.07	1.66	4.20	0.10	10.40
												Perm, Type 1	3.79	5	0.040	16.34	4.07	1.66	4.20	0.10	10.40
												Perm, Type 1	4.43	10	0.040	16.40	4.32	1.83	4.91	0.11	10.44

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 768+00 TO STA. 766+00, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
768+00	766+00	R	200.00	10.00	3.00	2.00	0.2825*	2.11	2.11	0.70	1.48	Seed	3.87	5	0.030	15.59	5.57	1.76	5.72	0.10	10.50
												Jute Mat	3.85	5	0.040	15.71	4.66	2.09	5.70	0.12	10.59
												Temp. Mat	3.85	5	0.040	15.71	4.66	2.09	5.70	0.12	10.59
												Perm, Type 1	3.85	5	0.040	15.71	4.66	2.09	5.70	0.12	10.59
												Perm, Type 2	3.85	5	0.040	15.71	4.66	2.09	5.70	0.12	10.59
												Perm, Type 2	4.52	10	0.040	15.67	4.96	2.30	6.68	0.13	10.65

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 768+00 TO STA. 772+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
768+00	769+00	R	100.00	10.00	4.00	2.00	0.0200	0.56	0.56	0.71	0.40	Seed	3.81	5	0.030	16.12	1.48	0.12	1.52	0.10	10.60
												Seed	4.44	10	0.040	16.25	1.31	0.16	1.78	0.13	10.78
769+00	772+50	R	350.00	10.00	3.00	2.00	0.1378*	5.25	5.81	0.70	4.07	Seed	3.72	5	0.030	17.01	6.47	1.91	15.14	0.22	11.11
												Jute Mat	3.70	5	0.040	17.19	5.40	2.25	15.06	0.26	11.31
												Temp. Mat	3.70	5	0.040	17.19	5.40	2.25	15.06	0.26	11.31
												Perm, Type 1	3.70	5	0.040	17.19	5.40	2.25	15.06	0.26	11.31
												Perm, Type 2	3.70	5	0.040	17.19	5.40	2.25	15.06	0.26	11.31
												Perm, Type 2	4.32	10	0.040	17.26	5.71	2.47	17.59	0.29	11.44

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DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 778+00 TO STA. 769+00, LHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
778+00	774+50	L	350.00	10.00	3.00	0.50	0.0171	1.16	1.16	0.75	0.87	Seed	3.62	5	0.030	18.01	1.88	0.17	3.15	0.16	10.57
												Seed	4.19	10	0.040	18.38	1.66	0.23	3.65	0.21	10.74
774+50	769+00	L	550.00	10.00	3.00	3.00	0.2015*	4.95	6.11	0.75	4.58	Seed	3.51	5	0.030	19.23	7.40	2.57	16.06	0.20	11.23
												Jute Mat	3.48	5	0.040	19.47	6.16	3.04	15.96	0.24	11.45
												Temp. Mat	3.48	5	0.040	19.47	6.16	3.04	15.96	0.24	11.45
												Perm, Type 1	3.48	5	0.040	19.47	6.16	3.04	15.96	0.24	11.45
												Perm, Type 2	3.48	5	0.040	19.47	6.16	3.04	15.96	0.24	11.45
												Perm, Type 3	3.48	5	0.040	19.47	6.16	3.04	15.96	0.24	11.45
												Perm, Type 3	4.05	10	0.040	19.77	6.51	3.32	18.53	0.26	11.58

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DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-10.13 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 778+00 TO STA. 772+50, RHS **Designer :** DL

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
778+00	775+50	R	250.00	10.00	3.00	0.50	0.0172	0.67	0.67	0.72	0.48	Seed	3.65	5	0.030	17.69	1.51	0.12	1.77	0.11	10.40
												Seed	4.23	10	0.040	18.02	1.34	0.16	2.05	0.15	10.52
775+50	772+50	R	300.00	10.00	3.00	2.00	0.2800*	6.92	7.59	0.70	5.33	Seed	3.60	5	0.030	18.25	8.82	3.61	19.15	0.21	11.03
												Jute Mat	3.59	5	0.040	18.36	7.36	4.27	19.10	0.24	11.22
												Temp. Mat	3.59	5	0.040	18.36	7.36	4.27	19.10	0.24	11.22
												Perm, Type 1	3.59	5	0.040	18.36	7.36	4.27	19.10	0.24	11.22
												Perm, Type 2	3.59	5	0.040	18.36	7.36	4.27	19.10	0.24	11.22
												Perm, Type 3	3.59	5	0.040	18.36	7.36	4.27	19.10	0.24	11.22
												Perm, Type 3	4.16	10	0.040	18.66	7.78	4.67	22.17	0.27	11.34

TranSystems

Made By: MDC Date: 2/26/2007
Checked: DL, RN Date: 3/13/2007
Job No.: PID 79977 Sheet No.: 1 of 6
Description: Exfiltration Trench at Median for SR823 - Phase 2 (SCI-823-10.31)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 2 median inlet spacing calculations.

Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
527+50	Left	1.0	0.201	8,740	8,740	1.0	0.9	11.3157	12	
	Right	1.0	0.201	8,740	8,740	1.0	0.9	11.3157	12	
533+00	Left	1.0	0.139	6,050	6,050	1.0	0.9	7.8325	8	
	Right	1.0	0.139	6,050	6,050	1.0	0.9	7.8325	8	
533+96.38 (low point)	Left	1.0	0.024	1,060	1,060	1.0	0.9	1.3725		Sump inlet area less than 0.25 acres, no exfiltration trench needed
	Right	1.0	0.024	1,060	1,060	1.0	0.9	1.3725		
	Left	1.0	0.022	975	975	1.0	0.9	1.2620		
	Right	1.0	0.022	975	975	1.0	0.9	1.2620		
534+85	Left	1.0	0.143	6,215	6,215	1.0	0.9	8.0461	12	
	Right	1.0	0.143	6,215	6,215	1.0	0.9	8.0461	12	
540+50	Left	1.0	0.013	550	550	1.0	0.9	0.7120	4	
	Right	1.0	0.013	550	550	1.0	0.9	0.7120	4	
541+00	Left	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	4	
	Right	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	4	
543+00	Left	1.0	0.244	10,630	10,630	1.0	0.9	13.7625	16	
	Right	1.0	0.294	12,824	12,824	1.0	0.9	16.6020	20	
553+00	Left	1.0	0.117	5,090	5,090	1.0	0.9	6.5893	8	
	Right	1.0	0.821	35,782	35,782	1.0	0.9	46.3247	48	

CB-3A										
Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
536+50	Right	1	0.409	17,821	17,821	1	0.9	23.2783	24	
537+00	Left	1	0.385	16,761	16,761	1	0.9	21.8934	24	

APPENDIX F

BMP CALCULATIONS

TranSystems

Made By: MDC Date: 2/26/2007
Checked: DL, RN Date: 3/13/2007
Job No.: PID 79977 Sheet No.: 2 of 6
Descriptio Exfiltration Trench at Median for SR823 - Phase 2 (SCI-823-10.31)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 2 median inlet spacing calculations.

Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
571+00	Left	1.0	0.116	5,058	5,058	1.0	0.9	6.5487	8	
	Right	1.0	0.866	37,708	37,708	1.0	0.9	48.8175	52	
574+00	Left	1.0	0.038	1,650	1,650	1.0	0.9	2.1361	4	
	Right	1.0	0.282	12,300	12,300	1.0	0.9	15.9239	16	
574+72.73 (low point)	Left	1.0	0.009	400	400	1.0	0.9	0.5179		Sump inlet area less than 0.25 acres, no exfiltration trench needed
	Right	1.0	0.068	2,982	2,982	1.0	0.9	3.8605		
	Left	1.0	0.010	425	425	1.0	0.9	0.5502		
	Right	1.0	0.068	2,975	2,975	1.0	0.9	3.8514		
575+50	Left	1.0	0.098	4,252	4,252	1.0	0.9	5.5048	8	
	Right	1.0	0.215	9,354	9,354	1.0	0.9	12.1100	16	
580+00	Left	1.0	0.025	1,100	1,100	1.0	0.9	1.4241	4	
	Right	1.0	0.025	1,100	1,100	1.0	0.9	1.4241	4	
581+00	Left	1.0	0.227	9,900	9,900	1.0	0.9	12.8168	16	
	Right	1.0	0.227	9,900	9,900	1.0	0.9	12.8168	16	
590+00	Left	1.0	0.240	10,450	10,450	1.0	0.9	13.5289	16	
	Right	1.0	0.240	10,450	10,450	1.0	0.9	13.5289	16	
599+50	Left	1.0	0.262	11,429	11,429	1.0	0.9	14.7958	16	
	Right	1.0	0.262	11,429	11,429	1.0	0.9	14.7958	16	

CB-3A										
Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
577+50	Left	1	0.175	7,642	7,642	1	0.9	9.9829	12	
578+00	Right	1	0.159	6,942	6,942	1	0.9	9.0678	12	

Made By: MDC Date: 2/26/2007
Checked: DL, RN Date: 3/13/2007
Job No.: PID 79977 Sheet No.: 3 of 6
Descriptio Exfiltration Trench at Median for SR823 - Phase 2 (SCI-823-10.31)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 2 median inlet spacing calculations.

Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
619+50	Left	1.0	0.301	13,121	13,121	1.0	0.9	16.9868	20	
	Right	1.0	0.243	10,571	10,571	1.0	0.9	13.6861	16	
627+50	Left	1.0	0.643	28,000	28,000	1.0	0.9	36.2496	40	
	Right	1.0	0.202	8,800	8,800	1.0	0.9	11.3927	12	
633+00	Left	1.0	0.442	19,250	19,250	1.0	0.9	24.9216	28	
	Right	1.0	0.139	6,050	6,050	1.0	0.9	7.8325	8	
635+00	Left	1.0	0.161	7,000	7,000	1.0	0.9	9.0624	12	
	Right	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	4	
637+00	Left	1.0	0.161	7,000	7,000	1.0	0.9	9.0624	12	
	Right	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	4	
637+66.13 (low point)	Left	1.0	0.053	2,315	2,315	1.0	0.9	2.9965		Sump inlet area less than 0.25 acres, no exfiltration trench needed
	Right	1.0	0.017	727	727	1.0	0.9	0.9418		
	Left	1.0	0.067	2,935	2,935	1.0	0.9	3.8003		
	Right	1.0	0.021	923	923	1.0	0.9	1.1944		
638+50	Left	1.0	0.361	15,732	15,732	1.0	0.9	20.3673	24	
	Right	1.0	0.114	4,944	4,944	1.0	0.9	6.4012	8	

I-3D										
Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
630+50	Right	1	0.2893	12600	12600	1	0.9	16.4586	20	

Made By: MDC Date: 2/26/2007
Checked: DL, RN Date: 3/13/2007
Job No.: PID 79977 Sheet No.: 4 of 6
Descriptio Exfiltration Trench at Median for SR823 - Phase 2 (SCI-823-10.31)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 2 median inlet spacing calculations.

Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
653+00	Left	1.0	0.804	35,018	35,018	1.0	0.9	45.3352	48	
	Right	1.0	0.253	11,006	11,006	1.0	0.9	14.2482	16	
655+50	Left	1.0	0.201	8,750	8,750	1.0	0.9	11.3280	12	
	Right	1.0	0.063	2,750	2,750	1.0	0.9	3.5602	4	
658+00	Left	1.0	0.201	8,750	8,750	1.0	0.9	11.3280	12	
	Right	1.0	0.063	2,750	2,750	1.0	0.9	3.5602	4	
660+50	Left	1.0	0.201	8,750	8,750	1.0	0.9	11.3280	12	
	Right	1.0	0.063	2,750	2,750	1.0	0.9	3.5602	4	
661+36.84 (low point)	Left	1.0	0.070	3,039	3,039	1.0	0.9	3.9349		Sump inlet area less than 0.25 acres, no exfiltration trench needed
	Right	1.0	0.022	955	955	1.0	0.9	1.2367		
	Left	1.0	0.051	2,211	2,211	1.0	0.9	2.8619		
	Right	1.0	0.016	695	695	1.0	0.9	0.8995		
662+00	Left	1.0	0.121	5,250	5,250	1.0	0.9	6.7968	8	
	Right	1.0	0.038	1,650	1,650	1.0	0.9	2.1361	4	
663+50	Left	1.0	0.241	10,500	10,500	1.0	0.9	13.5936	16	
	Right	1.0	0.076	3,300	3,300	1.0	0.9	4.2723	8	
666+50	Left	1.0	0.241	10,500	10,500	1.0	0.9	13.5936	16	
	Right	1.0	0.076	3,300	3,300	1.0	0.9	4.2723	8	
669+50	Left	1.0	0.321	14,000	14,000	1.0	0.9	18.1248	20	
	Right	1.0	0.101	4,400	4,400	1.0	0.9	5.6964	8	
673+50	Left	1.0	0.402	17,500	17,500	1.0	0.9	22.6560	24	
	Right	1.0	0.126	5,500	5,500	1.0	0.9	7.1205	8	
678+50	Left	1.0	0.782	34,058	34,058	1.0	0.9	44.0922	48	
	Right	1.0	0.246	10,704	10,704	1.0	0.9	13.8576	16	

I-3D										
Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
653+00	Left	1	0.0964	4200	4200	1	0.9	5.4862	8	
654+00	Right	1	0.2479	10800	10800	1	0.9	14.1074	16	
676+50	Right	1	0.2479	10800	10800	1	0.9	14.1074	16	
684+50	Right	1	0.2893	12600	12600	1	0.9	16.4586	20	

Made By: MDC Date: 2/26/2007
Checked: DL, RN Date: 3/13/2007
Job No.: PID 79977 Sheet No.: 5 of 6
Descriptic Exfiltration Trench at Median for SR823 - Phase 2 (SCI-823-10.31)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 2 median inlet spacing calculations.

Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
679+00	Left	1.0	0.705	30,692	30,692	1.0	0.9	39.7350	40	
	Right	1.0	0.221	9,646	9,646	1.0	0.9	12.4882	16	
702+50	Left	1.0	0.442	19,250	19,250	1.0	0.9	24.9216	28	
	Right	1.0	0.139	6,050	6,050	1.0	0.9	7.8325	8	
707+00	Left	1.0	0.362	15,750	15,750	1.0	0.9	20.3904	24	
	Right	1.0	0.114	4,950	4,950	1.0	0.9	6.4084	8	
711+00	Left	1.0	0.321	14,000	14,000	1.0	0.9	18.1248	20	
	Right	1.0	0.101	4,400	4,400	1.0	0.9	5.6964	8	
714+50	Left	1.0	0.188	8,210	8,210	1.0	0.9	10.6284	12	
	Right	1.0	0.088	3,850	3,850	1.0	0.9	4.9843	8	
715+50	Left	1.0	0.025	1,100	1,100	1.0	0.9	1.4241	4	
	Right	1.0	0.025	1,100	1,100	1.0	0.9	1.4241	4	
716+00	Left	1.0	0.013	550	550	1.0	0.9	0.7120	4	
	Right	1.0	0.013	550	550	1.0	0.9	0.7120	4	
720+50	Left	1.0	0.114	4,950	4,950	1.0	0.9	6.4084	8	
	Right	1.0	0.114	4,950	4,950	1.0	0.9	6.4084	8	
721+13.64 (low point)	Left	1.0	0.016	700	700	1.0	0.9	0.9063		Sump inlet area less than 0.25 acres, no exfiltration trench needed
	Right	1.0	0.016	700	700	1.0	0.9	0.9063		
	Left	1.0	0.022	950	950	1.0	0.9	1.2298		
	Right	1.0	0.022	950	950	1.0	0.9	1.2298		
722+00	Left	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	4	
	Right	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	4	
724+00	Left	1.0	0.202	8,800	8,800	1.0	0.9	11.3927	12	
	Right	1.0	0.202	8,800	8,800	1.0	0.9	11.3927	12	
732+00	Left	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	16	
	Right	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	16	
742+00	Left	1.0	0.175	7,643	7,643	1.0	0.9	9.8953	12	
	Right	1.0	0.560	24,404	24,404	1.0	0.9	31.5936	32	
750+00	Left	1.0	0.156	6,800	6,800	1.0	0.9	8.8035	12	
	Right	1.0	0.643	28,000	28,000	1.0	0.9	36.2496	40	
758+00	Left	1.0	0.137	5,950	5,950	1.0	0.9	7.7030	8	
	Right	1.0	0.562	24,500	24,500	1.0	0.9	31.7184	32	
765+00	Left	1.0	0.137	5,950	5,950	1.0	0.9	7.7030	8	
	Right	1.0	0.562	24,500	24,500	1.0	0.9	31.7184	32	
772+00	Left	1.0	0.197	8,567	8,567	1.0	0.9	11.0906	12	
	Right	1.0	0.810	35,274	35,274	1.0	0.9	45.6673	48	

Made By: MDC Date: 2/26/2007
Checked: DL, RN Date: 3/13/2007
Job No.: PID 79977 Sheet No.: 5 of 6
Descriptic Exfiltration Trench at Median for SR823 - Phase 2 (SCI-823-10.31)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 2 median inlet spacing calculations.

I-3D										
Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
707+00	Right	1	0.248	10,800	10,800	1	0.9	14.1074	16	
708+50	Left	1	0.138	6,000	6,000	1	0.9	7.8374	8	
710+50	Right	1	0.289	12,600	12,600	1	0.9	16.4586	20	
711+00	Right	1	0.041	1,800	1,800	1	0.9	2.3512	4	
729+50	Right	1	0.041	1,800	1,800	1	0.9	2.3512	4	
730+00	Right	1	0.165	7,200	7,200	1	0.9	9.4049	12	
732+00	Right	1	0.372	16,200	16,200	1	0.9	21.1611	24	
736+50	Right	1	0.413	18,000	18,000	1	0.9	23.5123	24	

CB-3, CB-3A										
720+50 (CB-3A)	Right	1	0.335	14,599	14,599	1	0.9	19.0704	20	
720+50 (CB-3A)	Left	1	0.335	14,599	14,599	1	0.9	19.0704	20	
721+13.64 (CB-3)	Left	1	0.053	2,291	2,291	1	0.9	2.9927	4	

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	10/23/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	789+00	RT	0.55	I				0		
			0	Non-I						
		Sum=	0.55		1.00	0.89	0.036	0	1	0.036

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
23958	0.89	31	Use 32'

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	789+00	LT	0.13	I				0		
			0	Non-I						
		Sum=	0.13		1.00	0.89	0.008	0	1	0.008

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
5663	0.89	7	Use 8'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	10/23/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	799+00	RT	0.8	I				0		
			0	Non-I						
		Sum=	0.8		1.00	0.89	0.053	0	1	0.053

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
34848	0.89	45

Use 48'

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	799+00	LT	0.2	I				0		
			0	Non-I						
		Sum=	0.2		1.00	0.89	0.013	0	1	0.013

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
8712	0.89	11

Use 12'

Note: Use length divisible by 4

Company CTY-RT-SEC PID	CH2M HILL

Designed By Date Checked By Date	CTS 10/23/2006

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	809+00	RT	0.8	I				0		
			0	Non-I						
		Sum=	0.8		1.00	0.89	0.053	0	1	0.053

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
34848	0.89	45	Use 48'

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	809+00	LT	0.2	I				0		
			0	Non-I						
		Sum=	0.2		1.00	0.89	0.013	0	1	0.013

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
8712	0.89	11	Use 12'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	10/23/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	818+00	RT	0.72	I				0		
			0	Non-I						
		Sum=	0.72		1.00	0.89	0.048	0	1	0.048

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
31363	0.89	41	Use 44'

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	818+00	LT	0.18	I				0		
			0	Non-I						
		Sum=	0.18		1.00	0.89	0.012	0	1	0.012

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
7841	0.89	10	Use 12'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	10/23/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	825+50	RT	0.42	I				0		
			0	Non-I						
		Sum=	0.42		1.00	0.89	0.028	0	1	0.028

Exfiltration Trench Design

Area	Cq	Lt
sf		ft
18295	0.89	24

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	825+50	LT	0.19	I				0		
			0	Non-I						
		Sum=	0.19		1.00	0.89	0.012	0	1	0.012

Exfiltration Trench Design

Area	Cq	Lt
sf		ft
8276	0.89	11

Use 12'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	10/23/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	834+00	RT	0.22	I				0		
			0	Non-I						
		Sum=	0.22		1.00	0.89	0.014	0	1	0.014

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
9583	0.89	12

Use 12'

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	834+00	LT	0.22	I				0		
			0	Non-I						
		Sum=	0.22		1.00	0.89	0.014	0	1	0.014

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
9583	0.89	12

Use 12'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	10/23/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	842+00	RT	0.2	I				0		
			0	Non-I						
		Sum=	0.2		1.00	0.89	0.013	0	1	0.013

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
8712	0.89	11

Use 12'

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	842+00	LT	0.2	I				0		
			0	Non-I						
		Sum=	0.2		1.00	0.89	0.013	0	1	0.013

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
8712	0.89	11

Use 12'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	10/23/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	850+50	RT	0.21	I				0		
			0	Non-I						
		Sum=	0.21		1.00	0.89	0.014	0	1	0.014

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
9148	0.89	12	Use 12'

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	850+50	LT	0.37	I				0		
			0	Non-I						
		Sum=	0.37		1.00	0.89	0.024	0	1	0.024

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
16117	0.89	21	Use 24'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	11/1/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	860+00	RT	0.19	I				0		
			0	Non-I						
		Sum=	0.19		1.00	0.89	0.012	0	1	0.012

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
8276	0.89	11	Use 12'

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	860+00	LT	0.77	I				0		
			0	Non-I						
		Sum=	0.77		1.00	0.89	0.051	0	1	0.051

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
33541	0.89	43	Use 44'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	11/1/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	867+00	RT	0.14	I				0		
			0	Non-I						
		Sum=	0.14		1.00	0.89	0.009	0	1	0.009

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
6098	0.89	8

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	867+00	LT	0.55	I				0		
			0	Non-I						
		Sum=	0.55		1.00	0.89	0.036	0	1	0.036

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
23958	0.89	31

Use 32'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	11/1/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	873+50	RT	0.13	I				0		
			0	Non-I						
		Sum=	0.13		1.00	0.89	0.008	0	1	0.008

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
5663	0.89	7	Use 8'

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	873+50	LT	0.46	I				0		
			0	Non-I						
		Sum=	0.46		1.00	0.89	0.030	0	1	0.030

Exfilitration Trench Design

Area	Cq	Lt	
sf		ft	
20038	0.89	26	Use 28'

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	11/1/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	850+50	RT	0.15	I				0		
			0	Non-I						
		Sum=	0.15		1.00	0.89	0.010	0	1	0.010

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
6534	0.89	8

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	850+50	LT	0.15	I				0		
			0	Non-I						
		Sum=	0.15		1.00	0.89	0.010	0	1	0.010

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
6534	0.89	8

Note: Use length divisible by 4

Company	CH2M HILL
CTY-RT-SEC	
PID	

Designed By	CTS
Date	11/1/2006
Checked By	
Date	

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	850+50	RT	0.15	I				0		
			0	Non-I						
		Sum=	0.15		1.00	0.89	0.010	0	1	0.010

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
6534	0.89	8

Note: Use length divisible by 4

WQv Outfall	Outfall Station	Location	Area	Land Use I or Non-I	Impervious Ratio	Cq	WQv	Existing Impervious	Treatment Ratio	Required WQv
			Ac				Ac-ft	Ac		Ac-ft
	850+50	LT	0.15	I				0		
			0	Non-I						
		Sum=	0.15		1.00	0.89	0.010	0	1	0.010

Exfilitration Trench Design

Area	Cq	Lt
sf		ft
6534	0.89	8

Note: Use length divisible by 4

SCI 823-10.13 PID 79977 PHASE 2

BMP CALS FOR DITCHES - SR823, RIGHT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: DL	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT

AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	REQUIRED DITCH WIDTH > 10 FT	COMMENTS
561+50	543+00	10	5.372	9.825		
543+00	541+50	10	1.039	5.474		
541+50	540+50	15	0.526	4.296		
561+50	574+50	10	4.266	9.051		
574+50	575+00	10	9.445	12.011	12.0	Fill Section, Coordinate with ODOT and establish the ditch width
575+00	577+50	10	2.801	7.792		in Stage 2
577+50	578+00	15	0.630	4.581		
596+50	582+00	10	12.720	13.353	13.4	Cut Section, Use 10 feet maximum Ditch width
581+50	582+00	10	0.100	2.379		
597+50	599+50	10	4.782	9.426		
599+50	600+50	10	0.773	4.927		
600+50	601+50	15	1.653	6.458		
608+50	603+50	10	1.619	6.410		
603+50	602+50	10	0.430	3.999		
602+50	602+00	15	0.262	3.352		
608+50	609+50	10	0.732	4.832		
609+50	610+00	10	0.434	4.012		
610+00	610+50	15	0.374	3.805		
611+50	611+00	10	0.347	3.705		
611+00	610+50	15	0.623	4.563		
611+50	615+50	10	1.134	5.647		
615+50	616+50	15	0.685	4.720		
619+00	618+00	10	0.900	5.201		

SCI 823-10.13 PID 79977 PHASE 2

BMP CALS FOR DITCHES - SR823, RIGHT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: DL	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	REQUIRED DITCH WIDTH > 10 FT	COMMENTS
618+00	617+00	15	0.805	4.999		
619+00	621+50	10	0.716	4.794		
621+50	622+00	10	0.170	2.874		
622+00	623+00	15	0.402	3.904		
623+00	623+50	15	0.219	3.145		
625+00	624+00	10	1.560	6.326		
624+00	623+50	15	0.230	3.200		
625+00	633+50	10	3.825	8.706		
633+50	634+50	10	0.660	4.657		
634+50	635+50	15	0.590	4.475		
643+00	637+50	10	3.175	8.147		
637+50	636+50	10	1.060	5.513		
636+50	636+00	15	0.314	3.575		
643+00	657+00	10	13.693	13.708	13.7	Cut Section, Use 10 feet maximum Ditch width
657+00	568+00	10	0.600	4.502		
658+00	658+50	15	0.314	3.575		
671+50	661+50	10	8.626	11.629	11.6	Cut Section, Use 10 feet maximum Ditch width
661+50	659+50	10	3.160	8.134		
659+50	659+00	15	0.300	3.518		
671+50	672+00	10	0.193	3.006		
672+00	673+00	15	0.674	4.692		
688+00	674+00	10	12.607	13.311	13.3	Cut Section, Use 10 feet maximum Ditch width
674+00	673+50	15	0.374	3.805		

SCI 823-10.13 PID 79977 PHASE 2

BMP CALS FOR DITCHES - SR823, RIGHT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: DL	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	REQUIRED DITCH WIDTH > 10 FT	COMMENTS
688+00	691+00	10	4.960	9.550		
691+50	691+00	10	0.191	2.995		
691+50	693+50	10	3.005	7.989		
695+00	693+50	10	4.440	9.180		
695+00	697+50	10	1.340	5.993		
697+50	700+00	10	2.983	7.968		
700+00	701+00	15	0.770	4.920		
703+00	702+00	10	0.303	3.530		
702+00	701+00	15	0.450	4.064		
703+00	714+50	10	4.819	9.452		
714+50	715+50	10	0.540	4.336		
715+50	716+50	15	0.615	4.542		
716+50	718+00	15	6.653	10.602		
722+50	720+00	10	4.743	9.399		
722+50	723+00	10	0.171	2.880		
723+00	723+50	15	0.203	3.061		
745+50	726+00	10	15.942	14.471	14.5	Cut Section, Use 10 feet maximum Ditch width
726+00	725+50	10	5.523	9.922		
725+50	725+00	15	0.260	3.343		
725+00	724+00	15	1.170	5.710		
724+00	723+50	15	0.205	3.072		
745+50	748+50	10	6.644	10.597	10.6	Fill Section, Use 10 feet ditch width

SCI 823-10.13 PID 79977 PHASE 2

BMP CALS FOR DITCHES - SR823, RIGHT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: DL	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT

AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	REQUIRED DITCH WIDTH > 10 FT	COMMENTS
748+50	750+00	10	1.200	5.762		
750+00	750+50	15	0.271	3.393		
759+50	753+00	10	3.074	8.054		
753+00	751+50	10	1.100	5.586		
751+50	751+00	15	0.253	3.311		
763+50	761+00	10	2.794	7.785		
763+50	764+50	10	0.690	4.732		
764+50	765+00	10	0.410	3.931		
765+00	766+00	15	0.630	4.581		
768+00	766+50	10	1.780	6.630		
766+50	766+00	15	0.333	3.651		
768+00	769+00	10	0.563	4.401		
769+00	771+50	10	2.680	7.670		
771+50	772+50	15	2.570	7.557		
778+00	775+50	10	0.664	4.668		
775+50	773+50	10	2.866	7.856		
773+50	772+50	15	4.050	8.885		

SCI 823-10.13 PID 79977 PHASE 2

BMP CALS FOR DITCHES - SR823, LEFT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07 | DONE BY: DL | CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{-356})$ FT

AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	REQUIRED DITCH WIDTH > 10 (FT)	COMMENTS
561+50	543+00	10	5.47	9.89		
543+00	542+50	10	0.13	2.62		
542+50	541+50	10	0.39	3.88		
541+50	540+50	15	0.41	3.93		
561+50	572+00	10	2.65	7.64		
572+00	573+50	10	0.36	3.76		
573+50	574+50	10	0.31	3.57		
574+50	575+00	10	0.20	3.03		
597+00	580+50	10	5.96	10.19	10.2	Cut Section, Use 10 feet maximum Ditch width
608+00	603+00	10	1.73	6.56		
603+00	601+00	10	1.38	6.05		
601+00	600+00	15	0.64	4.60		
612+50	615+50	10	0.87	5.14		
615+50	618+00	10	2.35	7.32		
618+00	618+50	15	0.38	3.83		
625+50	624+50	10	0.67	4.69		
624+50	623+50	10	0.76	4.90		
623+50	622+50	15	1.06	5.51		
626+50	633+50	10	3.27	8.24		
633+50	635+50	10	1.16	5.69		
635+50	636+00	15	0.75	4.87		
643+00	641+00	10	0.64	4.61		

SCI 823-10.13 PID 79977 PHASE 2

BMP CALS FOR DITCHES - SR823, LEFT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: DL	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	REQUIRED DITCH WIDTH > 10 (FT)	COMMENTS
643+00	647+50	10	0.95	5.29		
647+50	648+00	10	0.42	3.96		
648+50	648+00	10	0.53	4.29		
648+50	656+50	10	2.88	7.87		
661+50	660+00	10	1.52	6.27		
660+00	659+00	15	1.30	5.93		
670+00	663+50	10	3.35	8.30		
663+50	663+00	10	0.18	2.93		
679+50	675+00	10	1.07	5.54		
675+00	673+00	10	0.84	5.07		
673+00	672+50	15	0.33	3.63		
688+00	683+00	10	1.37	6.03		
683+00	681+50	10	1.89	6.77		
688+00	689+50	10	0.36	3.76		
689+50	691+00	10	1.21	5.77		
691+00	692+50	10	0.90	5.19		
692+50	693+00	15	0.39	3.85		
702+50	702+00	10	0.25	3.27		
702+00	699+00	10	2.56	7.55		
699+00	697+50	15	1.43	6.13		

SCI 823-10.13 PID 79977 PHASE 2

BMP CALS FOR DITCHES - SR823, LEFT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: DL	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	REQUIRED DITCH WIDTH > 10 (FT)	COMMENTS
702+50	714+00	10	3.82	8.70		
714+00	716+50	10	1.18	5.73		
716+50	717+00	15	0.27	3.38		
744+00	725+50	10	4.98	9.56		
725+50	724+00	10	0.53	4.30		
724+00	723+50	10	0.22	3.15		
723+50	720+50	10	27.74	17.62	17.6	Fill Section, Coordinate with ODOT and establish the ditch width
720+50	720+00	15	0.25	3.29		in Stage 2
720+00	719+50	15	0.26	3.36		
760+50	753+50	10	2.80	7.79		
753+50	752+50	10	1.84	6.71		
752+50	751+50	10	1.00	5.41		
751+50	748+50	10	2.78	7.77		
748+50	747+50	15	1.61	6.40		
760+50	762+50	10	1.38	6.06		
762+50	765+00	10	12.44	13.25	13.2	Fill Section, Coordinate with ODOT and establish the ditch width
765+00	765+50	15	0.64	4.60		in Stage 2
778+00	774+50	10	1.17	5.70		
774+50	770+00	10	4.62	9.31		
770+00	769+00	15	0.79	4.97		

APPENDIX G

LD-33 Form

FORM LD-33
REV. 12-82

OHIO DEPARTMENT OF TRANSPORTATION
COUNTY ENGINEER
APPROVAL FORM

DATE SUBMITTED TO DISTRICT DEPUTY DIRECTOR: December 10, 2007

DATE SUBMITTED TO COUNTY ENGINEER: December 10, 2007

COUNTY: SCIOTO ROUTE: 823 SECTION: 10.13

CULVERT DATA

STATION	SIZE & TYPE	ELEVATION OF CULVERT INVERT		ELEVATION OF EXISTING CHANNEL AT		SKEW	
		INLET	OUTLET	INLET	OUTLET		
582+00.1 SR 823	30" Type A	818.40	817.14	◊	◊	90°	⊥
600+75.0 SR 823	60" Type A,707.03	821.75	802.79	821.75	802.79	20.5°	LF
610+39.0 SR 823	60" Type A, 707.03	889.28	831.23	◊	831.23	1.0°	RF
617+51.0 SR 823	60" Type A, 707.03	852.95	792.30	852.95	*	26.75°	RF
623+01.2 SR 823	60" Type A, 707.03	862.84	823.34	*	*	14.9°	RF
635+86.0 SR 823	66" Type A, 707.03	774.87	743.39	774.87	743.39	8.0°	LF
658+79.0 SR 823	78" Type A, 707.03	720.37	691.47	*	*	1.0°	LF
672+93.0 SR 823	60" Type A, 707.03	796.61	715.28	796.61	715.61	16.9°	RF
699+51.0 SR 823	60" Type A, 707.03	770.71	713.37	770.71	713.37	31.3°	RF
723+50.0 SR 823	60" Type A, 707.03	748.30	745.20	◊	◊	90°	⊥
749+33.0 SR 823	60" Type A, 707.03	815.89	774.03	*	*	35.0°	RF
761+44.8 SR 823	60" Type A, 707.03	862.90	859.16	*	◊	31.5°	LF
766+00.0 SR 823	60" Type A, 707.03	848.42	798.5	848.42	*	90°	⊥
771+00.0 SR 823	60" Type A, 707.03	842.50	796.23	*	*	35.0°	RF

I have reviewed and hereby approve the drainage proposed for the highway designated heron in accordance with the provisions of Section 6131.631 of the Revised Code of the State of Ohio.

COUNTY ENGINEER SCIOTO COUNTY

(SIGNATURE)

DATE

COMMENTS:

* Relocated Channel
◊ New Ditch Location

OHIO DEPARTMENT OF TRANSPORTATION
COUNTY ENGINEER
APPROVAL FORM

FORM LD-33

REV. 12-82

DATE SUBMITTED TO DISTRICT DEPUTY DIRECTOR: December 10, 2007

DATE SUBMITTED TO COUNTY ENGINEER: December 10, 2007

COUNTY: SCIOTO ROUTE: COUNTY ROAD 29 SECTION: N/A

COUNTY: SCIOTO ROUTE: COUNTY ROAD 54 SECTION: N/A

CULVERT DATA

STATION	SIZE & TYPE	ELEVATION OF CULVERT INVERT		ELEVATION OF EXISTING CHANNEL AT		SKEW
		INLET	OUTLET	INLET	OUTLET	
19+75.0 CR 29	36" Type A, 706.02	775.02	774.50	◊	◊	90° ⊥
28+00.0 CR 54	30" Type A, 706.02	704.54	703.64	◊	◊	90° ⊥
32+00.0 CR 54	30" Type A, 706.02	706.02	716.73	◊	◊	90° ⊥

I have reviewed and hereby approve the drainage proposed for the highway designated heron in accordance with the provisions of Section 6131.631 of the Revised Code of the State of Ohio.

COUNTY ENGINEER SCIOTO COUNTY

(SIGNATURE)

DATE

COMMENTS:

* Relocated Channel
◊ New Ditch Location

FORM LD-33
REV. 12-82

OHIO DEPARTMENT OF TRANSPORTATION
COUNTY ENGINEER
APPROVAL FORM

DATE SUBMITTED TO DISTRICT DEPUTY DIRECTOR DECEMBER 10, 2007

DATE SUBMITTED TO COUNTY ENGINEER DECEMBER 10, 2007

COUNTY Scioto ROUTE 823 SECTION 10.13

CULVERT DATA

STATION	SIZE & TYPE	ELEVATION OF CULVERT INVERT		ELEVATION OF EXISTING CHANNEL AT		SKEW
		INLET	OUTLET	INLET	OUTLET	
796+06.29	66" Type A, 707.0	839.88	771.66	843.08	771.66	1°40'50" RF
815+00.28	72" Type A, 707.01	756.28	725.40	756.24	725.40	49°04'03" LF
823+45.11	60" Type A, 707.01	761.05	731.83	760.37	731.84	17°07'58" RF
854+39.64	108" Type A, 707.01	620.18	610.64	620.18	612.11	37°18'37" LF
857+16.49	66" Type A, 707.01	628.13	611.05	632.68	615.37	27°23'14" RF
868+91.27	42" Type A, 707.01	650.23	631.40	651.91	631.37	38°06'57" LF
Ramp A						
1912+55.79	72" Type A	524.31	522.98	524.51	523.57	25°15'18" RF

I have reviewed and hereby approve the drainage proposed for the highway designated hereon in accordance with the provisions of Section 6131.631 of the Revised Code of the State of Ohio.

_____ COUNTY ENGINEER _____ COUNTY
(SIGNATURE)

DATE _____

COMMENTS:

DOT - 2735

FORM LD-33
REV. 12-82

OHIO DEPARTMENT OF TRANSPORTATION
COUNTY ENGINEER
APPROVAL FORM

DATE SUBMITTED TO DISTRICT DEPUTY DIRECTOR DECEMBER 10, 2007

DATE SUBMITTED TO COUNTY ENGINEER DECEMBER 10, 2007

COUNTY Scioto ROUTE CR 55 SECTION N/A

CULVERT DATA

STATION	SIZE & TYPE	ELEVATION OF CULVERT INVERT		ELEVATION OF EXISTING CHANNEL AT		SKEW
		INLET	OUTLET	INLET	OUTLET	
17+00	30" Type A	560.00	557.00	568.48	566.00	0°00'00"
22+00	30" Type A	560.00	557.00	567.33	565.73	0°00'00"

I have reviewed and hereby approve the drainage proposed for the highway designated hereon in accordance with the provisions of Section 6131.631 of the Revised Code of the State of Ohio.

_____ COUNTY ENGINEER _____ COUNTY
(SIGNATURE)

DATE _____

COMMENTS:

DOT - 2735

FORM LD-33
REV. 12-82

OHIO DEPARTMENT OF TRANSPORTATION
COUNTY ENGINEER
APPROVAL FORM

DATE SUBMITTED TO DISTRICT DEPUTY DIRECTOR DECEMBER 10, 2007

DATE SUBMITTED TO COUNTY ENGINEER DECEMBER 10, 2007

COUNTY Scioto ROUTE US 23 SECTION N/A

CULVERT DATA

STATION	SIZE & TYPE	ELEVATION OF CULVERT INVERT		ELEVATION OF EXISTING CHANNEL AT		SKEW
		INLET	OUTLET	INLET	OUTLET	
609+50	10'x5' Box	531.00	530.00	540.02	536.04	0°00'00"
619+73.25	66" Type A 706.02	529.00	527.02	536.46	529.15	17°28'51" RF
635+80.57	48" Type A	530.42	530.45	531.98	532.03	0°07'45" LF

I have reviewed and hereby approve the drainage proposed for the highway designated hereon in accordance with the provisions of Section 6131.631 of the Revised Code of the State of Ohio.

_____ COUNTY ENGINEER _____ COUNTY
(SIGNATURE)

DATE _____

COMMENTS:

DOT - 2735