HUR-04-08.02

PID 118005

DRAINAGE REPORT
MARCH 15, 2024
REVISED SEPTEMBER 30, 2024
REVISED DECEMBER 1, 2025

PREPARED FOR:

OHIO DEPARTMENT OF TRANSPORTATION
DISTRICT 3
906 CLARK AVENUE
ASHLAND, OH 44805

PREPARED BY:

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CMT

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INTRODUCTION

HUR-4-8.02 will convert a rural signalized intersection to a modern roundabout. The roundabout is shifted to the northeast to minimize conflict with the existing oil line and impacts to properties. This results in minor realignment of the east and west legs and significant realignment of the north and south legs of the intersection. The project is located in Lyme Township, Huron County, Ohio. General limits of the work are from 350' west to 700' east and 800' south to 1000' north of the intersection of State Route 4 and State Route 113.

The existing intersection is a crest in all directions. The west leg drains to the west in existing roadside ditches into a system of catch basins. The north leg drains to the north in roadside ditches. The left side of the east leg sheet flows to the north eventually draining to the ditch along SR 4. The right side of the east leg drains to the east in a roadside ditch. The south leg drains to a sag point at approximately STA 419+50 where water is captured by catch basins and carried west.

The proposed drainage closely mimics the existing drainage pattern utilizing roadside ditches and new storm sewers to convey roadway and offsite drainage to existing outfalls.

DESIGN CRITERIA

Ohio Department of Transportation Location and Design Manual, Volume II (July 2025 revision) was used as the basis for design methodology. Pavement spread calculations and ditch capacity analyses were performed using CDSS software. Storm sewer design calculations were performed inside OpenRoads Designer using the built in ODOT engineering library, catalogs and rainfall curves.

Both SR 4 and SR 113 are 2-lane roads with less than 6,000 ADT; therefore, per L&D Table 1103-1 allowable spread onto the pavement is 6-feet within the curbed sections. The 50% recurrence interval is used for pavement spread per L&D Section 1103.2.

ADT is greater than 3,000 on both SR 4 and SR 113; therefore, per L&D Section 1102.3.1 ditch design utilized 10% recurrence interval for depth of flow and 20% recurrence interval for shear stress.

Storm sewers are sized to flow full for 10-year storms and the hydraulic grade line was checked for the 25-year storm. A minimum time of concentration of 10 minutes was used per L&D guidance for catch basins in pavement and 15 minutes for catch basins in ditches.

DRAINAGE DESIGN

Ditches

Adequately sized to contain the design year storm with 1' minimum freeboard from edge of pavement and fully contained within the banks. See Appendix A for ditch calculations.

Pavement Spread

Pavement spread calculations show the pavement spread within allowable for all curbed sections. Erosion protection has been shown on the plans where drainage runs out at the end of curbs. See Appendix B for spread calculations.

Storm Sewer

Existing storm sewers on the south side of the east leg carry existing drainage into the project area. Assuming the existing 6" pipe (D-21) is flowing full as it enters the site, 0.3 cfs was added to the catch basin crossing SR 4 (D-25).

Offsite drainage area was estimated using OGRIP lidar data from the OGRIP Data Downloads website. Time of concentration was estimated using sheet flow and shallow concentrated flow per L&D Volume II guidance.

See Appendix C for storm sewer calculations and associated drainage exhibit.

POST CONSTRUCTION BEST MANAGEMENT PRACTICES

The project is estimated to disturb approximately 7.53-acres. New impervious area in new permanent right of way is approximately 1.09-acres; therefore, storm BMPs that treat stormwater quality and storm water quantity are required. The total treatment required is 2.82-acres.

There are 4 treatment areas within the project limits. 2 Bioretention Cells and 2 Amended Vegetated Filter Strips.

Bioretention Cells

There are 2 Bioretention Cells in the project, BIO#1 and BIO#2. The Cells do not conflict with the bedrock as bedrock was not encountered during the geotechnical investigation. Both Bioretention Cells have the same layer thickness as can be described below:

- 30" Bioretention planting soil (See standard note W101 for soil mix)
- 3" Fine aggregate per CMS 703.20
- 3" Coarse aggregate, Size No. 78 per CMS 703.20
- 12" Coarse aggregate, Size No. 57 per CMS 703.20

A cross section of the layers can be found on the detail in the planset.

BIO#1 can be found in the SW quadrant of the project from STA 74+35 LT to 76+50 LT.
BIO#2 can be found in the NE quadrant of the project from STA 700+13 LT to 702+53 LT.

Due to elevation and outlet constraints within the project limits, the underdrain is kept at 3 feet 9 inches until the outlet where it rises to the minimum of 2 feet below the final surface elevation of the bioretention planting soil, as is allowed in section 113.5.3.11 of the L&D Vol.2. BIO#1 outlets into CB D-1, while BIO#2 outlets into the NE Ditch.

Amended Vegetated Filter Strips

There are 2 Amended Vegetated Filter Strips, AVFS1 and 2.

AVFS1 can be found on the North leg of the project, STA 40+92 RT to 43+47 RT with an average width of 28.

AVFS2 can be found on the North leg of the project, STA 34+09 LT to 38+30 LT with an average width of 17.

The proposed BMPs treat 2.89-acres within existing and proposed ODOT right of way.

See Appendix C for drainage areas and Appendix D for BMP calculations, and details for each BMP.

HUR-04-08.02

APPENDIX A: DITCH CALCULATIONS

CMT

DITCH ANALYSIS

PID : 118005 **Date :** 03/01/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description : North Leg LT **Designer :** AAA

Rainfall Area : B

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.)
33+00	34+00	R	105.00	4.00	4.00	4.00	0.0127	0.32	0.32	0.58	0.19	Seed	3.60	5	0.030	16.37	1.27	0.09	0.67	0.12	4.95
												Seed	4.05	10	0.040	16.60	1.09	0.12	0.75	0.15	5.20
34+00	35+00	R	101.00	4.00	4.00	4.00	0.0035	0.25	0.57	0.58	0.33	Seed	3.42	5	0.030	18.07	0.98	0.05	1.13	0.23	5.87
												Seed	3.82	10	0.040	18.58	0.83	0.06	1.26	0.29	6.34
35+00	36+00	R	95.00	4.00	5.00	4.00	0.0028	0.22	0.79	0.59	0.46	Seed	3.26	5	0.030	19.65	0.99	0.05	1.50	0.29	6.59
												Seed	3.63	10	0.040	20.44	0.83	0.06	1.67	0.36	7.21
36+00	37+00	R	95.00	4.00	7.00	4.00	0.0069	0.18	0.97	0.62	0.57	Seed	3.16	5	0.030	20.79	1.39	0.11	1.81	0.24	6.69
												Seed	3.51	10	0.040	21.78	1.17	0.13	2.01	0.30	7.34
37+00	38+00	R	100.00	4.00	4.00	4.00	0.0022	0.14	1.11	0.67	0.67	Seed	3.03	5	0.030	22.44	1.00	0.05	2.01	0.37	6.94
												Seed	3.34	10	0.040	23.73	0.84	0.06	2.22	0.45	7.63
38+00	38+50	R	43.00	4.00	3.00	4.00	0.0062	0.04	1.15	0.66	0.69	Seed	2.99	5	0.030	22.92	1.47	0.11	2.07	0.28	5.97
												Seed	3.29	10	0.040	24.30	1.25	0.14	2.28	0.35	6.44

DITCH ANALYSIS

PID : 118005 **Date :** 08/30/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description : North RT **Designer :** AAA

Rainfall Area : B

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.)
700+00	33+00	R	155.00	4.00	8.00	4.00	0.0340	0.77	0.77	0.67	0.52	Seed	3.90	5	0.030	16.05	2.43	0.35	2.01	0.17	5.99
												Seed	4.61	10	0.040	16.22	2.11	0.45	2.38	0.21	6.56
33+00	34+00	R	100.00	4.00	7.00	4.00	0.0098	0.49	1.26	0.57	0.80	Seed	3.82	5	0.030	16.96	1.83	0.18	3.04	0.30	7.25
												Seed	4.50	10	0.040	17.27	1.57	0.23	3.58	0.38	8.14
34+00	35+00	R	102.00	4.00	6.00	4.00	0.0097	0.84	2.10	0.50	1.22	Seed	3.75	5	0.030	17.77	2.09	0.23	4.55	0.37	7.72
												Seed	4.41	10	0.040	18.22	1.78	0.29	5.36	0.47	8.72
35+00	36+00	R	102.00	4.00	3.00	3.00	0.0099	1.29	3.39	0.40	1.73	Seed	3.69	5	0.030	18.44	2.52	0.29	6.38	0.47	6.82
												Seed	4.33	10	0.040	19.00	2.16	0.37	7.50	0.60	7.59
36+00	37+00	R	101.00	4.00	3.00	3.00	0.0069	2.69	6.08	0.40	2.81	Seed	3.63	5	0.030	19.10	2.55	0.29	10.20	0.67	8.00
												Seed	4.26	10	0.040	19.77	2.17	0.36	11.95	0.84	9.06
37+00	38+00	R	100.00	4.00	3.00	3.00	0.0072	0.44	6.52	0.40	2.98	Seed	3.58	5	0.030	19.73	2.62	0.30	10.69	0.68	8.06
												Seed	4.19	10	0.040	20.52	2.23	0.38	12.50	0.85	9.12
38+00	38+50	R	50.00	4.00	3.00	3.00	0.0062	0.14	6.66	0.46	3.05	Seed	3.56	5	0.030	20.06	2.49	0.27	10.84	0.71	8.25

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.)
												Seed	4.16	10	0.040	20.91	2.12	0.35	12.67	0.89	9.36

DITCH ANALYSIS

PID : 118005 **Date :** 03/01/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description : East Leg RT **Designer :** AAA

Rainfall Area : B

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.)
164+38	165+40	R	100.00	2.00	4.00	2.00	0.0337	1.54	1.54	0.48	0.74	Seed	3.40	5	0.030	18.28	3.20	0.58	2.51	0.28	3.66
												Jute Mat	3.39	5	0.040	18.40	2.61	0.68	2.50	0.32	3.93
												Temp. Mat	3.39	5	0.040	18.40	2.61	0.68	2.50	0.32	3.93
												Temp. Mat	3.84	10	0.040	18.37	2.71	0.73	2.84	0.35	4.07
165+40	166+40	R	100.00	2.00	3.00	2.00	0.0280	0.66	2.20	0.44	1.03	Seed	3.34	5	0.030	18.89	3.38	0.62	3.43	0.35	3.76
												Jute Mat	3.33	5	0.040	19.00	2.75	0.72	3.42	0.41	4.05
												Temp. Mat	3.33	5	0.040	19.00	2.75	0.72	3.42	0.41	4.05
												Temp. Mat	3.78	10	0.040	18.96	2.86	0.77	3.89	0.44	4.20
166+40	167+40	R	100.00	2.00	3.00	2.00	0.0157	0.67	2.87	0.42	1.31	Seed	3.27	5	0.030	19.57	2.93	0.45	4.29	0.46	4.32
												Jute Mat	3.26	5	0.040	19.70	2.38	0.53	4.27	0.54	4.69
												Temp. Mat	3.26	5	0.040	19.70	2.38	0.53	4.27	0.54	4.69
												Temp. Mat	3.71	10	0.040	19.63	2.47	0.56	4.86	0.57	4.87
167+40	168+40	R	100.00	2.00	4.00	3.00	0.0061	0.69	3.56	0.42	1.60	Seed	3.19	5	0.030	20.50	2.06	0.23	5.10	0.60	6.22

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.)
												Seed	3.62	10	0.040	20.59	1.72	0.28	5.78	0.74	7.15
168+40	168+96	R	56.00	2.00	4.00	3.00	0.0056	0.32	3.88	0.44	1.74	Seed	3.15	5	0.030	20.96	2.03	0.22	5.47	0.64	6.46
												Seed	3.56	10	0.040	21.14	1.69	0.27	6.20	0.78	7.43

DITCH ANALYSIS

PID : 118005 **Date :** 08/30/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description :RAB East LT to North RT Ending at Dike **Designer :** AAA

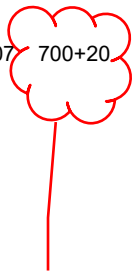
Rainfall Area : B

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+75	702+53	L	122.00	4.00	4.00	4.00	0.0026	0.29	0.29	0.72	0.21	Seed	3.77	5	0.030	17.54	0.79	0.03	0.79	0.21	5.65
Entrance to BIO #2												Seed	4.44	10	0.040	17.90	0.69	0.04	0.93	0.27	6.13
702+53	702+07	L	46.00	8.00	3.00	3.00	0.0028	0.30	0.59	0.50	0.36	Seed	3.69	5	0.030	18.47	0.82	0.03	1.32	0.19	9.13
												Seed	4.34	10	0.040	18.94	0.72	0.04	1.56	0.25	9.47
702+07	700+20	L	187.00	8.00	3.00	3.00	0.0028	0.77	1.36	0.50	0.74	Seed	3.46	5	0.030	21.38	1.05	0.05	2.57	0.28	9.67
												Seed	4.04	10	0.040	22.26	0.92	0.06	3.01	0.36	10.17



DITCH ANALYSIS

PID : 118005 **Date :** 09/10/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description :RAB East LT to North RT **Designer :** AAA

Rainfall Area : B

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+75	703+00	L	90.00	4.00	4.00	4.00	0.0151	0.29	0.29	0.72	0.21	Seed	3.90	5	0.030	16.04	1.43	0.12	0.82	0.13	5.01
												Seed	4.62	10	0.040	16.19	1.25	0.16	0.96	0.17	5.32
703+00	702+00	L	100.00	4.00	4.00	4.00	0.0021	0.17	0.46	0.50	0.29	Seed	3.72	5	0.030	18.05	0.82	0.03	1.09	0.26	6.11
												Seed	4.38	10	0.040	18.50	0.71	0.04	1.29	0.34	6.71
702+00	700+20	L	180.00	4.00	4.00	4.00	0.0020	0.22	0.68	0.50	0.40	Seed	3.45	5	0.030	21.40	0.87	0.04	1.39	0.31	6.45
												Seed	4.03	10	0.040	22.40	0.75	0.05	1.63	0.39	7.12
700+20	33+00	R	155.00	4.00	8.00	4.00	0.0340	0.77	1.45	0.67	0.92	Seed	3.39	5	0.030	22.32	2.80	0.45	3.12	0.21	6.54
												Jute Mat	3.37	5	0.040	22.52	2.29	0.52	3.10	0.25	6.96
												Temp. Mat	3.37	5	0.040	22.52	2.29	0.52	3.10	0.25	6.96
												Temp. Mat	3.94	10	0.040	23.47	2.40	0.57	3.63	0.27	7.23
33+00	34+00	R	100.00	4.00	7.00	4.00	0.0098	0.49	1.94	0.57	1.20	Seed	3.32	5	0.030	23.36	1.98	0.21	3.98	0.34	7.76
												Seed	3.86	10	0.040	24.45	1.69	0.26	4.63	0.43	8.74
34+00	35+00	R	102.00	4.00	6.00	4.00	0.0097	0.84	2.78	0.50	1.62	Seed	3.27	5	0.030	24.13	2.18	0.24	5.29	0.40	8.03

BIO#2 Dike

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.)
												Seed	3.80	10	0.040	25.36	1.86	0.31	6.15	0.51	9.07
35+00	36+00	R	102.00	4.00	3.00	3.00	0.0099	1.29	4.07	0.40	2.14	Seed	3.22	5	0.030	24.79	2.57	0.30	6.88	0.49	6.94
												Seed	3.74	10	0.040	26.13	2.20	0.38	7.98	0.62	7.72
36+00	37+00	R	101.00	4.00	3.00	3.00	0.0069	2.69	6.76	0.40	3.21	Seed	3.18	5	0.030	25.45	2.55	0.29	10.22	0.67	8.00
												Seed	3.69	10	0.040	26.91	2.17	0.36	11.83	0.84	9.03
37+00	38+00	R	100.00	4.00	3.00	3.00	0.0072	0.44	7.20	0.40	3.39	Seed	3.14	5	0.030	26.08	2.62	0.30	10.65	0.67	8.05
												Seed	3.63	10	0.040	27.65	2.22	0.38	12.31	0.85	9.08
38+00	38+50	R	50.00	4.00	3.00	3.00	0.0062	0.14	7.34	0.46	3.45	Seed	3.12	5	0.030	26.42	2.49	0.27	10.78	0.71	8.24
												Seed	3.61	10	0.040	28.05	2.11	0.34	12.45	0.89	9.31

DITCH ANALYSIS

PID : 118005 **Date :** 08/30/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description :RAB West to South LT **Designer :** AAA

Rainfall Area : B

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.)
83+89	82+86	L	103.00	4.00	19.00	3.00	0.0020	0.25	0.25	0.50	0.13	Seed	3.71	5	0.030	18.19	0.53	0.02	0.46	0.15	7.37
												Seed	4.36	10	0.040	18.69	0.46	0.02	0.55	0.19	8.25
82+86	82+58	L	28.00	10.00	16.00	3.00	0.0020	1.17	1.42	0.60	0.83	Seed	3.66	5	0.030	18.74	0.84	0.04	3.03	0.28	15.40
												Seed	4.30	10	0.040	19.33	0.73	0.05	3.56	0.36	16.91
82+58	80+91	L	167.00	10.00	5.00	2.00	0.0020	0.90	2.32	0.53	1.30	Seed	3.46	5	0.030	21.31	1.06	0.05	4.51	0.37	12.62
												Seed	4.04	10	0.040	22.26	0.93	0.06	5.27	0.48	13.39

Entrance to BIO #1

BIO#1 Dike

DITCH ANALYSIS

PID : 118005 **Date :** 03/01/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description : South Leg LT heading North **Designer :** AAA

Rainfall Area : B

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.)
416+03	417+03	L	100.00	2.00	3.00	3.00	0.0059	0.36	0.36	0.73	0.27	Seed	3.62	5	0.030	16.25	1.31	0.10	0.96	0.26	3.58
												Seed	4.06	10	0.040	16.49	1.10	0.12	1.08	0.33	3.97
417+03	418+03	L	100.00	2.00	3.00	3.00	0.0147	0.04	0.40	0.40	0.28	Seed	3.51	5	0.030	17.18	1.81	0.19	0.98	0.21	3.24
												Seed	3.93	10	0.040	17.57	1.53	0.24	1.10	0.26	3.55
418+03	419+03	L	100.00	2.00	4.00	3.00	0.0086	0.04	0.44	0.68	0.31	Seed	3.40	5	0.030	18.28	1.49	0.13	1.05	0.25	3.72
												Seed	3.79	10	0.040	18.87	1.26	0.16	1.17	0.30	4.12
419+03	419+45	L	42.00	2.00	6.00	3.00	0.0088	0.03	0.47	0.81	0.33	Seed	3.35	5	0.030	18.75	1.47	0.13	1.11	0.24	4.20
												Seed	3.73	10	0.040	19.44	1.23	0.17	1.24	0.30	4.71

DITCH ANALYSIS

PID : 118005 **Date :** 03/01/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description : South Leg LT heading South **Designer :** AAA

Rainfall Area : B

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.)
73+63	72+83	L	90.00	2.00	7.00	3.00	0.0168	0.17	0.17	0.60	0.10	Seed	3.63	5	0.030	16.13	1.28	0.12	0.37	0.11	3.13
												Seed	4.08	10	0.040	16.33	1.10	0.15	0.42	0.14	3.40

DITCH ANALYSIS

PID : 118005 **Date :** 03/01/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description : South Leg RT heading North **Designer :** AAA

Rainfall Area : B

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.)
70+00	70+50	R	61.00	2.00	4.00	3.00	0.0034	1.64	1.64	0.48	0.79	Seed	2.45	5	0.030	31.72	1.28	0.09	1.93	0.43	5.01
												Seed	2.80	10	0.040	31.87	1.08	0.11	2.20	0.53	5.70
70+50	71+50	L	101.00	2.00	5.00	3.00	0.0137	0.55	2.19	0.56	1.10	Seed	2.41	5	0.030	32.46	2.25	0.30	2.64	0.35	4.77
												Seed	2.75	10	0.040	32.75	1.89	0.37	3.01	0.43	5.43
71+50	72+50	L	90.00	2.00	4.00	3.00	0.0139	0.14	2.33	0.57	1.18	Seed	2.38	5	0.030	33.10	2.35	0.32	2.80	0.36	4.55
												Seed	2.71	10	0.040	33.51	1.98	0.39	3.19	0.45	5.15

DITCH ANALYSIS

PID : 118005 **Date :** 03/01/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description : South Leg RT heading South Up to 72+50 **Designer :** AAA

Rainfall Area : B

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.)
73+51	73+00	R	51.00	3.00	13.00	2.00	0.0058	0.06	0.06	0.78	0.05	Seed	3.60	5	0.030	16.40	0.63	0.03	0.17	0.08	4.13
												Seed	4.06	10	0.040	16.54	0.53	0.04	0.19	0.10	4.45
73+00	72+50	R	74.00	2.00	4.00	3.00	0.0139	0.10	0.16	0.79	0.13	Seed	3.50	5	0.030	17.30	1.33	0.12	0.44	0.13	2.94
												Seed	3.93	10	0.040	17.60	1.15	0.14	0.49	0.17	3.17

DITCH ANALYSIS

PID : 118005 **Date :** 03/01/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description : South Leg RT heading South Up to 73+75 **Designer :** AAA

Rainfall Area : B

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.)
74+82	74+00	R	82.00	2.00	3.00	3.00	0.0117	0.50	0.50	0.46	0.23	Seed	3.66	5	0.030	15.85	1.58	0.15	0.84	0.20	3.22
												Seed	4.12	10	0.040	16.00	1.34	0.19	0.95	0.26	3.53
74+00	73+75	R	25.00	2.00	3.00	3.00	0.0100	0.24	0.74	0.48	0.35	Seed	3.64	5	0.030	16.10	1.71	0.16	1.25	0.26	3.58
												Seed	4.09	10	0.040	16.29	1.44	0.20	1.41	0.33	3.97

HUR-04-08.02

APPENDIX B: PAVEMENT SPREAD CALCULATIONS

CMT

INLET SPACING DESIGN

PID : 118005 **Date :** 02/22/2024 **Project :** HUR-4-0802 **Location :** SR 4 / SR 113

Description :RAB East Leg, LT Side of Pavement **Designer :** AAA

Rainfall Area: B **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

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.)	
701+16	Begin																		
702+50	CB-3A	134.00	0.81	0.14	3.87	0.78	10.00	0.0300	0.0833	0.0160	2.00	0.0000	3.83	0.43	0.00	0.43	0.143	1.72	
703+75	CB-3A	125.00	0.90	0.05	5.73	0.95	10.00	0.0300	0.0833	0.0160	2.00	0.0000	3.83	******	******	0.17	0.101	1.21	End

BASIN ADDED AS PLACEHOLDER; WATER FLOWS OUT OF CURB TO SLOPE

INLET SPACING DESIGN

PID : 118005 **Date :** 02/22/2024 **Project :** HUR-4-0802 **Location :** SR 4 /SR 113

Description : RAB North Leg, Left Side of Pavement, Median **Designer :** AAA

Rainfall Area: B **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

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.)
30+03	Begin																	
30+96	CB-3A	93.00	0.90	0.04	3.19	1.34	10.00	0.0260	0.0086	0.0086	1.00	0.0400	3.83	0.11	0.03	0.14	0.041	4.78
32+86	CB-3A	190.00	0.90	0.08	10.00	1.45	11.45	0.0427	0.0350	0.0350	1.00	0.0400	3.59	0.28	0.00	0.28	0.082	2.34

INLET SPACING DESIGN

PID : 118005 **Date :** 02/22/2024 **Project :** HUR-4-0802 **Location :** SR 4 / SR 113

Description : RAB North Leg, Right Side of Pavement **Designer :** AAA

Rainfall Area: B **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

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.)
701+16	Begin																	
700+00	CB-3A	116.00	0.82	0.14	3.89	1.41	10.00	0.0055	0.0833	0.0350	2.00	0.0000	3.83	0.43	0.00	0.43	0.195	2.82

INLET SPACING DESIGN

PID : 118005 **Date :** 02/22/2024 **Project :** HUR-04-0802 **Location :** SR 4/SR 113

Description : RAB South Leg, Left Side of Pavement **Designer :** AAA

Rainfall Area: B **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

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.)	
499+43	Begin																		
502+06	CB-3A	263.00	0.90	0.32	5.73	3.14	10.00	0.0038	0.0833	0.0400	2.00	0.0000	3.83	******	******	1.10	0.287	5.02	End

BASIN ADDED AS PLACEHOLDER; WATER FLOWS OUT OF CURB TO SLOPE

INLET SPACING DESIGN

PID : 118005 **Date :** 02/22/2024 **Project :** HUR-04-0802 **Location :** SR 4 /SR 113

Description : RAB South Leg, NB Lane, RT side **Designer :** AAA

Rainfall Area: B **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.42

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.)
77+00	Begin																	
(RT) 75+40	CB-3A	103.00	0.50	0.57	11.06	2.42	13.48	0.0053	0.0833	0.0010	2.00	0.0000	3.31	0.54	0.40	0.94	0.205	40.82
(LT) 75+40	CB-3A	160.00	0.90	0.07	1.84	0.86	10.00	0.0570	0.0342	0.0342	1.00	0.0400	3.83	0.58	0.06	0.63	0.105	3.06

PAVEMENT IS IN SUPERELEVATION; WATER EXCEEDING GUTTER WILL FLOW TO LT SIDE

BYPASSED FLOW GOES TO LT SIDE BASIN

PAVEMENT IS IN SUPERELEVATION; WATER EXCEEDING GUTTER WILL FLOW TO LT SIDE

INLET SPACING DESIGN

PID : 118005 **Date :** 02/22/2024 **Project :** HUR-04-0802 **Location :** SR 4 /SR 113

Description : RAB South Leg, Right Side of Pavement, draining north to East Leg RT **Designer :** AAA

Rainfall Area: B **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.42

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.)
77+00	Begin																	
802+00	CB-3A	254.00	0.70	0.46	10.05	1.44	11.49	0.0275	0.0833	0.0160	2.00	0.0000	3.59	1.07	0.08	1.15	0.206	4.44

INLET SPACING DESIGN

PID : 118005 **Date :** 02/22/2024 **Project :** HUR-40802 **Location :** SR 4 /SR 113

Description :RAB West Leg, Left Side of Pavement and North Leg LT **Designer :** AAA

Rainfall Area: B **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

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.)
600+24	Begin																	
601+70	CB-3A	146.00	0.72	0.23	10.00	1.13	11.14	0.0148	0.0833	0.0200	2.00	0.0000	3.64	0.60	0.00	0.60	0.184	2.87
603+10	CB-3A	140.00	0.80	0.07	10.00	1.21	11.21	0.0213	0.0833	0.0833	2.00	0.0000	3.63	0.20	0.00	0.20	0.115	1.38

INLET SPACING DESIGN

PID : 118005 **Date :** 02/22/2024 **Project :** HUR-40802 **Location :** SR 4 /SR 113

Description :RAB West Leg, Left Side of Pavement **Designer :** AAA

Rainfall Area: B **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

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.)
600+24	Begin																	
158+90	CB-3A	239.00	0.62	0.26	7.40	2.12	10.00	0.0113	0.0833	0.0160	2.00	0.0000	3.83	0.61	0.01	0.62	0.195	3.74

BASIN ADDED AS PLACEHOLDER; WATER FLOWS OUT OF CURB TO SLOPE

INLET SPACING DESIGN

PID : 118005 **Date :** 02/22/2024 **Project :** HUR-04-0802 **Location :** SR 4 /SR 113

Description :RAB West Leg, Right Side of Pavement **Designer :** AAA

Rainfall Area: B **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

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.)
12+10	Begin																	
11+18	CB-3A	92.00	0.90	0.05	2.12	1.52	10.00	0.0140	0.0090	0.0090	1.00	0.0400	3.83	0.14	0.05	0.19	0.052	5.79
158+95	CB-3A	244.00	0.90	0.07	2.22	2.29	10.00	0.0117	0.0833	0.0160	2.00	0.0000	3.83	0.28	0.00	0.28	0.145	1.74

CB in pavement gore area

Bypass flow follows cross slope transition and flows into gutter on RT

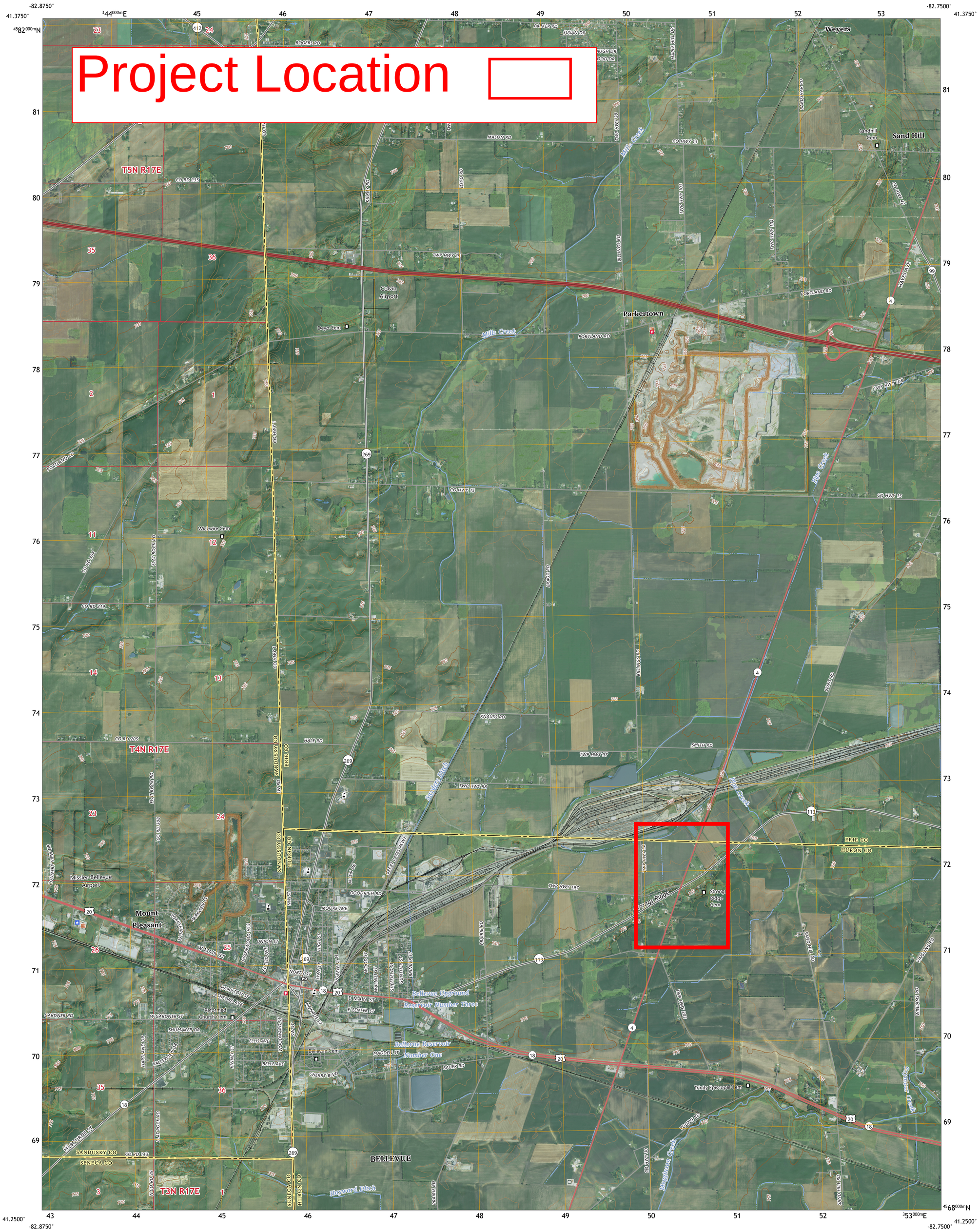
HUR-04-08.02

APPENDIX C: STORM SEWER CALCULATIONS

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

BELLEVUE QUADRANGLE
OHIO
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 17T

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery	NAIP,	July 2017 - December 2017
Roads	U.S. Census Bureau,	2016
Names	GNIS,	1979 - 2023
Hydrography	National Hydrography Dataset,	2006 - 2019
Contours	National Elevation Dataset,	2010
Boundaries	Multiple sources; see metadata file	2021 - 2022
Public Land Survey System	BLM,	2017
Wetlands	FWS National Wetlands Inventory	2004 - 2007

MN
GN
7°32'
134 MILS
1°12
21 MILS
UTM GRID AND 2023 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
LF
Grid Zone Designation
17T

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 5 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

QUADRANGLE LOCATION

ADJOINING QUADRANGLES

1 Vickery
2 Castalia
3 Sandusky
4 Clyde
5 Kimball
6 Fireside
7 Flat Rock
8 Monroeville

ROAD CLASSIFICATION

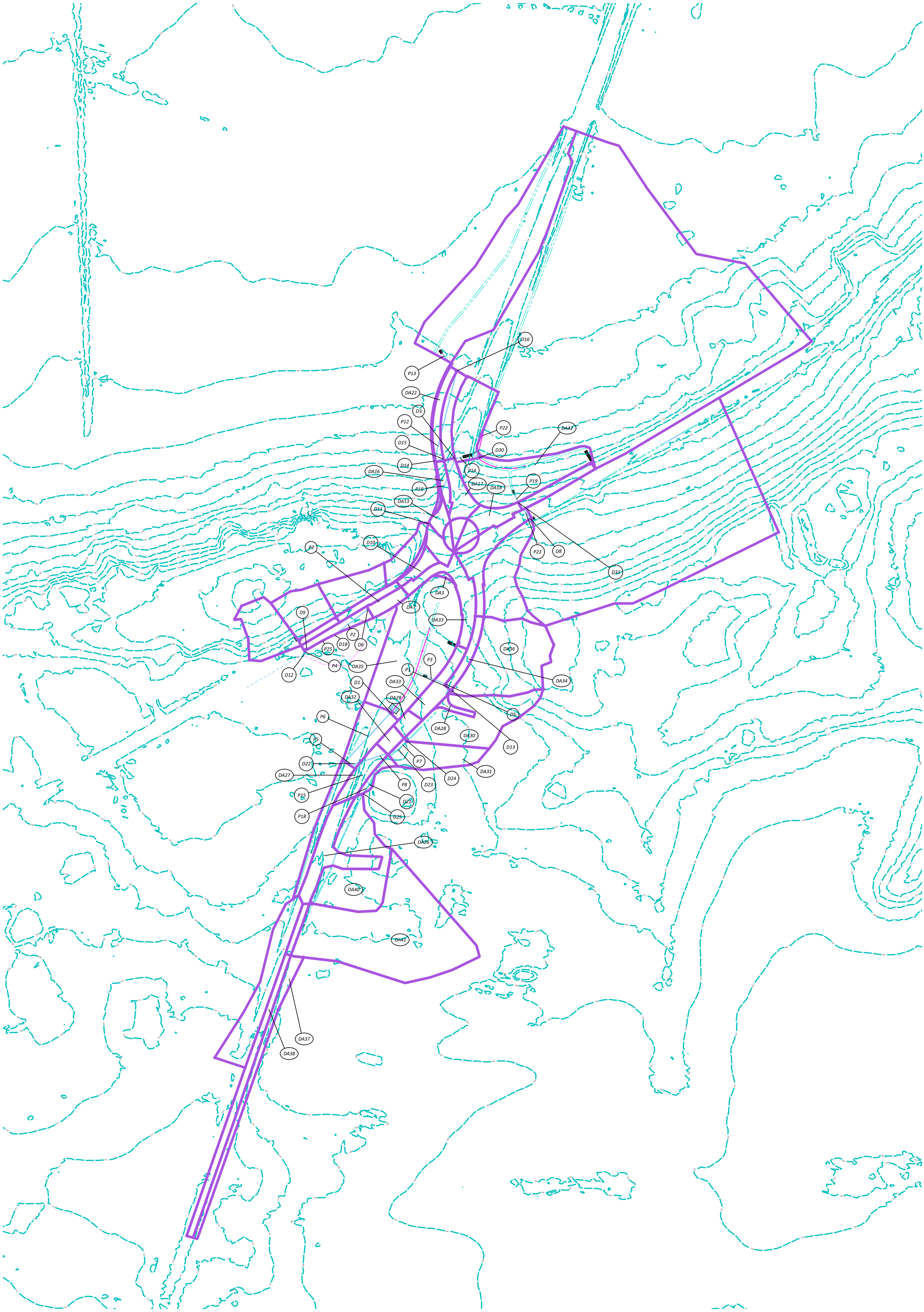
Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD
Interstate Route	US Route
State Route	

BELLEVUE, OH
2023

NSN 7643016387412
NGA REF NO.USGSX24K3201

HUR-04-08.02

MODEL: Drainage Exhibit PAPERSIZE: 34x22 (in.) DATE: 11/26/2025 TIME: 9:45:23 AM PLTDRV: OHDOT_PDF_Color.pltcfg PENTBL: OHDOT_PenC.tbl USER: WORKSPACE: OHDOT WORKSET: 118005_23005607-00_HUR40802 PRODUCT: OpenRoadsDesigner 10.12.03.2
L:\ODOT\23005607-00_HUR40802\118005\400-Engineering\Drainage\Engdata\Drainage Exhibit.dgn



SHEET P.1 / TOTAL 1	PROJECT ID 118005	REVIEWER JWB 3-15-2024	DESIGNER AAA	CMT CRAWFORD, MURPHY & TILLY, INC. 6060 ROCKSIDE WOODS BOULEVARD NORTH SUITE 321 INDEPENDENCE, OHIO 44131 PH (440)462-4020 www.cmtengr.com	DESIGN AGENCY

DRAINAGE EXHIBIT

HORIZONTAL SCALE IN FEET

0 50

25 100

FlexTable: Catchment Table

ID	Label	Outflow Element	Runoff Coefficient (Rational)	Flow (Total Out) (cfs)	Catchment CA (acres)	Time of Concentration (min)	Scaled Area (acres)	Catchment Flow Time (min)	Is Active?
939	Unnamed1	D-8	0.900	0.73	0.14	10.00	0.16	10.00	True
773	Unnamed2	D-13	0.500	1.45	0.28	10.00	0.57	10.00	True
791	Unnamed6	D-9	0.900	0.31	0.06	10.00	0.07	10.00	True
792	Unnamed7	D-6	0.900	0.25	0.05	10.00	0.05	10.00	True
794	Unnamed9	D-11	0.500	0.27	0.05	10.00	0.10	10.00	True
795	Unnamed10	D-11	0.900	0.24	0.05	10.00	0.05	10.00	True
796	Unnamed11	D-11	0.900	0.07	0.01	10.00	0.01	10.00	True
797	Unnamed12	D-11	0.900	0.27	0.05	10.00	0.06	10.00	True
798	Unnamed13	D-14	0.900	0.19	0.04	10.00	0.04	10.00	True
799	Unnamed14	D-14	0.900	0.04	0.01	10.00	0.01	10.00	True
800	Unnamed15	D-14	0.900	0.02	0.00	10.00	0.00	10.00	True
801	Unnamed16	D-15	0.900	0.19	0.04	10.00	0.04	10.00	True
802	Unnamed17	D-3	0.900	0.50	0.10	10.00	0.11	10.00	True
803	Unnamed18	D-31	0.900	0.40	0.08	10.00	0.09	10.00	True
804	Unnamed19	D-14	0.500	0.05	0.01	10.00	0.02	10.00	True
805	Unnamed20	D-3	0.500	0.07	0.01	10.00	0.03	10.00	True
806	Unnamed21	D-31	0.500	0.08	0.02	10.00	0.03	10.00	True
807	Unnamed22	D-16	0.900	0.36	0.07	10.00	0.08	10.00	True
910	Unnamed26	D-25	0.900	1.08	0.21	10.00	0.23	10.00	True
871	Unnamed27	D-21		0.32	0.06	10.00	0.14	10.00	True
872	Unnamed28	D-24	0.900	0.11	0.02	10.00	0.02	10.00	True
873	Unnamed29	D-24	0.900	0.18	0.04	10.00	0.04	10.00	True
874	Unnamed30	D-24	0.400	0.91	0.18	10.00	0.44	10.00	True
875	Unnamed31	D-23	0.400	0.42	0.08	10.00	0.20	10.00	True
876	Unnamed32	D-23	0.900	0.18	0.04	10.00	0.04	10.00	True
877	Unnamed33	D-1	0.900	1.43	0.28	10.00	0.31	10.00	True
940	Unnamed34	D-8	0.900	0.08	0.01	10.00	0.02	10.00	True
879	Unnamed35	D-1	0.500	2.06	0.40	10.00	0.80	10.00	True
880	Unnamed36	D-1	0.500	1.45	0.28	10.00	0.57	10.00	True
899	Unnamed37	D-25	0.500	0.23	0.08	33.51	0.17	33.51	True
900	Unnamed38	D-25	0.900	0.48	0.18	33.51	0.20	33.51	True
911	Unnamed39	D-25	0.900	0.15	0.03	10.00	0.03	10.00	True
912	Unnamed40	D-25	0.400	0.99	0.19	10.00	0.48	10.00	True
913	Unnamed41	D-25	0.400	2.48	0.49	10.00	1.21	10.00	True
936	Unnamed43	D-5	0.900	0.44	0.09	10.00	0.10	10.00	True
955	Unnamed44	D-12	0.400	0.00	0.00	10.00	0.18	10.00	True

HUR-04-08.02

Storm Sewer Design Report, 10-year Storm

PID 118005

Date 12/1/2025

Label	-Node- Upstream Downstream	Start Station	Stop Station	Upstream Inlet Area (acres)	System Drainage Area (acres)	Upstream Inlet C	System CA (acres)	Upstream Inlet Tc (min)	System Flow Time (min)	System Intensity (in/h)	Flow (cfs)	Diameter (in)	Length (Unified) (ft)	Slope (Calculated) (%)	-Invert (Conduit)- Upstream Downstream (ft)	Manning's n	Velocity (ft/s)	Capacity (Design) (cfs)	Flow / Capacity (Design) (%)	-Ground- Upstream Downstream (ft)	Cover (Start) (ft)	Notes
P-2	D-6 D-18	160+47.00 160+47.00	159+60.00 159+60.00	0.05	0.05	0.9	0.05	10	10	5.08	0.25	15	88	1.54%	762.85 761.5	0.013	2.95	8.62	2.9	766.56 765.25	2.27	TYPE B
P-25	D-18 D-9	159+60.00 159+60.00	158+95.00 158+95.00	(N/A)	0.05	(N/A)	0.05	0	10.5	4.98	0.24	15	65	0.15%	761.5 761.4	0.013	1.3	2.72	8.9	765.25 764.16	2.3	TYPE B
P-4	D-9 D-12	158+95.00 158+95.00	158+86.29 158+86.29	0.07	0.12	0.9	0.09	10	11.33	4.83	0.44	12	10	0.41%	761.4 761.36	0.013	2.25	2.45	18.1	764.16 763.5	1.59	TYPE B
P-23	D-8 D-31	164+35.97 164+35.97	164+31.07 164+31.07	0.18	0.18	0.9	0.11	10	10	5.08	0.55	15	41	0.94%	759.49 759.1	0.013	3.14	6.28	8.7	762.99 763.31	2.06	TYPE B
P-19	D-31 D-32	164+31.07 164+31.07	164+33.00 164+33.00	0.12	0.3	0.789	0.17	10	10.22	5.03	0.85	15	21	2.67%	759 758.45	0.013	5.16	11.35	7.5	763.31 758.45	2.86	TYPE C
P-7	D-24 D-23	420+29.60 420+29.60	420+07.16 420+07.16	0.51	0.51	0.463	0.14	10	10	5.08	0.73	12	25	0.99%	759.5 759.25	0.013	3.55	3.55	20.4	762.42 762.15	1.75	TYPE C
P-8	D-23 D-22	420+07.16 420+07.16	419+47.00 419+47.00	0.24	0.75	0.48	0.26	10	10.12	5.05	1.32	15	98	0.31%	759 758.7	0.013	2.69	3.85	34.3	762.15 765.02	1.71	TYPE B
P-18	D-25 D-21	418+95.63 418+95.63	419+18.33 419+18.33	2.33	2.33	0.507	1.18	33.51	33.51	2.71	3.23	15	24	0.42%	759 758.9	0.013	3.78	4.53	71.2	761.26 761.75	0.82	TYPE C
P-15	D-21 D-22	419+18.33 419+18.33	419+47.00 419+47.00	0.14	2.46	0	1.22	10	33.61	2.71	3.34	15	52	0.38%	758.9 758.7	0.013	3.64	4.3	77.6	761.75 765.02	1.4	TYPE B
P-5	D-22 D-7	419+47.00 419+47.00	419+46.81 419+46.81	(N/A)	3.22	(N/A)	1.48	0	33.85	2.69	4.02	15	19	0.75%	758.7 758.56	0.013	4.96	6.01	66.9	765.02 761.71	4.87	TYPE C
P-6	D-1 D-7	420+76.44 420+76.44	419+46.81 419+46.81	1.68	1.68	0.574	0.97	10	10	5.08	4.94	15	141	0.67%	759.6 758.65	0.013	4.91	5.7	86.7	761.8 761.71	0.76	TYPE B
P-24	D-7 D-19	419+46.81 419+46.81	419+46.73 419+46.73	(N/A)	4.9	(N/A)	2.45	0	33.92	2.69	6.64	15	5	0.74%	758.56 758.52	0.013	5.41	5.98	111	761.71 758.27	1.71	TYPE C SYSTEM OUTLET
P-11	D-14 D-15	426+00.62 426+00.62	426+11.00 426+11.00	0.04	0.04	0.9	0.03	10	10	5.08	0.15	15	19	-2.67%	758 758.5	0.013	3.1	11.36	1.3	763.05 762.83	3.61	TYPE B
P-12	D-14 D-16	426+00.62 426+00.62	427+92.23 427+92.23	0.07	0.11	0.796	0.07	10	10.1	5.06	0.37	15	193	4.15%	758 750	0.013	4.68	14.16	2.6	763.05 753.9	3.61	TYPE B
P-13	D-16 D-20	427+92.23 427+92.23	428+17.78 428+17.78	0.08	0.19	0.9	0.12	10	10.79	4.93	0.61	15	49	6.21%	750 746.95	0.015	5.68	15	4.1	753.9 746.95	2.46	TYPE B OUTFALL
P-10	D-11 D-3	424+73.26 424+73.26	426+19.01 426+19.01	0.23	0.23	0.717	0.09	10	10	5.08	0.46	15	146	1.89%	760.75 758	0.013	3.82	9.55	4.9	765.86 761.96	3.67	TYPE B
P-14	D-3 D-4	426+19.01 426+19.01	426+28.79 426+28.79	0.14	0.37	0.815	0.16	10	10.64	4.95	0.81	15	18	4.15%	758 757.26	0.013	5.95	14.16	5.7	761.96 757.26	2.52	TYPE C SYSTEM OUTLET
P-1	D-13 D-5	421+60.42 421+60.42	421+67.83 421+67.83	0.57	0.57	0.5	0.14	10	10	5.08	0.7	12	18	4.34%	763 762.2	0.013	5.94	7.98	8.8	765.63 765.16	1.46	TYPE B
P-3	D-5 D-17	421+67.83 421+67.83	421+70.16 421+70.16	0.1	0.66	0.9	0.19	10	10.05	5.07	0.99	12	42	0.24%	762.2 762.1	0.013	2.29	1.88	52.3	765.16 763.33	1.79	TYPE B SEE NOTE 1

NOTE 1: Lack of available cover to increase pipe size. Lack of available fall to outlet to increase slope. Proposed 12" pipe diameter meets capacity requirements.

CMT

HUR-04-08.02

Storm Sewer HGL Check, 25-year Storm

PID 118005

Date 12/1/2025

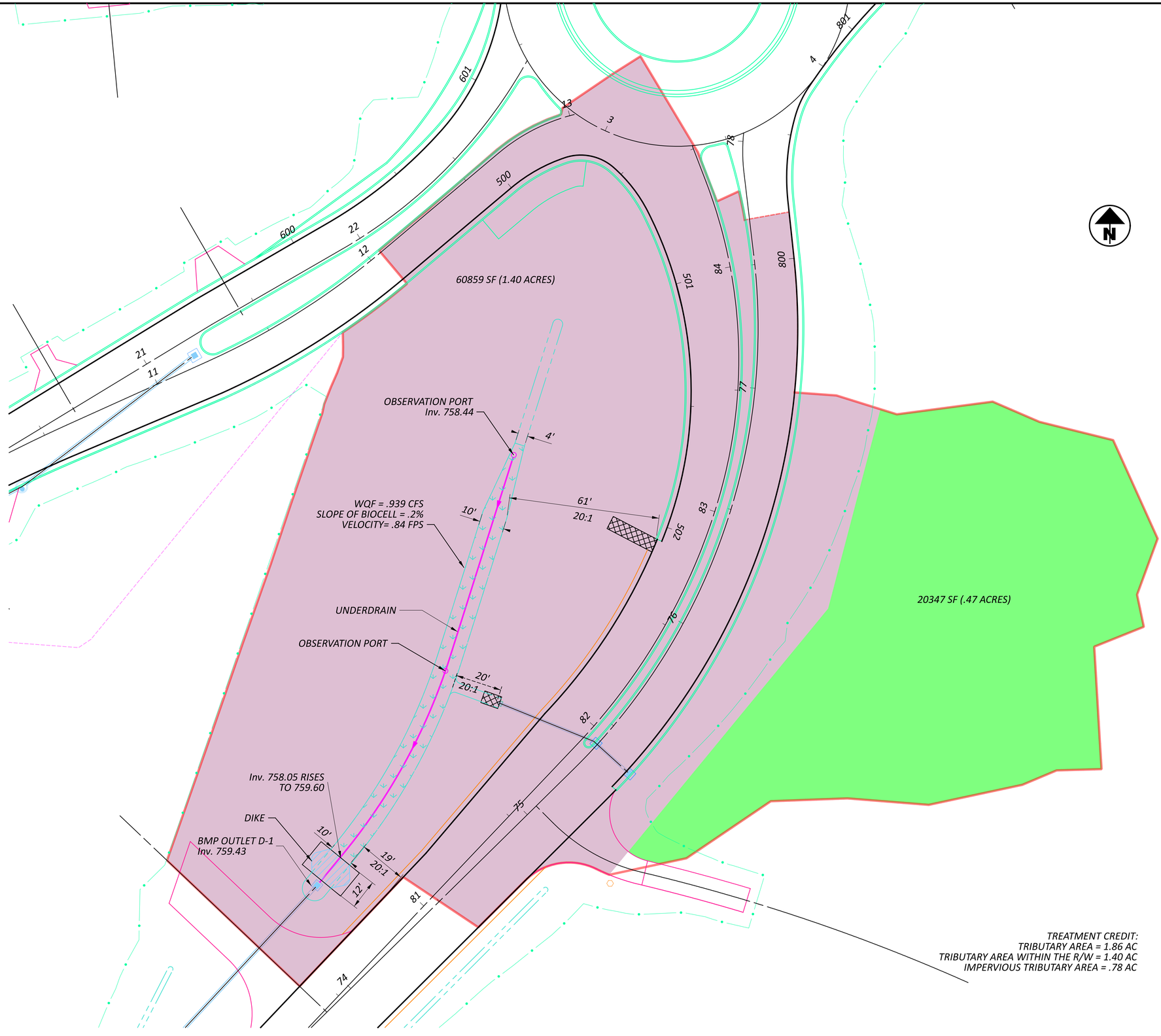
Label	-Node- Upstream Downstream	Start Station	Stop Station	Upstream Inlet Area (acres)	System Drainage Area (acres)	Upstream Inlet C	System CA (acres)	Upstream Inlet Tc (min)	System Flow Time (min)	System Intensity (in/h)	Flow (cfs)	Diameter (in)	Length (Unified) (ft)	Slope (Calculated) (%)	-Invert (Conduit)- Upstream Downstream (ft)	Manning's n	Friction Slope (ft/ft)	-HGL- Upstream Downstream (ft)	-Ground- Upstream Downstream (ft)	Ground Minus HGL (Start) (ft)	Cover (Start) (ft)	Notes
P-2	D-6 D-18	160+47.00 160+47.00	159+60.00 159+60.00	0.05	0.05	0.9	0.05	10	10	5.08	0.25	15	88	1.54%	762.85 761.5	0.013	0.0138	763.04 761.89	766.56 765.25	3.52	2.27	TYPE B
P-25	D-18 D-9	159+60.00 159+60.00	158+95.00 158+95.00	(N/A)	0.05	(N/A)	0.05	0	10.5	4.98	0.24	15	65	0.15%	761.5 761.4	0.013	0.0002	761.89 761.88	765.25 764.16	3.36	2.3	TYPE B
P-4	D-9 D-12	158+95.00 158+95.00	158+86.29 158+86.29	0.07	0.12	0.9	0.09	10	11.33	4.83	0.44	12	10	0.41%	761.4 761.36	0.013	0.0007	761.88 761.87	764.16 763.5	2.29	1.59	TYPE B
P-23	D-8 D-31	164+35.97 164+35.97	164+31.07 164+31.07	0.18	0.18	0.9	0.11	10	10	5.08	0.55	15	41	0.94%	759.49 759.1	0.013	0.0091	759.78 759.35	762.99 763.31	3.21	2.06	TYPE B
P-19	D-31 D-32	164+31.07 164+31.07	164+33.00 164+33.00	0.12	0.3	0.789	0.17	10	10.22	5.03	0.85	15	21	2.67%	759 758.45	0.013	0.0192	759.36 758.69	763.31 758.45	3.94	2.86	TYPE C
P-7	D-24 D-23	420+29.60 420+29.60	420+07.16 420+07.16	0.51	0.51	0.463	0.14	10	10	5.08	0.73	12	25	0.99%	759.5 759.25	0.013	0.0017	759.87 759.92	762.42 762.15	2.55	1.75	TYPE C
P-8	D-23 D-22	420+07.16 420+07.16	419+47.00 419+47.00	0.24	0.75	0.48	0.26	10	10.12	5.05	1.32	15	98	0.31%	759 758.7	0.013	0.0004	759.92 759.89	762.15 765.02	2.23	1.71	TYPE B
P-18	D-25 D-21	418+95.63 418+95.63	419+18.33 419+18.33	2.33	2.33	0.507	1.18	33.51	33.51	2.71	3.23	15	24	0.42%	759 758.9	0.013	0.0023	760.04 760	761.26 761.75	1.22	0.82	TYPE C
P-15	D-21 D-22	419+18.33 419+18.33	419+47.00 419+47.00	0.14	2.46	0	1.22	10	33.61	2.71	3.34	15	52	0.38%	758.9 758.7	0.013	0.0023	760 759.89	761.75 765.02	1.75	1.4	TYPE B
P-5	D-22 D-7	419+47.00 419+47.00	419+46.81 419+46.81	(N/A)	3.22	(N/A)	1.48	0	33.85	2.69	4.02	15	19	0.75%	758.7 758.56	0.013	0.0037	759.89 759.83	765.02 761.71	5.13	4.87	TYPE C
P-6	D-1 D-7	420+76.44 420+76.44	419+46.81 419+46.81	1.68	1.68	0.574	0.97	10	10	5.08	4.94	15	141	0.67%	759.6 758.65	0.013	0.0059	760.56 759.83	761.8 761.71	1.25	0.76	TYPE B
P-24	D-7 D-19	419+46.81 419+46.81	419+46.73 419+46.73	(N/A)	4.9	(N/A)	2.45	0	33.92	2.69	6.64	15	5	0.74%	758.56 758.52	0.013	0.0106	759.83 759.77	761.71 758.27	1.89	1.71	TYPE C SYSTEM OUTLET
P-11	D-14 D-15	426+00.62 426+00.62	426+11.00 426+11.00	0.04	0.04	0.9	0.03	10	10	5.08	0.15	15	19	-2.67%	758 758.5	0.013	0.0242	758.65 758.23	763.05 762.83	4.4	3.61	TYPE B
P-12	D-14 D-16	426+00.62 426+00.62	427+92.23 427+92.23	0.07	0.11	0.796	0.07	10	10.1	5.06	0.37	15	193	4.15%	758 750	0.013	0.0414	758.23 750.3	763.05 753.9	4.82	3.61	TYPE B
P-13	D-16 D-20	427+92.23 427+92.23	428+17.78 428+17.78	0.08	0.19	0.9	0.12	10	10.79	4.93	0.61	15	49	6.21%	750 746.95	0.015	0.0566	750.3 747.13	753.9 746.95	3.6	2.46	TYPE B OUTFALL
P-10	D-11 D-3	424+73.26 424+73.26	426+19.01 426+19.01	0.23	0.23	0.717	0.09	10	10	5.08	0.46	15	146	1.89%	760.75 758	0.013	0.0186	761.01 758.35	765.86 761.96	4.85	3.67	TYPE B
P-14	D-3 D-4	426+19.01 426+19.01	426+28.79 426+28.79	0.14	0.37	0.815	0.16	10	10.64	4.95	0.81	15	18	4.15%	758 757.26	0.013	0.027	758.35 757.48	761.96 757.26	3.61	2.52	TYPE C SYSTEM OUTLET
P-1	D-13 D-5	421+60.42 421+60.42	421+67.83 421+67.83	0.57	0.57	0.5	0.14	10	10	5.08	0.7	12	18	4.34%	763 762.2	0.013	0.0386	763.35 762.72	765.63 765.16	2.28	1.46	TYPE B
P-3	D-5 D-17	421+67.83 421+67.83	421+70.16 421+70.16	0.1	0.66	0.9	0.19	10	10.05	5.07	0.99	12	42	0.24%	762.2 762.1	0.013	0.0032	762.72 762.52	765.16 763.33	2.44	1.79	TYPE B SEE NOTE 1

NOTE 1: Lack of available cover to increase pipe size. Lack of available fall to outlet to increase slope. Proposed 12" pipe diameter meets capacity requirements.

HUR-04-08.02

APPENDIX D: POST CONSTRUCTION STORMWATER BMP CALCULATIONS

CMT



LEGEND

TRIBUTARY AREA

AREA IN ROW

AREA OUTSIDE ROW

HORIZONTAL SCALE IN FEET

0 10 20 40

BIO#1
BMP EXHIBIT

DESIGN AGENCY

CMT
CRAWFORD, MURPHY & TILLY, INC.
8501 ROCKSIDE WOODS
SUITE 201
BLUE ASH, OHIO 44151
PH (440) 482-4020
www.crawfordmurphy.com

DESIGNER: AAA

REVIEWER: JWB 09-07-24

PROJECT ID: 118005

SHEET: P.0 TOTAL: 0

HUR-04-08.02

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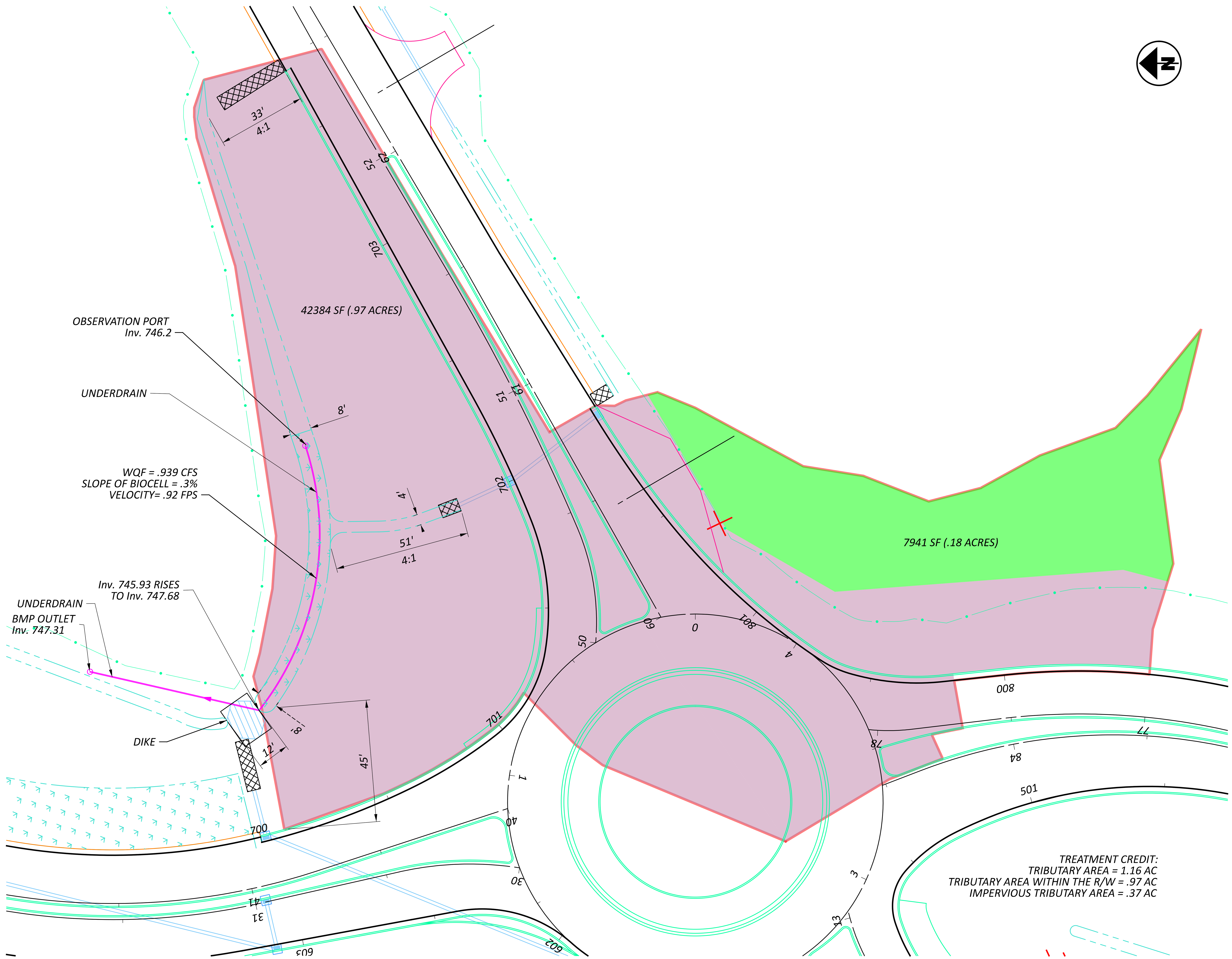
HUR-04-08.02

BIO#2
BMP EXHIBIT

HORIZONTAL SCALE IN FEET
0 10 20 40



LEGEND

(red line)	TRIBUTARY AREA
(purple area)	AREA IN ROW
(green area)	AREA OUTSIDE ROW

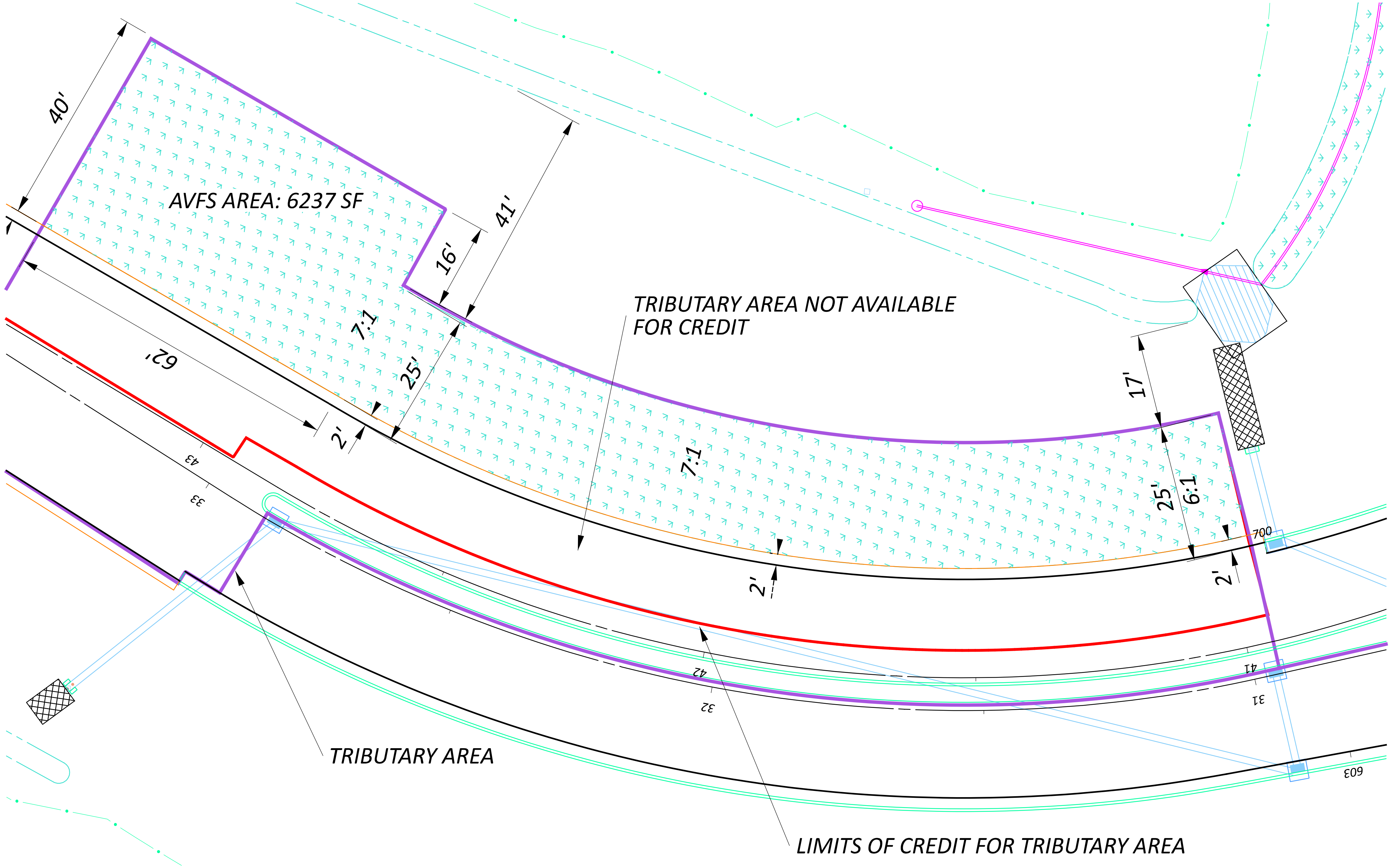
DESIGN AGENCY
CMT CRAWFORD, MURPHY & TILLY, INC.

DESIGNER
AAA

REVIEWER
JWB 09-17-24

PROJECT ID
118005

SHEET P.0 TOTAL 0



LEGEND

- TRIBUTARY AREA (45% TREATMENT CREDIT)
- AMENDED VEGETATED FILTER STRIP AREA (100% TREATMENT CREDIT)
- DRAINAGE AREA

TREATMENT CREDIT:

AVFS AREA = 6237 SF X 100% CREDIT = 6237 SF (.14 AC)

TRIBUTARY AREA = 7249 SF (.17 AC)

TRIBUTARY AREA AVAILABLE FOR CREDIT = 7249 SF X 45% CREDIT = 3262.05 SF (.07 AC)

TOTAL TREATMENT CREDIT = 9499.05 (.22 AC)

HORIZONTAL SCALE IN FEET

0 5 10 20

AVFS1

BMP EXHIBIT

DESIGN AGENCY

CMT CRAWFORD, MURPHY & TILLY, INC.

DESIGNER AAA

REVIEWER JWB 09-17-24

PROJECT ID 118005

SHEET P.0 TOTAL 0

HUR-04-08.02

MODEL: AVF1 - AVFS1 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 11/26/2025 TIME: 9:45:30 AM PLTDRV: OHDOT_PDF_Color.pltcfg PENTBL: OHDOT_PenC.tbl USER: WORKSPACE: OHDOT WORKSET: 118005_23005607-00_HUR40802 PRODUCT: OpenRoadsDesigner 10.12.03.2
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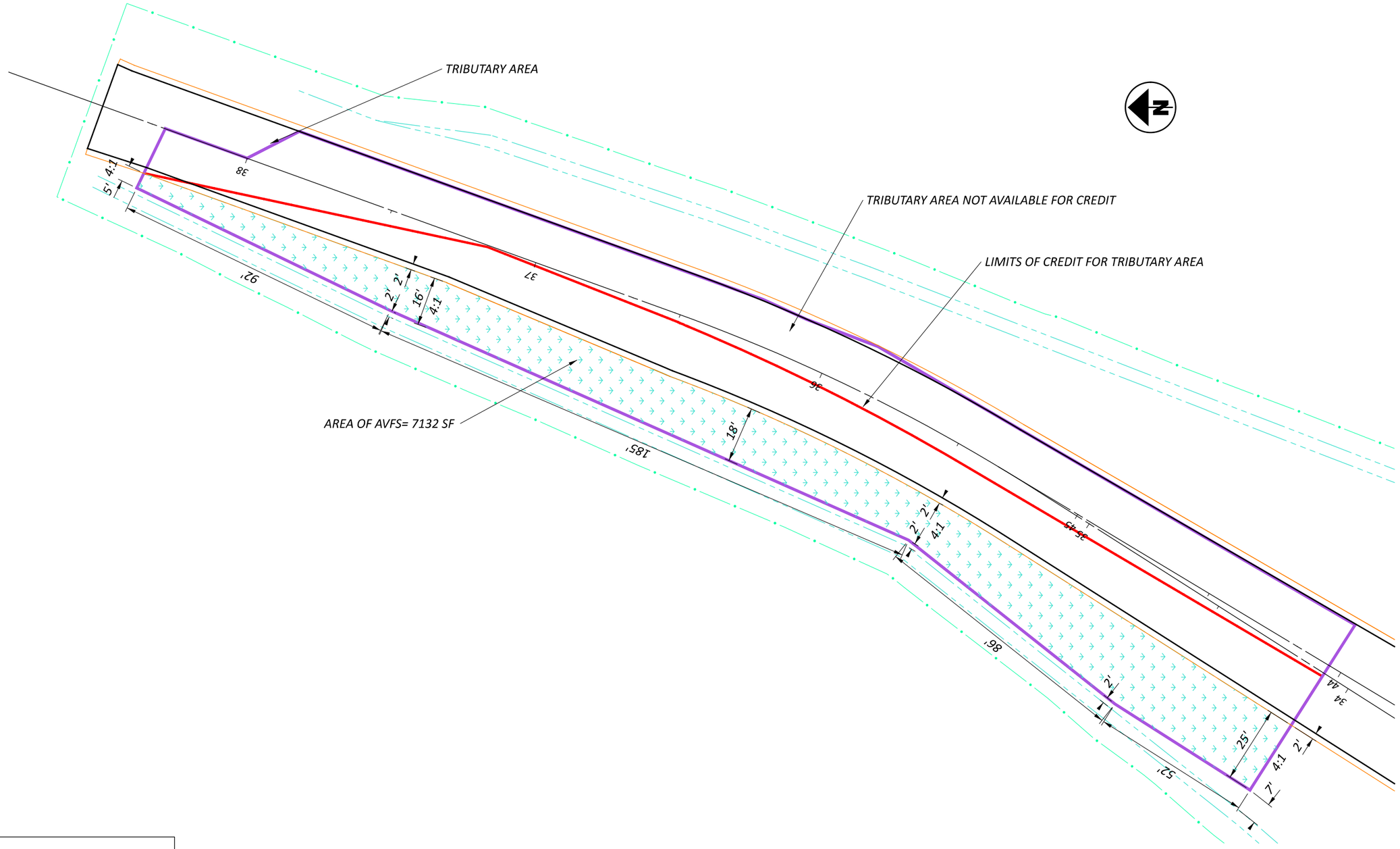

HORIZONTAL SCALE IN FEET
0 10 20 40

N

LEGEND

- TRIBUTARY AREA (45% TREATMENT CREDIT)
- AMENDED VEGETATED FILTER STRIP AREA (100% TREATMENT CREDIT)
- DRAINAGE AREA

TREATMENT CREDIT:
AVFS AREA = 7132 SF X 100% CREDIT = 7132 SF (.16 AC)

TRIBUTARY AREA = 13494 SF (.31 AC)
TRIBUTARY AREA AVAILABLE FOR CREDIT = 13494 SF X 45% CREDIT = 6072.30 SF (.14 AC)

TOTAL TREATMENT CREDIT = 13204.30 (.30 AC)

AVFS2
BMP EXHIBIT

DESIGN AGENCY
CMT
RAY WOOD, MURPHY & TULLAR, INC.
8160 ROCKSIDE WOODS BLVD. SOUTH
SUITE 320
CLEVELAND, OHIO 44131
PH (440)526-4620
www.cmtengr.com

DESIGNER: AAA
REVIEWER: JWB 09-17-24
PROJECT ID: 118005
SHEET: P.0
TOTAL: 0

HUR-04-08.02

MODEL: AVF2 - AVFS2 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 11/26/2025 TIME: 9:45:31 AM PLTDRV: OHDOT_PDF_Color.pltcfg PENTBL: OHDOT_PenC.tbl USER:
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Ohio Department of Transportation - Office of Hydraulic Engineering

Post-Construction BMP Calculation Spreadsheet

Post Construction - Project Summary

Project Data

		Units
Project EDA	7.5271	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	1.0919	acres
Does Entire Site Drain to Large River (>100 sq. miles)?	No	
Water Quality Treatment Required	**Yes**	
Water Quantity Treatment Required	**Yes**	

Treatment Percent and Treatment Requirement

Aix (Project EDA that is inside the existing right-of-way)	3.8946	acres
Ain (New Impervious Area in New Permanent R/W)	1.0919	acres
T% (Treatment Percent)	**37.52**	**%**
Treatment Requirement	**2.82**	**acres**

BMPs Provided

BMP Name	BMP Type	Contributing Drainage Area (acres)	Contributing Drainage Area in ODOT R/W (acres)
Bio. #1	Bioretention Cell	1.86	1.40
Bio. #2	Bioretention Cell	1.16	0.97
AVFS1	Other	0.22	0.22
AVFS2	Other	0.30	0.30
AVFS3	Other	-	-
AVFS4	Other	-	-
AVFS5	Other	-	-
AVFS6	Other	-	-
AVFS7	Other	-	-
AVFS8	Other	-	-

Treatment Provided

Total Area within ODOT R/W Treated (acres)	**2.89**
Treatment Requirements (acres)	**2.82**
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**

Water Quality Flow Rate (WQ_F)

Drainage Area #1	Area (acres)	Coefficient of Runoff (C)
Tributary Area within Existing R/W	1.40	0.9
Impervious Trib. Area Outside Existing R/W	0.00	0.9
Tributary Area Land Use #3	0.47	0.4
Tributary Area Land Use #4		
Total Tributary Area	1.86	0.775
BMP Type	Bioretention Cell	
Time of Concentration (minutes)	NA	
Intensity, i (in/hr)	0.65	
Water Quality Flow (WQ_F)	**0.939**	**cfs**

Drainage Area #2	Area (acres)	Coefficient of Runoff (C)
Tributary Area within Existing R/W	0.97	0.9
Impervious Trib. Area Outside Existing R/W	0.00	0.9
Tributary Area Land Use #3	0.18	0.4
Tributary Area Land Use #4		
Total Tributary Area	1.16	0.821
BMP Type	Bioretention Cell	
Time of Concentration (minutes)	NA	
Intensity, i (in/hr)	0.65	
Water Quality Flow (WQ_F)	**0.617**	**cfs**

Drainage Area #3	Area (acres)	Coefficient of Runoff (C)
Tributary Area within Existing R/W		0.9
Impervious Trib. Area Outside Existing R/W		0.9
Tributary Area Land Use #3		
Tributary Area Land Use #4		
Total Tributary Area	0.00	
BMP Type		
Time of Concentration (minutes)		
Intensity, i (in/hr)		
Water Quality Flow (WQ_F)		**cfs**

Drainage Area #4	Area (acres)	Coefficient of Runoff (C)
Tributary Area within Existing R/W		0.9
Impervious Trib. Area Outside Existing R/W		0.9
Tributary Area Land Use #3		
Tributary Area Land Use #4		
Total Tributary Area	0.00	
BMP Type		
Time of Concentration (minutes)		
Intensity, i (in/hr)		
Water Quality Flow (WQ_F)		**cfs**

Water Quality Volume (WQ_V)

Drainage Area #1	Values	Units
Tributary Area within Existing R/W	5.80	acres
Impervious Trib. Area Outside Existing R/W	0.00	acres
Pervious Trib. Area Outside Existing R/W	1.70	acres
Total Tributary Area	7.50	acres
Impervious Tributary Area	5.80	acres
Impervious fraction (i)	0.77	fraction
Volumetric Runoff Coefficient (R_V)	0.75	NA
Precipitation (P)	0.90	inches
WQ_V	**0.420**	ac-ft

Drainage Area #2	Values	Units
Tributary Area within Existing R/W		acres
Impervious Trib. Area Outside Existing R/W		acres
Pervious Trib. Area Outside Existing R/W		acres
Total Tributary Area	0.00	acres
Impervious Tributary Area	0.00	acres
Impervious fraction (i)		fraction
Volumetric Runoff Coefficient (R_V)	0.00	NA
Precipitation (P)	0.90	inches
WQ_V	**0.000**	ac-ft

Drainage Area #3	Values	Units
Tributary Area within Existing R/W		acres
Impervious Trib. Area Outside Existing R/W		acres
Pervious Trib. Area Outside Existing R/W		acres
Total Tributary Area	0.00	acres
Impervious Tributary Area	0.00	acres
Impervious fraction (i)		fraction
Volumetric Runoff Coefficient (R_V)	0.00	NA
Precipitation (P)	0.90	inches
WQ_V	**0.000**	ac-ft

Drainage Area #4	Values	Units
Tributary Area within Existing R/W		acres
Impervious Trib. Area Outside Existing R/W		acres
Pervious Trib. Area Outside Existing R/W		acres
Total Tributary Area	0.00	acres
Impervious Tributary Area	0.00	acres
Tributary Area within Existing R/W	5.80	acres
Impervious Trib. Area Outside Existing R/W	0.00	acres
Pervious Trib. Area Outside Existing R/W	1.70	acres
Impervious fraction (i)		fraction
Volumetric Runoff Coefficient (R_V)	0.00	NA
Precipitation (P)	0.90	inches

Amended Vegetated Filter Strip

Filter Strip	LEG	Route	Begin Station	End Station	Side	Filter Strip Width (FT) [See Note A]	Amended Filter Strip Area (SQFT)	Tributary Area (SQFT)	Tributary Area Credited (SQFT)	Filter Strip Slope (z:1)	Treatment Credit Area (SQFT)	Area Treated (Acres)	Item 671 Erosion Control Mats (SQYD)
AVFS1	NORTH	SR 4	40+92	43+47	RT	28	6,237.00	7,249.00	3,262.05	6	9,499.05	0.22	693
AVFS2	NORTH	SR 4	34+09	38+30	LT	17	7,132.00	13,494.00	6,072.30	4	13,204.30	0.30	792
AVFS3									-		-	-	0
AVFS4									-		-	-	0
AVFS5									-		-	-	0
AVFS6									-		-	-	0
AVFS7									-		-	-	0
AVFS8									-		-	-	0
AVFS9									-		-	-	0
									-		-	-	0

Note A: Average width used where Filter Strip Width is Variable

Total Treatment Credit Earned from Amended Vegetated Filter Strips 0.521 acres

Bioretention Cell

Drainage Area #	Total Tributary Area (acres)	Tributary Area within the R/W (acres)	Impervious Tributary Area[1] (acres)
Bio. #1	1.86	1.40	0.78
Bio. #2	1.16	0.97	0.37
Bio. #3			
Bio. #4			
Bio. #5			
Bio. #6			

Total Treatment Credit Earned from Bioretention (within R/W):[2]

2.37	acres

(Treatment is for quality and quantity)

Drainage Area #	Minimum Bioretention Cell Surface Area (acres)	Bioretention Cell Surface Area Designed (acres)	Meets Design?
Bio. #1	0.039	0.040	Good
Bio. #2	0.019	0.020	Good
Bio. #3	0.000		Good
Bio. #4	0.000		Good
Bio. #5	0.000		Good
Bio. #6	0.000		Good

Yellow: Requires Input (See instructions tab)

BMP Design Considerations	Answer	Design Check
1. Has pretreatment been provided per L&D Vol. 2, Sec. 1117.5?	Yes	Good
2. Is the water quality flow (WQ_F) through the bioretention cell limited to 1 foot per second?	Yes	Good
3. Has an overflow been provided 12 inches above the bioretention cell surface?	Yes	Good
4. Has the overflow been sized to convey the design check storm?	Yes	Good
5. Is the bioretention cell cross section designed per L&D Vol. 2, Sec. 1117.5.3.G and Figure 1117-8?	Yes	Good
6. Is temporary erosion control mat, Item 671 provided over the bioretention cell?	Yes	Good