



**Stage 3 Drainage Report
City of Deer Park
Hamilton County, Ohio
Blue Ash Road
April 7, 2026
PID 119069**

TABLE OF CONTENTS

Introduction	3
Storm Sewer Design	4
Post Construction BMP Calculations	5

List of Exhibits:

Exhibit "A"	Post-Developed Drainage Areas
Appendix A	Storm Calculations
Appendix B	Post Construction BMP Calculations

INTRODUCTION

The proposed improvement project involves full depth reconstruction of Blue Ash Road along the existing horizontal alignment from the southern corporation limits of the City of Deer Park near Webster Avenue to Duneden Avenue.

The existing drainage is collected using curb and an enclosed storm system. The project area includes a mix of commercial and residential areas along the east side of Blue Ash Road. Most of the west side of the road includes a paved parking area with depressed curb. There are two highpoints in the vertical profile near Webster Avenue and Orchard Lane.

The proposed improvements to Blue Ash Road will maintain existing drainage patterns, while all storm structures and conduit will be replaced within the project limits. Spread calculations have been performed to ensure proper spacing with additional catch basins added where necessary. Capacity calculations have also been performed resulting in some pipes from the existing trunk line being upsized to meet drainage requirements.

The Earth disturbed area will exceed 1.0 Acre requiring the need for Post Construction BMP's on this project. Due to limited right-of-way, a manufactured system will be proposed. All removals or abandoned structures and/or conduits are called out in the plans.

STORM SEWER DESIGN

The Ohio Department of Transportation (ODOT) Location and Design Manual, Volume 2 guidelines are used for the storm sewer design.

ODOT *CDSS* design software is used for the spread/inlet spacing and capacity design. The results of the spread and capacity calculations are shown in Appendix A of this report. The drawings showing run-off watersheds are presented in Exhibit A of this report. All results show spreads below the respective maximum thresholds. All proposed conduit was sized appropriately for a 10 year design and 25 year check on hydraulic grade line. Capacity was met and hydraulic grade line was under the grate or rim elevation for all evaluated storm sewer.

The project is located in ODOT Rainfall Intensity Zone (IDF) “C”. Spread Calculations are performed for the 5-year storm (20% AEP) (ODOT L&D Vol. 2. Section 1103-2).

POST CONSTRUCTION BMP CALCULATIONS

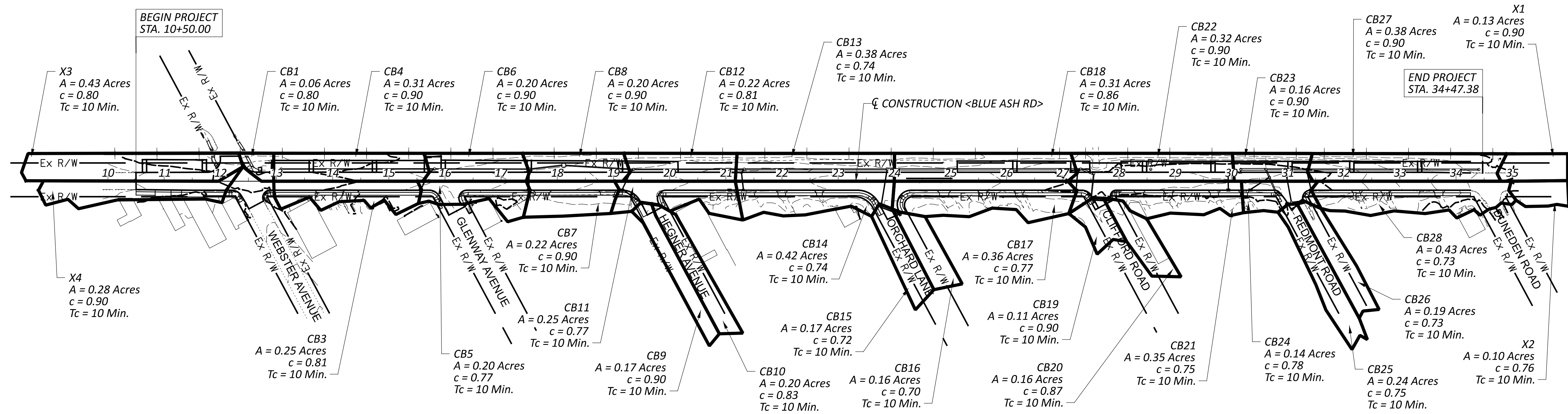
The calculated project earth disturbed area (EDA) for this project, as defined in the Ohio Department of Transportation (ODOT) Location and Design Manual, Volume 2, is over 1.0 Acres. This will require implementation of post construction best management practices (BMP's).

Due to the lack of any new impervious area in new right-of-way we are classifying this project as redevelopment, and only quality treatment will be addressed (per L&D Vol 2, 1111.6.3) The treatment area calculation for the project can be found in Appendix C of this report.

Given the limited right-of-way a Manufactured System was chosen to act as the post construction BMP for the project. a location on the North End of the project was chosen. Calculations for Water Quality Flow, sizing of the manufactured system and associated drainage maps are included in Appendix C of this report.



**EXHIBIT A
POST-DEVELOPED
DRAINAGE AREAS**



HAM CR 251 0.11 BLUE ASH ROAD PHASE 2
 POST CONSTRUCTION DRAINAGE MAP

DESIGN AGENCY



DESIGNER
 KJC

REVIEWER
 -

PROJECT ID
 119069

SHEET TOTAL
 A

**THE
KLEINGERS
GROUP**



**APPENDIX A
STORM
CALCULATIONS**

ID	Station	to	Station	Side	Total Area (sq ft)	Total Area (acres)	Area 1 (pervious)	Area 2 (non-pervious)	Composite c
X1			34+80	LT	5735	0.13	0	5735	0.90
CB27	34+80		31+36	LT	16670	0.38	0	16670	0.90
CB23	31+36		30+18	LT	6755	0.16	0	6755	0.90
CB22	27+25		29+95	LT	14093	0.32	0	14093	0.90
CB18	24+50		27+25	LT	13380	0.31	1252	12128	0.86
CB13	24+50		21+28	LT	16427	0.38	6704	9723	0.74
CB12	21+07		19+32	LT	9681	0.22	2200	7481	0.81
CB8	19+32		17+50	LT	8893	0.20	0	8893	0.90
CB6	17+50		15+74	LT	8825	0.20	0	8825	0.90
CB4	15+74		12+95	LT	13516	0.31	0	13516	0.90
CB1	12+95		12+78	LT	2419	0.06	584	1835	0.80
								0	
X2			31+42	RT	4340	0.10	1500	2840	0.76
CB28	34+95		31+42	RT	18824	0.43	8206	10618	0.73
CB26			31+28	RT	8264	0.19	3500	4764	0.73
CB25			31+02	RT	10457	0.24	4000	6457	0.75
CB24	31+42		30+33	RT	6187	0.14	1840	4347	0.78
CB21	27+25		29+95	RT	15378	0.35	5641	9737	0.75
CB20			27+85	RT	7162	0.16	500	6662	0.87
CB19			27+55	RT	4839	0.11	0	4839	0.90
CB17	24+50		27+25	RT	15832	0.36	5182	10650	0.77
CB16			24+10	RT	6979	0.16	3500	3479	0.70
CB15			23+75	RT	7593	0.17	3500	4093	0.72
CB14	24+50		21+28	RT	18326	0.42	7510	10816	0.74
								0	
CB11	21+07		19+09	RT	10887	0.25	3524	7363	0.77
CB10			19+83	RT	8787	0.20	1500	7287	0.83
CB9			19+50	RT	7268	0.17	0	7268	0.90
CB7	19+09		17+50	RT	9575	0.22	0	9575	0.90
CB5	17+50		15+57	RT	8750	0.20	2752	5998	0.77
CB3	15+57		12+95	RT	10755	0.25	2454	8301	0.81
								1	
X3	12+50		8+50	LT	18583	0.43	4610	13973	0.80
X4	12+50		8+80	RT	12237	0.28	0	12237	0.90



INLET SPACING DESIGN

PID : 119069 **Date :** 04/06/2026 **Project :** Blue Ash Phase 2

Location :

Description : West side spread project beginning

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

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.)
12+50	Begin																	
8+80	CB-3	370.00	0.90	0.28	10.00	4.06	14.06	0.0110	0.0200	0.0200	0.00	0.1670	3.47	*****	*****	0.87	0.131	6.57 End



INLET SPACING DESIGN

PID : 119069 **Date :** 04/06/2026 **Project :** Blue Ash Phase 2

Location :

Description : West side spread project beginning

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

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.)
12+50	Begin																	
8+50	CB-3	400.00	0.80	0.43	10.00	4.06	14.06	0.0110	0.0200	0.0200	0.00	0.1670	3.47	*****	*****	1.19	0.148	7.39 End



INLET SPACING DESIGN

PID : 119069 **Date :** 10/17/2024 **Project :** Blue Ash Phase 2

Location :

Description : East side spread

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

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.)
34+95	Begin																	
31+42	CB-3	353.00	0.73	0.43	10.00	3.32	13.32	0.0141	0.0200	0.0200	0.00	0.1670	3.57	*****	*****	1.12	0.138	6.88 End



INLET SPACING DESIGN

PID : 119069 **Date :** 10/17/2024 **Project :** Blue Ash Phase 2

Location :

Description : East side spread

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

Allowable Depth (ft.) : 0.00

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.)
27+25	Begin																	
29+95	CB-3	270.00	0.69	0.36	10.00	4.06	14.06	0.0048	0.0200	0.0200	0.00	0.1670	3.47	*****	*****	0.86	0.153	7.64 End



INLET SPACING DESIGN

PID : 119069 **Date :** 10/17/2024 **Project :** Blue Ash Phase 2

Location :

Description : East side spread

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

Allowable Depth (ft.) : 0.00

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.)
24+00	Begin																	
27+25	CB-3	325.00	0.77	0.36	10.00	4.64	14.64	0.0052	0.0200	0.0200	0.00	0.1670	3.40	*****	*****	0.94	0.156	7.78 End



INLET SPACING DESIGN

PID : 119069 **Date :** 10/17/2024 **Project :** Blue Ash Phase 2

Location :

Description : East side spread

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

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.)	
24+00	Begin																		
21+28	CB-3	272.00	0.74	0.41	10.00	3.76	13.76	0.0052	0.0200	0.0200	0.00	0.1670	3.51	*****	*****	1.06	0.163	8.14	Sag
19+09	Begin																		
21+28	CB-3	219.00	0.77	0.25	10.00	3.16	13.16	0.0062	0.0200	0.0200	0.00	0.1670	3.59	*****	*****	0.69	0.134	6.70	End

SUMP DATA

Total Flow (cfs) : 1.76

Ponded Depth (ft.) : 0.145

Spread on Pavement (ft.) : 2.75



INLET SPACING DESIGN

PID : 119069 **Date :** 10/17/2024 **Project :** Blue Ash Phase 2

Location :

Description : East side spread

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

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.)
15+57	Begin																	
17+50	CB-3	193.00	0.77	0.20	10.00	2.94	12.94	0.0062	0.0200	0.0200	0.00	0.1670	3.62	0.56	0.00	0.56	0.124	6.18
19+09	CB-3	159.00	0.90	0.22	10.00	2.26	12.26	0.0062	0.0200	0.0200	0.00	0.1670	3.72	0.71	0.03	0.74	0.137	6.86



INLET SPACING DESIGN

PID : 119069 **Date :** 10/17/2024 **Project :** Blue Ash Phase 2

Location :

Description : East side spread

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

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.)
12+95	Begin																	
15+57	CB-3	262.00	0.81	0.25	10.00	3.75	13.75	0.0062	0.0200	0.0200	0.00	0.1670	3.51	*****	*****	0.71	0.135	6.77 End



INLET SPACING DESIGN

PID : 119069 **Date :** 10/17/2024 **Project :** Blue Ash Phase 2

Location :

Description : West side spread

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

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.)
34+80	Begin																	
31+36	CB-3	344.00	0.90	0.38	10.00	3.15	13.15	0.0142	0.0200	0.0200	0.00	0.1670	3.59	0.99	0.24	1.23	0.142	7.12
30+18	CB-3	118.00	0.90	0.16	10.00	1.54	11.54	0.0074	0.0200	0.0200	0.00	0.1670	3.82	*****	*****	0.79	0.136	6.82 Sag
24+00	Begin																	
27+25	CB-3	325.00	0.86	0.31	10.00	4.68	14.68	0.0052	0.0200	0.0200	0.00	0.1670	3.39	0.83	0.08	0.90	0.153	7.66
30+18	CB-3	293.00	0.90	0.32	10.00	4.04	14.04	0.0052	0.0200	0.0200	0.00	0.1670	3.47	*****	*****	1.08	0.164	8.18 End

SUMP DATA

Total Flow (cfs) : 1.87

Ponded Depth (ft.) : 0.152

Spread on Pavement (ft.) : 2.82



INLET SPACING DESIGN

PID : 119069 **Date :** 10/17/2024 **Project :** Blue Ash Phase 2

Location :

Description : West side spread

Designer : KJC

Rainfall Area: C

Storm Frequency (yr.) : 2

Total Allow. Spread (ft.) : 8.00

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.)	
24+00	Begin																		
21+15	CB-3	285.00	0.74	0.38	10.00	4.09	14.09	0.0050	0.0200	0.0200	0.00	0.1670	3.47	*****	*****	0.98	0.159	7.94	Sag
12+95	Begin																		
15+74	CB-3	279.00	0.90	0.31	10.00	3.69	13.69	0.0062	0.0200	0.0200	0.00	0.1670	3.52	0.87	0.11	0.98	0.153	7.64	
19+32	CB-3	358.00	0.90	0.20	10.00	5.12	15.12	0.0062	0.0200	0.0200	0.00	0.1670	3.34	0.70	0.02	0.71	0.136	6.78	
17+50	CB-3	182.00	0.90	0.21	10.00	2.61	12.61	0.0062	0.0200	0.0200	0.00	0.1670	3.67	0.69	0.02	0.71	0.135	6.77	
21+15	CB-3	365.00	0.81	0.22	10.00	5.44	15.44	0.0062	0.0200	0.0200	0.00	0.1670	3.31	*****	*****	0.61	0.128	6.38	End

SUMP DATA

Total Flow (cfs) : 1.58

Ponded Depth (ft.) : 0.132

Spread on Pavement (ft.) : 2.63



STORM SEWER SYSTEM

PID : 119069 **Date :** 01/15/2025 **Project :** Blue Ash Phase 2

Location :

Description : Capacity check

Designer : KJC

Rainfall Area: C

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 12.00

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	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S	
	From 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'		
X1	MH19	0.13	0.12	10.00	5.32	5.99	0.6	0.7	12	33.0	0.0670	865.16	6.06	8.60	0.0005	865.36	869.61	4.25	3.45	MH 3
	begin	0.13	0.12									862.95				863.62	869.38			0.015
MH19	MH18	0.00	0.00	10.09	5.30	5.64	0.6	0.7	24	307.0	0.0113	862.95	2.95	22.39	0.0000	863.20	869.38	6.18	4.43	MH 3
	31+34	0.13	0.12									859.49				860.63	865.08			0.015
CB28	CB27	0.43	0.31	10.00	5.32	5.99	1.7	1.9	12	32.0	0.0275	862.24	5.82	5.51	0.0037	862.66	864.61	1.95	1.37	CB 3
	begin	0.56	0.43									861.36				862.21	864.66			0.015
CB27	MH18	0.38	0.34	10.09	5.30	5.99	3.5	3.9	12	6.0	0.0283	861.36	7.09	5.59	0.0162	862.21	864.66	2.45	2.30	CB 6
	31+34	0.94	0.77									861.19				862.11	865.08			0.015
MH18	MH16	0.00	0.00	11.82	4.98	5.61	3.8	4.3	24	38.0	0.0105	855.84	4.93	21.64	0.0005	856.82	865.08	8.26	7.24	MH 3
	30+96	0.94	0.77									855.44				856.81	864.76			0.015
CB26	MH17	0.19	0.14	10.00	5.32	5.99	0.7	0.8	12	21.0	0.0105	862.30	3.28	3.40	0.0007	862.79	864.80	2.01	1.50	CB 3
	begin	1.13	0.91									862.08				862.77	864.67			0.015
CB25	MH17	0.24	0.18	10.00	5.32	6.00	1.0	1.1	12	6.0	0.0117	861.00	3.68	3.59	0.0012	861.66	864.67	3.01	2.67	CB 3
	begin	1.37	1.09									860.93				861.65	864.71			0.015
MH17	MH16	0.00	0.00	10.11	5.30	5.60	1.7	1.8	12	60.0	0.0915	860.93	9.02	10.05	0.0033	861.23	864.71	3.48	2.78	MH 3
	30+96	1.37	1.09									855.44				856.52	864.76			0.015



STORM SEWER SYSTEM

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 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'
MH16	MH13	30+96 30+61	0.00 1.37	0.00 1.09	11.95	4.95	5.60	5.4	6.1	24	35.0	0.0111	855.44 855.05	5.54	22.26	0.0010	856.52 856.49	864.76 864.47	8.24	7.32	MH 3 0.015
CB24	MH14	30+34 begin 30+68	0.14 1.51	0.11 1.20	10.00	5.32	5.98	0.6	0.7	12	41.0	0.0585	861.50 859.10	5.66	8.04	0.0004	861.70 859.77	863.84 864.33	2.14	1.34	CB 3 0.015
MH14	MH13	30+68 30+61	0.00 1.51	0.00 1.20	10.12	5.30	5.97	0.6	0.7	24	16.0	0.0562	859.10 858.20	5.04	50.02	0.0000	859.34 859.34	864.33 864.47	4.99	3.23	MH 3 0.015
MH13	END	30+61 final 30+60	0.00 1.51	0.00 1.20	17.06	4.20	4.77	22.8	25.9	48	100.0	0.0100	851.00 850.00	7.54	133.92	0.0004	852.80 852.75	866.47 866.47	13.67	11.47	MH 3 0.015
CB1	MH1	12+89 begin 13+08	0.06 1.57	0.05 1.25	10.00	5.32	5.99	0.3	0.3	12	17.0	0.0176	867.40 867.10	2.91	4.41	0.0001	867.71 867.71	870.07 870.53	2.36	1.67	CB 3A 0.015
MH1	MH2	13+08 15+81	0.00 1.57	0.00 1.25	10.10	5.30	5.39	0.3	0.3	12	273.0	0.0076	867.10 865.02	2.15	2.90	0.0001	867.31 866.30	870.53 869.18	3.22	2.43	MH 3 0.015
CB3	CB4	15+57 begin 15+71	0.25 1.82	0.20 1.45	10.00	5.32	5.39	1.1	1.1	12	34.0	0.0141	866.09 865.61	4.05	3.95	0.0012	866.46 866.39	868.78 868.82	2.32	1.69	CB 3 0.015
CB4	MH2	15+71 15+81	0.31 2.13	0.28 1.73	10.14	5.29	5.39	2.5	2.6	12	12.0	0.0492	865.61 865.02	8.07	7.36	0.0070	866.39 866.30	868.82 869.18	2.43	2.21	CB 6 0.015
MH2	MH3	15+81 17+50	0.00 2.13	0.00 1.73	12.36	4.88	5.39	2.6	2.9	12	169.0	0.0049	864.82 864.00	3.29	2.31	0.0085	866.30 864.86	869.18 868.10	2.88	3.36	MH 3 0.015
Warning																					
CB5	CB6	17+49 begin 17+50	0.20 2.33	0.15 1.88	10.00	5.32	5.98	0.8	0.9	12	31.0	0.0129	865.09 864.69	3.64	3.77	0.0009	865.44 865.39	867.60 867.59	2.16	1.51	CB 3 0.015
CB6	MH3	17+50 17+50	0.20 2.53	0.18 2.06	10.14	5.29	5.98	1.8	2.0	12	6.0	0.0817	864.69 864.20	8.77	9.49	0.0042	865.03 865.00	867.59 868.10	2.56	1.90	CB 3A 0.015



STORM SEWER SYSTEM

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 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'
MH3	D1	17+50 18+11	0.00 2.53	0.00 2.06	13.21	4.74	5.35	4.1	4.6	18	56.0	0.0055	863.50 863.19	4.01	7.29	0.0026	864.50 864.35	868.10 868.07	3.60	3.10	MH 3 0.015
D1	MH4	18+11 19+36	0.00 2.53	0.00 2.06	13.45	4.71	5.19	4.1	4.5	18	119.0	0.0056	863.19 862.52	4.03	7.35	0.0024	864.31 864.02	848.07 866.95	-16.24	-16.62	MH 3 0.015
CB10	CB9	19+84 begin	0.20 2.73	0.17 2.23	10.00	5.32	5.89	0.9	1.0	12	33.0	0.0042	864.40 864.26	2.48	2.16	0.0010	865.07 865.04	866.81 866.80	1.74	1.41	CB 3A 0.015
CB9	CB7	19+50 19+16	0.17 2.90	0.15 2.38	10.22	5.28	5.89	1.7	1.9	12	43.0	0.0088	864.26 863.88	3.84	3.12	0.0037	865.04 864.88	866.80 866.57	1.76	1.54	CB 3A 0.015
CB7	CB8	19+16 19+30	0.22 3.12	0.20 2.58	10.41	5.24	5.89	2.7	3.0	12	36.0	0.0067	863.88 863.64	3.45	2.71	0.0097	864.88 864.51	866.57 866.61	1.69	1.69	CB 3 0.015
CB8	MH4	19+30 19+36	0.20 3.32	0.18 2.76	10.60	5.20	5.88	3.6	4.1	12	8.0	0.0438	863.64 863.29	8.46	6.95	0.0176	864.36 864.22	866.61 866.95	2.25	1.97	CB 6 0.015
MH4	MH6	19+36 21+33	0.00 3.32	0.00 2.76	13.94	4.63	5.19	7.2	8.1	18	123.0	0.0063	862.52 861.74	4.67	7.80	0.0079	864.02 863.04	866.95 866.17	2.93	2.93	MH 3 0.015
CB11	CB14	21+07 begin	0.25 3.57	0.19 2.95	10.00	5.32	5.94	1.0	1.1	12	25.0	0.0040	863.06 862.96	2.51	2.10	0.0014	863.99 863.96	865.39 865.47	1.40	1.33	CB 3 0.015
CB14	CB13	21+31 21+28	0.42 3.99	0.31 3.26	10.17	5.29	5.94	2.7	3.0	12	31.0	0.0065	862.96 862.76	3.39	2.67	0.0094	863.96 863.63	865.47 865.45	1.51	1.51	CB 6 0.015
CB12	CB13	21+08 begin	0.22 4.21	0.18 3.44	10.00	5.32	5.94	0.9	1.1	12	20.0	0.0120	863.00 862.76	3.69	3.64	0.0012	863.62 863.60	865.51 865.45	1.89	1.51	CB 6 0.015
CB13	MH6	21+28 21+33	0.38 4.59	0.28 3.72	10.32	5.26	5.94	5.1	5.7	12	8.0	0.0512	862.76 862.35	9.71	7.52	0.0342	863.60 863.32	865.45 866.17	1.85	1.69	CB 6 0.015



STORM SEWER SYSTEM

JUNCTION		STATION From To	ΔAREA Σ AREA (acres)	ΔCA Σ CA	BEGIN TIME (min.)	RAINFALL INTENSITY		DISCHARGE (cfs.)		PIPE			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'
From	To					(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)									
MH6	MH7	21+33 23+87	0.00 4.59	0.00 3.72	14.38	4.56	5.08	11.5	12.8	24	254.0	0.0072	861.24 859.40	5.73	17.95	0.0043	862.55 861.04	866.17 867.17	3.62	2.93	MH 3 0.015
CB16	CB15 begin	24+10 23+75	0.16 4.75	0.11 3.84	10.00	5.32	5.98	0.6	0.7	12	37.0	0.0197	865.08 864.35	3.86	4.67	0.0005	865.34 865.02	867.21 866.95	1.87	1.13	CB 3 0.015
CB15	MH7	23+75 23+87	0.17 4.92	0.12 3.96	10.16	5.29	5.94	1.2	1.4	12	66.0	0.0356	864.35 862.00	5.89	6.27	0.0020	864.68 862.75	866.95 867.17	2.27	1.60	CB 3 0.015
MH7	MH8	23+87 27+32	0.00 4.92	0.00 3.96	15.12	4.46	4.93	12.3	13.6	30	344.0	0.0065	858.90 856.68	5.60	30.72	0.0015	860.11 858.55	867.17 865.52	7.06	5.77	MH 3 0.015
CB17	CB18 begin	27+24 27+26	0.36 5.28	0.28 4.24	10.00	5.32	5.99	1.5	1.7	12	31.0	0.0200	862.13 861.51	5.01	4.70	0.0029	862.56 862.28	865.03 865.14	2.47	1.90	CB 3 0.015
CB18	MH8	27+26 27+32	0.31 5.59	0.27 4.50	10.10	5.30	5.98	2.9	3.3	12	8.0	0.0637	861.51 861.00	9.18	8.39	0.0111	861.97 861.89	865.14 865.52	3.17	2.63	CB 6 0.015
MH8	MH9	27+32 27+55	0.00 5.59	0.00 4.50	16.14	4.32	4.92	14.3	16.2	30	21.0	0.0071	856.68 856.53	6.04	32.32	0.0021	858.50 858.46	865.52 864.48	7.02	6.34	MH 3 0.015
CB20	CB19 begin	27+85 27+55	0.16 5.75	0.14 4.64	10.00	5.32	5.97	0.7	0.8	12	29.0	0.0062	862.83 862.65	2.73	2.62	0.0007	863.36 863.34	865.21 865.53	1.85	1.38	CB 6 0.015
CB19	MH10	27+55 27+51	0.11 5.86	0.10 4.74	10.18	5.29	5.97	1.3	1.4	12	7.0	0.0443	862.65 862.34	6.42	6.99	0.0021	863.11 863.09	865.53 865.40	2.42	1.88	CB 6 0.015
MH10	MH9	27+51 27+51	0.00 5.86	0.00 4.74	10.20	5.28	4.88	1.3	1.2	18	51.0	0.0067	856.99 856.65	3.13	8.00	0.0002	857.74 857.73	865.40 865.71	7.66	6.91	MH 3 0.015
MH9	MH11	27+55 28+56	0.00 5.86	0.00 4.74	16.20	4.31	4.88	15.3	17.3	36	98.0	0.0056	856.03 855.48	5.59	46.58	0.0009	857.73 857.64	864.48 864.65	6.75	5.45	MH 3 0.015

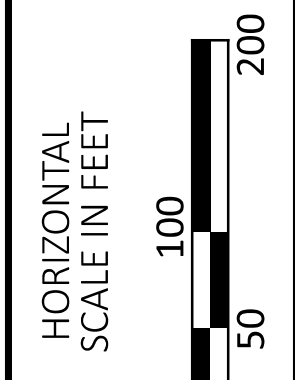
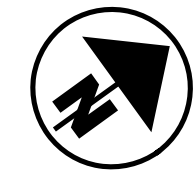
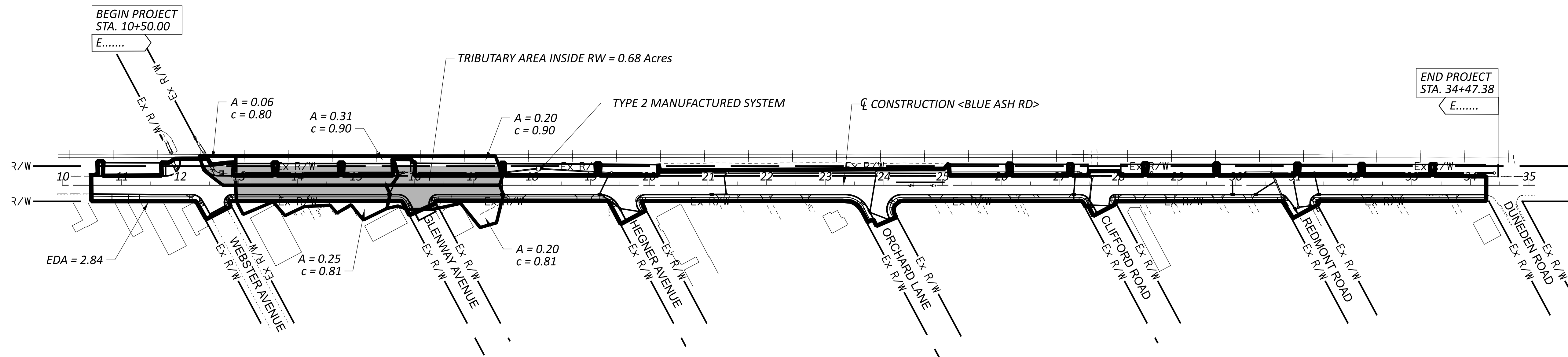


STORM SEWER SYSTEM

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	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'
MH11	MH12	28+56	0.00	0.00	16.49	4.27	4.82	15.1	17.0	36	156.0	0.0056	855.48	5.59	46.70	0.0009	856.90	864.65	7.75	6.17	MH 3
		30+17	5.86	4.74									854.60				856.76	864.31			0.015
CB21	CB22	29+95	0.35	0.26	10.00	5.32	5.96	1.4	1.6	12	31.0	0.0081	861.45	3.53	2.98	0.0026	862.09	863.79	1.70	1.34	CB 3
	begin	29+94	6.21	5.00									861.20				862.01	863.91			0.015
CB22	CB23	29+94	0.32	0.29	10.15	5.29	5.96	2.9	3.3	12	22.0	0.0150	861.20	5.31	4.07	0.0113	862.01	863.91	1.90	1.71	CB 6
		30+16	6.53	5.29									860.87				861.76	863.92			0.015
CB23	MH12	30+16	0.16	0.14	10.22	5.28	5.96	3.7	4.1	12	6.0	0.0617	860.87	9.65	8.25	0.0180	861.54	863.92	2.38	2.05	CB 6
		30+17	6.69	5.43									860.50				861.43	864.31			0.015
MH12	MH13	30+17	0.00	0.00	16.95	4.22	4.80	17.8	20.3	36	45.0	0.0100	854.60	7.20	62.18	0.0012	856.43	864.31	7.88	6.71	MH 3
		30+61	6.69	5.43									854.15				856.37	864.47			0.015



APPENDIX C
POST CONSTRUCTION BMP
CALCULATIONS



HAM CR 251 0.11 BLUE ASH ROAD PHASE 2
 POST CONSTRUCTION BMP MAP

DESIGN AGENCY	
DESIGNER	KJC
REVIEWER	-
PROJECT ID	119069
SHEET	TOTAL
B	1



Post Construction - Project Summary

Project Data

		Units
Project EDA	2.84	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)	2.84	acres
Ain (New Impervious Area in New Permanent R/W)	0	acres
T% (Treatment Percent)	20.00	%
Treatment Requirement	0.57	acres

BMPs Provided

BMP Name	BMP Type	Contributing Drainage Area (acres)	Contributing Drainage Area in ODOT R/W (acres)
VFS1	Manufactured System	1.04	0.68
VFS2			
VFS3			
VBF1			
VBF2			
BMP6			
BMP7			
BMP8			
BMP9			
BMP10			

Treatment Provided

Total Area with ODOT R/W Treated (acres)	0.68
Treatment Requirements (acres)	0.57
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	0.68	0.9
Impervious Trib. Area Outside Existing R/W	0.21	0.9
Tributary Area Land Use #3	0.15	0.5
Tributary Area Land Use #4		
Total Tributary Area	1.04	0.842
BMP Type	Manufactured System	
Time of Concentration (minutes)	13	
Intensity, i (in/hr)	1.62	
Water Quality Flow (WQ_F)	1.419	cfs

Drainage Area #2	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 #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



Manufactured Systems

Drainage Area #	Total Tributary Area (acres)	Tributary Area within R/W (acres)	WQ _F (cfs)	Required Manufactured System Type	Manufactured System Type Provided
A1	1.04	0.68	1.419	2	2
A2					
A3					
A4					
A5					

Yellow: Requires Input (See instructions tab)

Total Area Treated by Manufactured Systems (within the right-of-way)

0.68 acres

(Treatment is for quality only, not quantity)

BMP Design Considerations

1. Does the Water Quality flow rate match the system type in L&D Table 1117-1?	Yes	Good
2. Is the Water Quality flow rate greater than 6 cfs including all contributing area?	No	Good
3. Is the manufactured system located under a traffic lane?	No	Good
4. Is the storm sewer draining to the manufactured system deeper than 10 feet?	No	Good
5. Is there clear maintenance access to the manufactured system?	Yes	Good