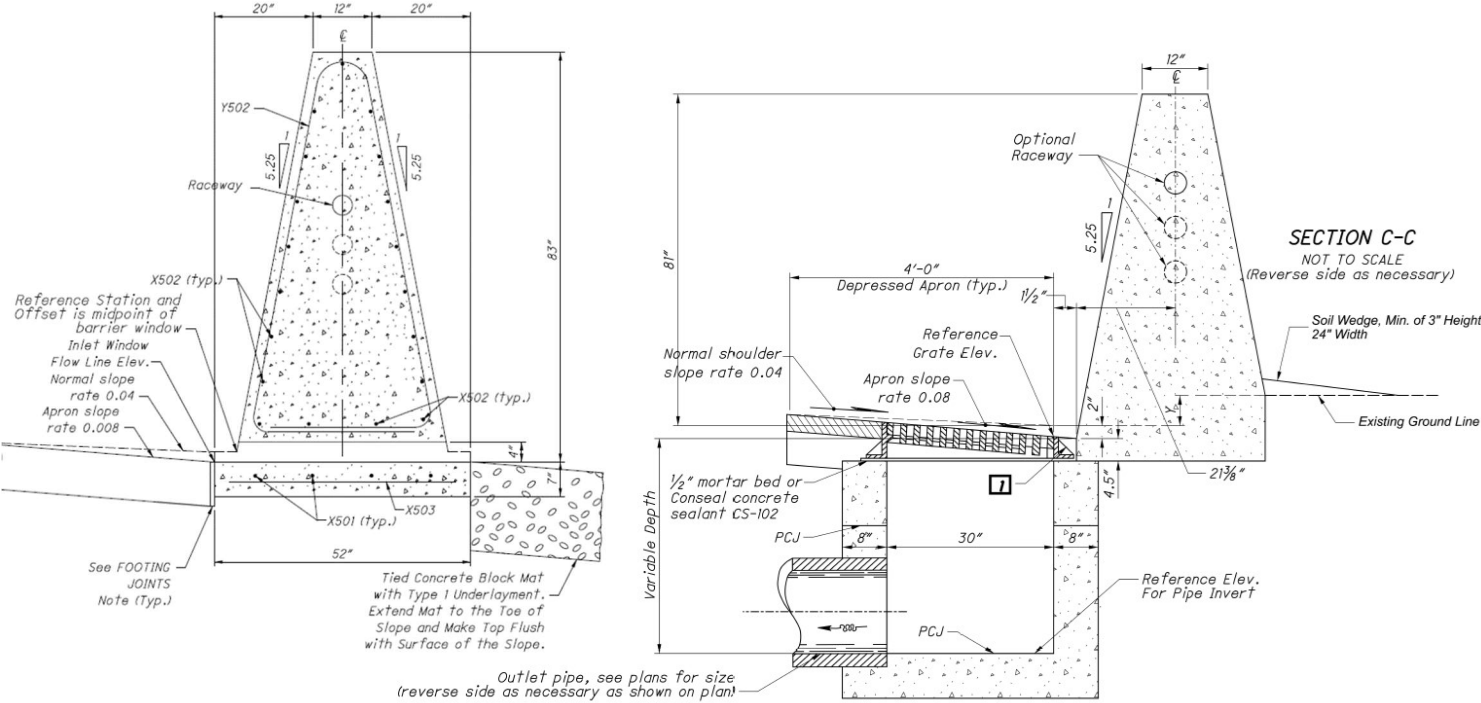


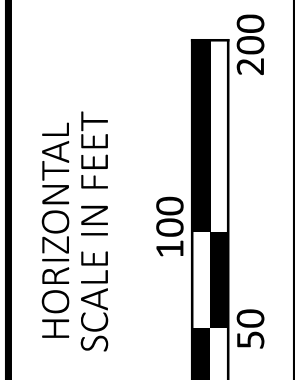
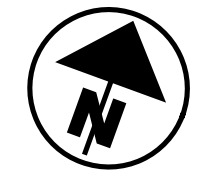
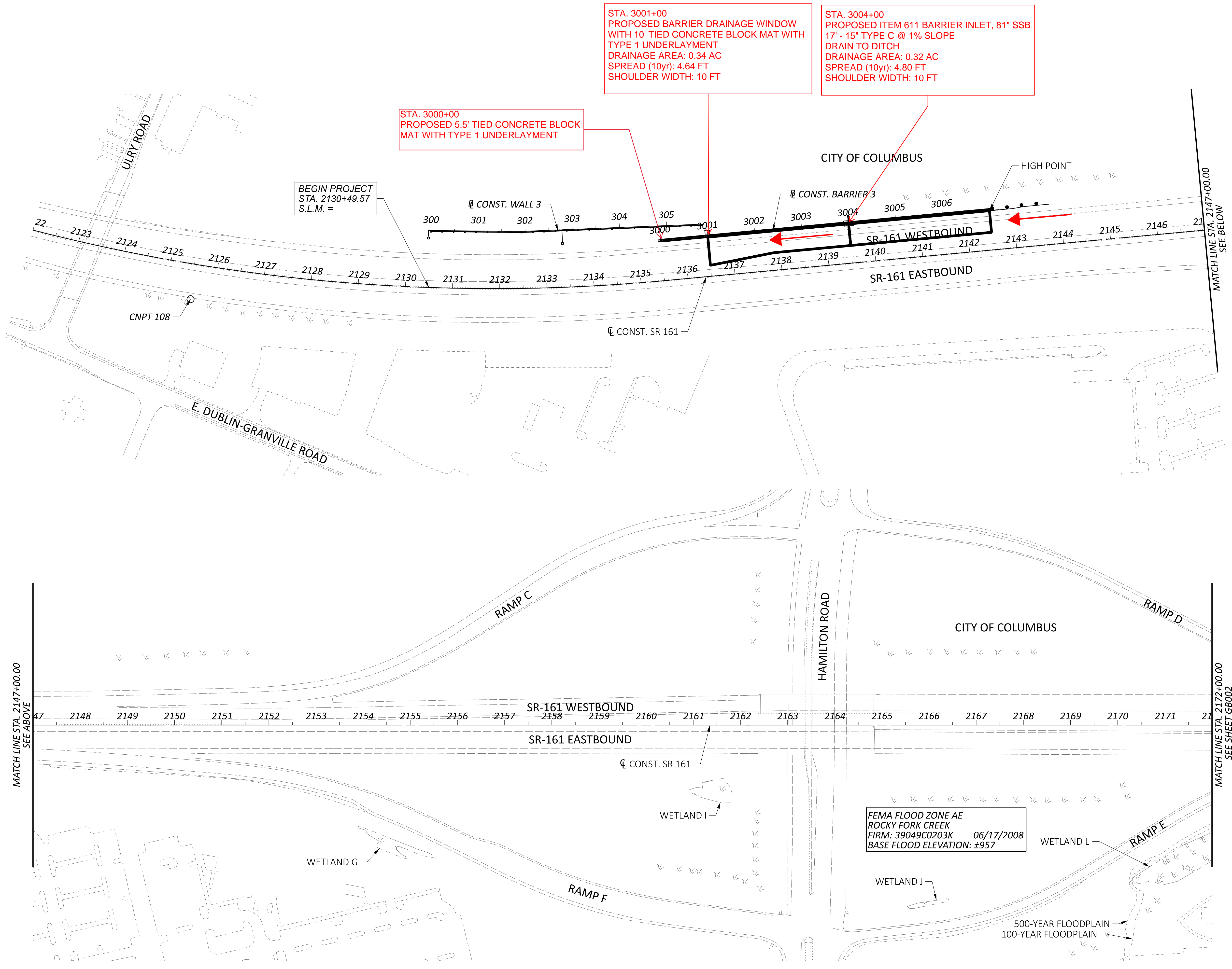
Ohio Department of Transportation

FRA-161-15.80 Noise Walls – 81” Barrier Drainage Analysis

PID 117607

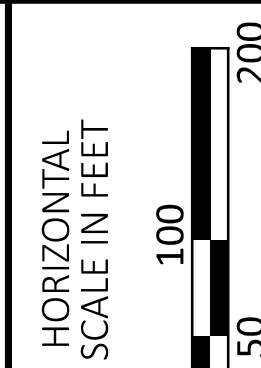
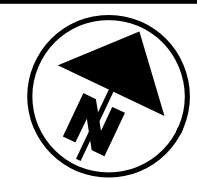
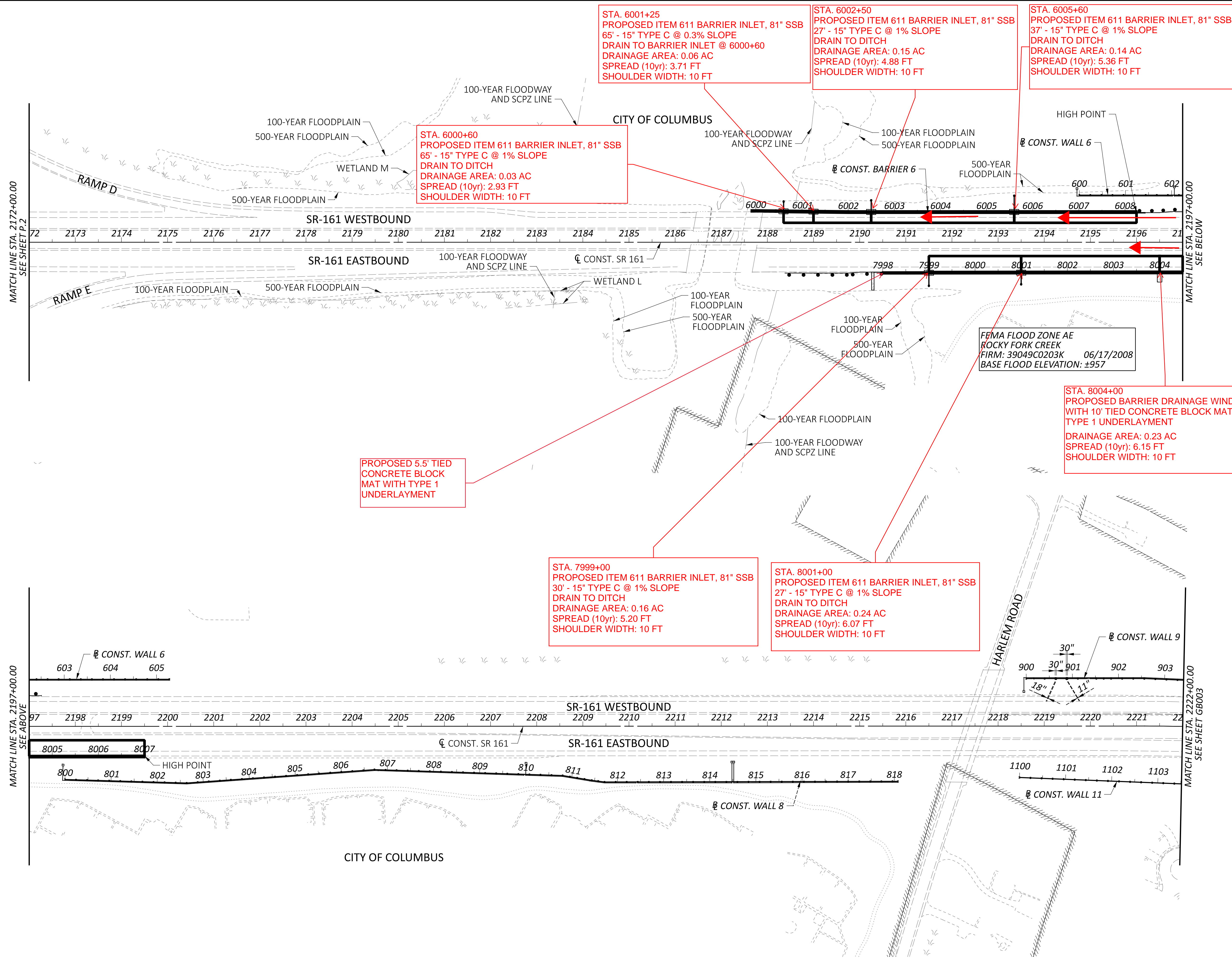
March 27, 2024





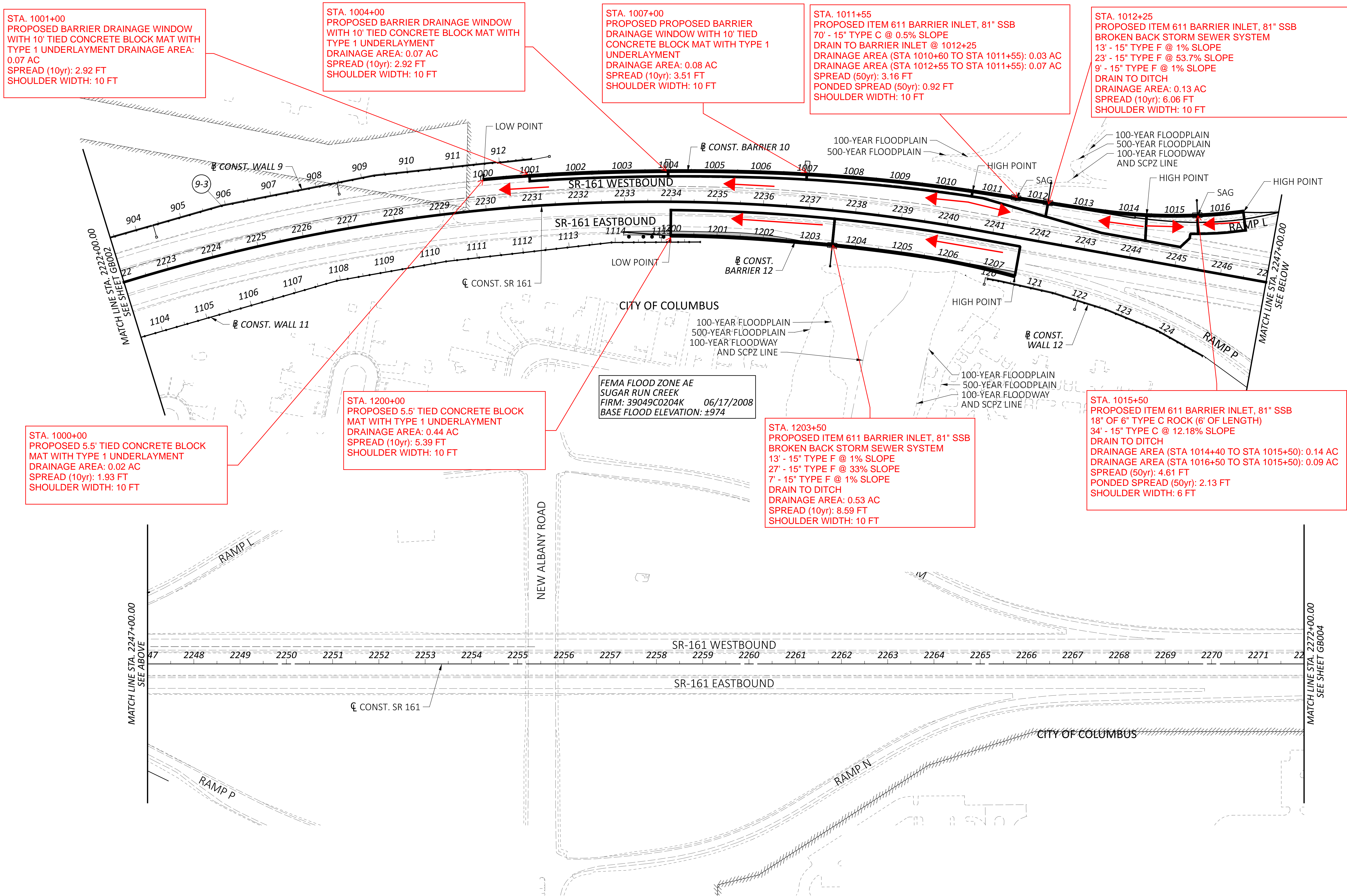
SCHEMATIC PLAN WITH 81" BARRIER DRAINAGE AREAS AND SPREAD CALC SUMMARIES
 STA. 2122+00.00 TO STA. 2172+00.00

DESIGN AGENCY	
8101 NORTH HUGHES BLVD, SUITE 100 COLUMBUS, OHIO 43235 (614) 818-4900 www.arcadis.com	
DESIGNER	
MDB	
REVIEWER	
JDH 3-27-2024	
PROJECT ID	
117607	
SHEET	TOTAL
1	3



SCHEMATIC PLAN WITH 81" BARRIER DRAINAGE AREAS AND SPREAD CALC SUMMARIES
 STA. 2172+00.00 TO STA. 2222+00.00

DESIGN AGENCY	
DESIGNER	
MDB	
REVIEWER	
JDH 3-27-2024	
PROJECT ID	
117607	
SHEET	TOTAL
2	3



STA. 1001+00
 PROPOSED BARRIER DRAINAGE WINDOW WITH 10' TIED CONCRETE BLOCK MAT WITH TYPE 1 UNDERLAYMENT DRAINAGE AREA: 0.07 AC SPREAD (10yr): 2.92 FT SHOULDER WIDTH: 10 FT

STA. 1004+00
 PROPOSED BARRIER DRAINAGE WINDOW WITH 10' TIED CONCRETE BLOCK MAT WITH TYPE 1 UNDERLAYMENT DRAINAGE AREA: 0.07 AC SPREAD (10yr): 2.92 FT SHOULDER WIDTH: 10 FT

STA. 1007+00
 PROPOSED PROPOSED BARRIER DRAINAGE WINDOW WITH 10' TIED CONCRETE BLOCK MAT WITH TYPE 1 UNDERLAYMENT DRAINAGE AREA: 0.08 AC SPREAD (10yr): 3.51 FT SHOULDER WIDTH: 10 FT

STA. 1011+55
 PROPOSED ITEM 611 BARRIER INLET, 81" SSB 70' - 15" TYPE C @ 0.5% SLOPE DRAIN TO BARRIER INLET @ 1012+25 DRAINAGE AREA (STA 1010+60 TO STA 1011+55): 0.03 AC DRAINAGE AREA (STA 1012+55 TO STA 1011+55): 0.07 AC SPREAD (50yr): 3.16 FT PONDED SPREAD (50yr): 0.92 FT SHOULDER WIDTH: 10 FT

STA. 1012+25
 PROPOSED ITEM 611 BARRIER INLET, 81" SSB BROKEN BACK STORM SEWER SYSTEM 13' - 15" TYPE F @ 1% SLOPE 23' - 15" TYPE F @ 53.7% SLOPE 9' - 15" TYPE F @ 1% SLOPE DRAIN TO DITCH DRAINAGE AREA: 0.13 AC SPREAD (10yr): 6.06 FT SHOULDER WIDTH: 10 FT

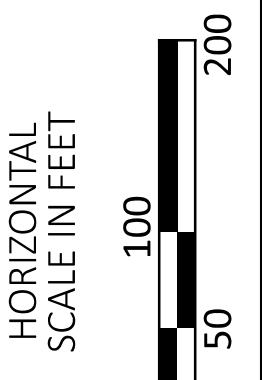
STA. 1000+00
 PROPOSED 5.5' TIED CONCRETE BLOCK MAT WITH TYPE 1 UNDERLAYMENT DRAINAGE AREA: 0.02 AC SPREAD (10yr): 1.93 FT SHOULDER WIDTH: 10 FT

STA. 1200+00
 PROPOSED 5.5' TIED CONCRETE BLOCK MAT WITH TYPE 1 UNDERLAYMENT DRAINAGE AREA: 0.44 AC SPREAD (10yr): 5.39 FT SHOULDER WIDTH: 10 FT

FEMA FLOOD ZONE AE SUGAR RUN CREEK FIRM: 39049C0204K 06/17/2008 BASE FLOOD ELEVATION: ±974

STA. 1203+50
 PROPOSED ITEM 611 BARRIER INLET, 81" SSB BROKEN BACK STORM SEWER SYSTEM 13' - 15" TYPE F @ 1% SLOPE 27' - 15" TYPE F @ 33% SLOPE 7' - 15" TYPE F @ 1% SLOPE DRAIN TO DITCH DRAINAGE AREA: 0.53 AC SPREAD (10yr): 8.59 FT SHOULDER WIDTH: 10 FT

STA. 1015+50
 PROPOSED ITEM 611 BARRIER INLET, 81" SSB 18" OF 6" TYPE C ROCK (6' OF LENGTH) 34' - 15" TYPE C @ 12.18% SLOPE DRAIN TO DITCH DRAINAGE AREA (STA 1014+40 TO STA 1015+50): 0.14 AC DRAINAGE AREA (STA 1016+50 TO STA 1015+50): 0.09 AC SPREAD (50yr): 4.61 FT PONDED SPREAD (50yr): 2.13 FT SHOULDER WIDTH: 6 FT



SCHEMATIC PLAN WITH 81" BARRIER DRAINAGE AREAS AND SPREAD CALC SUMMARIES
 STA. 2222+00.00 TO STA. 2272+00.00

DESIGN AGENCY	
ARCADIS 8101 NORTH HURST QUITE 100 COLUMBUS, OH 43235 (614) 818-4900 www.arcadis.com	
DESIGNER	
MDB	
REVIEWER	
JDH 3-27-2024	
PROJECT ID	
117607	
SHEET	TOTAL
3	3

Appendix A

Inlet Spacing Design Analysis



INLET SPACING DESIGN

PID : 117607 **Date :** 12-30-1899 **Project :** FRA-161-15.80

Location : Franklin County

Description : Wall 3 - 3007+00 to 3001+00

Designer : MDB

Rainfall Area: C

Storm Frequency (yr.) : 10

Total Allow. Spread (ft.) : 10.00

Allowable Depth (ft.) 0.33

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.)
3007+00	Begin																	
3004+00	I-2-10	300.00	0.90	0.32	5.00	2.10	10.00	0.0143	0.0416	0.0156	10.00	0.1700	5.32	1.45	0.09	1.53	0.203	4.89
3001+00	I-2-10	300.00	0.90	0.34	5.00	1.77	10.00	0.0208	0.0416	0.0156	10.00	0.1700	5.32	1.49	0.23	1.71	0.198	4.75



INLET SPACING DESIGN

PID : 117607 **Date :** 12-30-1899 **Project :** FRA-161-15.80

Location : Franklin County

Description : Wall 6 - 6008+25 to 6000+60

Designer : MDB

Rainfall Area: C

Storm Frequency (yr.) : 10

Total Allow. Spread (ft.) : 10.00

Allowable Depth (ft.) 0.33

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.)
6008+25	Begin																	
6005+60	I-2-10	265.00	0.90	0.14	5.00	5.32	10.32	0.0016	0.0416	0.0156	10.00	0.1700	5.26	0.66	0.00	0.66	0.223	5.36
6002+50	I-2-10	310.00	0.90	0.15	5.00	4.74	10.00	0.0032	0.0416	0.0156	10.00	0.1700	5.32	0.72	0.00	0.72	0.203	4.88
6001+25	I-2-10	125.00	0.90	0.06	5.00	2.53	10.00	0.0025	0.0416	0.0156	10.00	0.0000	5.32	0.31	0.00	0.31	0.154	3.71
6000+60	I-2-10	65.00	0.90	0.03	5.00	1.53	10.00	0.0025	0.0416	0.0156	10.00	0.0000	5.32	0.16	0.00	0.16	0.122	2.93



INLET SPACING DESIGN

PID : 117607 **Date :** 12-30-1899 **Project :** FRA-161-15.80

Location : Franklin County

Description : Wall 8 - 8007+00 to 7999+00

Designer : MDB

Rainfall Area: C

Storm Frequency (yr.) : 10

Total Allow. Spread (ft.) : 10.00

Allowable Depth (ft.) 0.33

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.)
8007+00	Begin																	
8004+00	I-2-10	300.00	0.90	0.23	5.00	4.75	10.00	0.0022	0.0416	0.0156	10.00	0.1700	5.32	1.10	0.00	1.10	0.256	6.15
8001+00	I-2-10	300.00	0.90	0.24	5.00	4.42	10.00	0.0025	0.0416	0.0156	10.00	0.1700	5.32	1.15	0.00	1.15	0.252	6.07
7999+00	I-2-10	200.00	0.90	0.16	5.00	3.22	10.00	0.0025	0.0416	0.0156	10.00	0.1700	5.32	0.76	0.00	0.76	0.216	5.20



INLET SPACING DESIGN

PID : 117607 **Date :** 12-30-1899 **Project :** FRA-161-15.80

Location : Franklin County

Description : Wall 10 - 1010+60 to 1000+00

Designer : MDB

Rainfall Area: C

Storm Frequency (yr.) : 10

Total Allow. Spread (ft.) : 10.00

Allowable Depth (ft.) 0.33

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.)
1010+60	Begin																	
1007+00	I-2-10	360.00	0.90	0.08	5.00	5.19	10.19	0.0056	0.0416	0.0156	10.00	0.1700	5.28	0.39	0.00	0.39	0.146	3.51
1004+00	I-2-10	300.00	0.90	0.07	5.00	3.51	10.00	0.0104	0.0416	0.0156	10.00	0.1700	5.32	0.33	0.00	0.33	0.121	2.92
1001+00	I-2-10	300.00	0.90	0.07	5.00	3.58	10.00	0.0100	0.0416	0.0156	10.00	0.0000	5.32	0.32	0.00	0.33	0.122	2.92



INLET SPACING DESIGN

PID : 116707 **Date :** 12-30-1899 **Project :** FRA-161-15.80

Location : Franklin County

Description : Wall 10 - 1010+60 to 1014+40 (50 YR Design)

Designer : MDB

Rainfall Area: C

Storm Frequency (yr.) : 50

Total Allow. Spread (ft.) : 10.00

Allowable Depth (ft.) : 0.33

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.)	
1010+60	Begin																		
1011+55	I-2-10	95.00	0.90	0.03	5.00	1.97	10.00	0.0034	0.0416	0.0156	10.00	0.1700	6.50	*****	*****	0.17	0.117	2.80	Sag
1014+40	Begin																		
1012+25	I-2-10	215.00	0.90	0.21	5.00	2.92	10.00	0.0029	0.0416	0.0156	10.00	0.1700	6.50	1.23	0.00	1.23	0.252	6.06	
1011+55	I-2-10	70.00	0.90	0.04	10.00	1.49	11.49	0.0029	0.0416	0.0156	10.00	0.1700	6.17	*****	*****	0.22	0.132	3.16	End

SUMP DATA

Total Flow (cfs) : 0.39

Ponded Depth (ft.) : 0.054

Spread on Pavement (ft.) : 0.92



INLET SPACING DESIGN

PID : 116707 **Date :** 12-30-1899 **Project :** FRA-161-15.80

Location : Franklin County

Description : Wall 10 - 1014+40 to 1016+50

Designer : MDB

Rainfall Area: C

Storm Frequency (yr.) : 50

Total Allow. Spread (ft.) : 10.00

Allowable Depth (ft.) : 0.33

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.)	
1014+40	Begin																		
1015+50	I-2-10	110.00	0.90	0.14	5.00	1.23	10.00	0.0059	0.0416	0.0156	10.00	0.1700	6.50	*****	*****	0.84	0.192	4.61	Sag
1016+50	Begin																		
1015+50	I-2-10	100.00	0.90	0.09	10.00	1.05	11.05	0.0107	0.0416	0.0156	10.00	0.1700	6.26	*****	*****	0.52	0.143	3.44	End

SUMP DATA

Total Flow (cfs) : 1.36

Ponded Depth (ft.) : 0.125

Spread on Pavement (ft.) : 2.13



INLET SPACING DESIGN

PID : 117607 **Date :** 12-30-1899 **Project :** FRA-161-15.80

Location : Franklin County

Description : Wall 12 - 1207+51 to 1200+00

Designer : MDB

Rainfall Area: C

Storm Frequency (yr.) : 10

Total Allow. Spread (ft.) : 10.00

Allowable Depth (ft.) 0.33

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.)
1207+51	Begin																	
1203+50	I-2-10	401.00	0.90	0.53	5.00	5.48	10.48	0.0019	0.0416	0.0156	10.00	0.1700	5.23	2.49	0.00	2.49	0.357	8.59
1200+00	I-2-6	350.00	0.90	0.44	5.00	2.17	10.00	0.0159	0.0416	0.0156	10.00	0.1700	5.32	1.22	0.89	2.11	0.224	5.39

Date: 03/27/2024
 Calculated By: MDB
 Checked By: JDH



MAH-680 Barrier Window - Flume Shear Stress

Inlet Station	Embankment Slope	D = Water Surface Depth (per CDSS spread calculations)	Shear Stress (L&D 1102.3.2)	Tied Concrete Block Mat Acceptable (<12 lbs/ft ²)
	ft/ft	ft	tac = 62.4DS	
Wall 3				
3001+00	0.50	0.198	6.18	✓
Wall 8				
8004+00	0.50	0.256	7.99	✓
Wall 10				
1007+00	0.50	0.146	4.56	✓
1004+00	0.50	0.121	3.78	✓
1001+00	0.50	0.122	3.81	✓
Wall 12				
1200+00	0.50	0.224	6.99	✓

Appendix B

Storm Sewer Analysis



STORM SEWER SYSTEM

PID : 117607 **Date :** **Project :** FRA-161-15.80 **Location :** Franklin County
Description : Wall 3 - 3004+00 **Designer :** MDB
Rainfall Area: C **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25
Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION		STATION	ΔAREA	ΔCA	BEGIN	RAINFALL		DISCHARGE		PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	(cfs.)	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S
		To	(acres)		(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN	'n'
R1	R2	3004+00	0.32	0.29	5.00	6.61	7.34	1.9	2.1	15	17.0	0.0100	972.23	4.13	6.02	0.0014	973.00	977.73	4.73	4.25	I Barrier
	begin	3004+00	0.32	0.29									972.06				972.98	973.56			0.015



STORM SEWER SYSTEM

PID : 117607

Date :

Project : FRA-161-15.80

Location : Franklin County

Description : Wall 6 - 6001+25 to 6000+60

Designer : MDB

Rainfall Area: C

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 15.00

Tailwater Elevation (ft.): 0.00

JUNCTION		STATION	ΔAREA	ΔCA	BEGIN	RAINFALL		DISCHARGE		PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	(cfs.)	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S
		To	(acres)		(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN	'n'
R1	R2	6001+25	0.06	0.05	5.00	6.61	7.15	0.4	0.4	15	65.0	0.0029	958.84	1.65	3.26	0.0000	959.40	963.84	4.44	3.75	I Barrier
	begin	6000+60	0.06	0.05									958.65				959.40	963.57			0.015
R2	R3	6000+60	0.03	0.03	5.66	6.40	7.11	0.5	0.6	15	23.0	0.0109	957.65	2.98	6.28	0.0001	958.18	963.57	5.39	4.67	I Barrier
	final	6000+60	0.09	0.08									957.40				958.18	958.90			0.015



STORM SEWER SYSTEM

PID : 117607 **Date :** **Project :** FRA-161-15.80 **Location :** Franklin County
Description : Wall 6 - 6002+50 **Designer :** MDB
Rainfall Area: C **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25
Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION		STATION	Δ AREA	Δ CA	BEGIN	RAINFALL		DISCHARGE		PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From To	Σ AREA (acres)	Σ CA	TIME (min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	IN / OUT (ft.)	VEL (fps.)	CAPACITY (cfs.)	SLOPE (ft./ft.)	IN / OUT (ft.)	IN / OUT (ft.)	MINUS HY GR	MINUS CROWN	MANNING'S 'n'
R1	R2	6002+50	0.15	0.14	5.00	6.61	7.32	0.9	1.0	15	27.0	0.0107	957.69	3.42	6.24	0.0003	958.23	964.02	5.79	5.08	I Barrier
	begin	6002+50	0.15	0.14									957.40				958.22	958.90			0.015



STORM SEWER SYSTEM

PID : 117607 **Date :** **Project :** FRA-161-15.80 **Location :** Franklin County
Description : Wall 6 - 6005+60 **Designer :** MDB

Rainfall Area: C **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25
Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION		STATION	ΔAREA	ΔCA	BEGIN	RAINFALL		DISCHARGE		PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	(cfs.)	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S
		To	(acres)		(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN	'n'
R1	R2	6005+60	0.14	0.13	5.00	6.61	7.30	0.8	0.9	15	37.0	0.0100	958.77	3.28	6.02	0.0003	959.22	964.81	5.59	4.79	I Barrier
	begin	6005+60	0.14	0.13									958.40				959.21	959.90			0.015



STORM SEWER SYSTEM

PID : 117607 **Date :** **Project :** FRA-161-15.80 **Location :** Franklin County
Description : Wall 8 - 7999+00 **Designer :** MDB

Rainfall Area: C **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25
Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION		STATION	ΔAREA	ΔCA	BEGIN	RAINFALL		DISCHARGE		PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	(cfs.)	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S
		To	(acres)		(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN	'n'
R1	R2	7999+00	0.16	0.14	5.00	6.61	7.32	1.0	1.1	15	30.0	0.0100	958.70	3.40	6.02	0.0004	959.24	964.18	4.94	4.23	I Barrier
	begin	7999+00	0.16	0.14									958.40				959.23	959.90			0.015



STORM SEWER SYSTEM

PID : 117607 **Date :** **Project :** FRA-161-15.80 **Location :** Franklin County
Description : Wall 8 - 8001+00 **Designer :** MDB
Rainfall Area: C **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25
Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION		STATION	Δ AREA	Δ CA	BEGIN	RAINFALL		DISCHARGE		PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From To	Σ AREA (acres)	Σ CA	TIME (min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	IN / OUT (ft.)	VEL (fps.)	CAPACITY (cfs.)	SLOPE (ft./ft.)	IN / OUT (ft.)	IN / OUT (ft.)	MINUS HY GR	MINUS CROWN	MANNING'S 'n'
R1	R2	8001+00	0.24	0.22	5.00	6.61	7.33	1.4	1.6	15	27.0	0.0100	960.27	3.81	6.02	0.0008	960.90	964.62	3.72	3.10	I Barrier
	begin	8001+00	0.24	0.22									960.00				960.87	961.50			0.015



STORM SEWER SYSTEM

PID : 117607

Date :

Project : FRA-161-15.80

Location : Franklin County

Description : Wall 10 - 1015+50

Designer : MDB

Rainfall Area: C

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 15.00

Tailwater Elevation (ft.): 0.00

JUNCTION		STATION	ΔAREA	ΔCA	BEGIN	RAINFALL			DISCHARGE		PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	(cfs.)	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S	
		To	(acres)		(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	(ft.)	HY GR	CROWN	'n'
R1	R2	1015+50	0.24	0.22	5.00	6.61	7.35	1.4	1.6	15	34.0	0.1218	984.78	9.27	21.01	0.0008	985.02	990.82	5.80	4.79	I Barrier	
	begin	1015+50	0.24	0.22									980.64				981.51	982.15			0.015	



STORM SEWER SYSTEM

PID : 117607

Date :

Project : FRA-161-15.80

Location : Franklin County

Description : Wall 12 - 1203+50

Designer : MDB

Rainfall Area: C

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 15.00

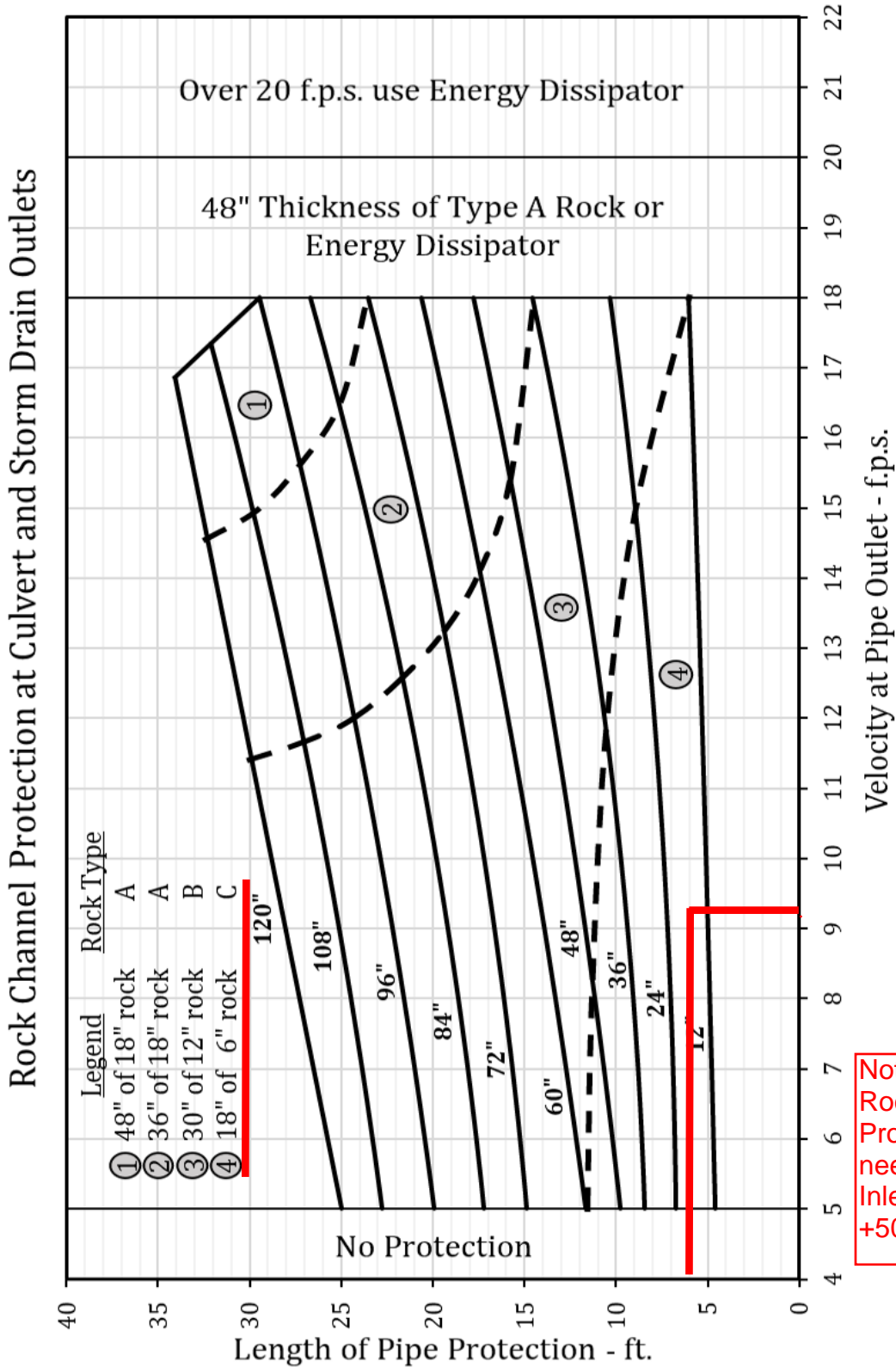
Tailwater Elevation (ft.): 0.00

JUNCTION		STATION	ΔAREA	ΔCA	BEGIN	RAINFALL		DISCHARGE		PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	(cfs.)	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S
		To	(acres)		(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN	'n'
R1	R2	1203+50	0.54	0.49	5.00	6.61	7.31	3.2	3.6	15	47.0	0.0100	981.24	4.72	6.02	0.0040	981.96	986.59	4.63	4.10	I Barrier
	begin	1203+50	0.54	0.49									980.77				981.78	982.27			0.015

ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS

1002-4

REFERENCE SECTION
1002.2.3



Note to Reviewer - Rock Channel Protection is only needed for Basin Inlet @ Sta. 1015 +50.

Appendix C

Post Construction BMP Calculation Analysis



Post Construction - Project Summary

Project Data

		Units
Project EDA	7.95	acres
Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2	No	
BMPs Required?	BMPs Required	NA
Ain (New Impervious Area in New Permanent R/W)	0	acres
Does Entire Site Drain to Large River (>100 sq. miles)?	No	
Water Quality Treatment Required	Yes	
Water Quantity Treatment Required	No	

Treatment Percent and Treatment Requirement

Aix (Project EDA that is inside the existing right-of-way)	7.95	acres
Ain (New Impervious Area in New Permanent R/W)	0	acres
T% (Treatment Percent)	20.00	%
Treatment Requirement	1.59	acres

BMPs Provided

BMP Name	BMP Type	Contributing Drainage Area (acres)	Contributing Drainage Area in ODOT R/W (acres)
VFS1	Vegetated Filter Strip	0.32	0.32
VFS2	Vegetated Filter Strip	0.19	0.19
VFS3	Vegetated Filter Strip	0.7	0.7
VFS4	Vegetated Filter Strip	0.66	0.66

Treatment Provided

Total Area with ODOT R/W Treated (acres)	1.87
Treatment Requirements (acres)	1.59
Treatment Check	Good

BMP Submittal Requirements (Per L&D, Vol. 2, Sec. 1116.2)

1. Estimated Project Earth Disturbed Area	Yes	Good
2. Treatment Percent Calculation	Yes	Good
3. BMP Selected for use	Yes	Good
4. Drainage area mapping for post-construction BMPs that show the total contributing drainage area and the amount of contributing area within ODOT right-of-way	Yes	Good
5. Plan sheets showing locations of post-construction BMP	Yes	Good
6. Calculations for each BMP	Yes	Good
7. Explanation for any area that is not treated	Yes	Good



Ohio Department of Transportation - Office of Hydraulic Engineering

Post-Construction BMP Calculation Spreadsheet

Vegetated Filter Strip

Filter Strip	Route	Begin Station	End Station	Side	Pavement Width (FT)	Filter Strip Width (FT)	Filter Strip Slope (z:1)	Filter Strip Length (FT)	Drainage Area (acres)	Filter Strip Area (SF)	Item 659 Topsoil Volume (CY)	Item 670 Erosion Protection Area (SY)
Filter Strip #1	SR 161	300+00	305+59	RT	N/A	15' Min.	3:1 Max	559	0.32	14,146	174.6	1,571.8
Filter Strip #2	SR 161	602+00	605+28	RT	N/A	24' Min.	3:1 Max	328	0.19	8,411	103.8	934.6
Filter Strip #3	SR 161	810+50	818+08	RT	N/A	23' Min.	3:1 Max	758	0.7	30,479	376.3	3,386.6
Filter Strip #4	SR 161	900+00	912+00	RT	N/A	21' Min.	3:1 Max	1,200	0.66	28,768	355.2	3,196.4
Filter Strip #5								0			0.0	0.0
Filter Strip #6								0			0.0	0.0
Filter Strip #7								0			0.0	0.0
Filter Strip #8								0			0.0	0.0
Filter Strip #9								0			0.0	0.0
Filter Strip #10								0			0.0	0.0

Total Treatment Credit Earned from Vegetated Filter Strips 1.87 acres

(Treatment is for quality only, not quantity)

BMP Design Considerations

	Answer	Design Check
1 Is the min. filter strip width 15-25 ft wide depending on L&D Table 1117-3?	Yes	Good
2 Is the slope 3:1 or flatter for 34 ft or narrower pavement drainage width	Yes	Good
3 Is the slope 6:1 or flatter for 35 - 48 ft pavement drainage width	NA	Good
4 Is the only contributing drainage to the filter strip from the road and shoulder?	Yes	Good
5 Does any concentrated flow or any outlets discharge to the filter strip?	No	Good
6 Is 4" of Item 659, Topsoil, included for the filter strip?	Yes	Good
7 Is Item 670, Slope Erosion Protection, included for the filter strip?	Yes	Good

