CARPENTER MARTY transportation

GRE-68-12.65

PID 115388

REVIEW COMPLETE

PM	
BRIDGES	
CONSTRUCT	
DRAINAGE	Tami Brehm, P.E. 03/03/2025
ENVIRON	
GEOTECH	
ITS	
MOT	
PAVEMENT	
ROADWAY	
R/W	
SURVEY	
TRAFFIC	
UTILITIES	
OTHER	
OTHER	

ODOT – DISTRICT 8

GREENE COUNTY
XENIA TOWNSHIP

Drainage Report - Interim Submittal

02/17/2025

10816 Millington Court
Blue Ash OH, 45242
513.734.8542
www.cmtran.com

Table of Contents

I. Project Narrative

Project Description

This project will the construction a grade separated pedestrian crossing, connecting the Little Miami Scenic Trail with the new Shawnee Interpretive Center. Additional at grade pedestrian crossing improvements are to be installed at the Brush Row Road intersection. The pedestrian facilities within the project limits of the U.S. 68 roadway corridor will also be upgraded.

Existing Conditions

This section of U.S. 68, in Oldtown, consist of a 2-lane road at the crest of a hill. Storm water is captured through existing curbs, curb inlets, and catch basins along the exiting roadway. This stormwater is routed to Oldtown Creek to the south or to the existing roadway ditch to the north.

Proposed Design

Stormwater will be routed in the same direction as the existing along U.S. 68. Curb will be replaced and the existing storm sewer system will be redesigned and replaced. Catch basins will be spaced to provide acceptable spread for a future 3-lane section through the project corridor.

Stormwater on the Little Miami Scenic Trail will keep the same drainage pattern, draining to ditches or directly to Oldtown Creek.

A manufactured system will be added at the south side of the project as a post construction BMP.

II. Storm Sewer Design

A 10-year (10% AEP) storm design storm and a 25-year (4% AEP) flood storm were used to design the capacity of the proposed storm sewers along the U.S. 68 Corridor. Sewers were designed to provide adequate velocity and capacity through the conduits. Drainage areas are provided in the drainage area map in appendix A. Inlet Spread was calculated with a 5-year (20% AEP) storm, a max allowable spread of 5' and a max allowable depth of 5". Catch Basin types varied from CB-3 to CB-3a to provide proper control for the spread.

STORM SEWER SYSTEM

PID : 115388 **Date :** 12/18/2024 **Project :** GRE-68-12.65 **Location :** Greene County

Description :U.S. 68 Storm Sewer South of Bridge **Designer :** CEF

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

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 829.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D10	D9	100+41	0.05	0.04	10.00	5.32	5.64	0.2	0.2	12	52.0	0.0062	832.63	1.88	2.61	0.0001	833.24	835.21	1.97	1.58	CB 3A
begin		99+89	0.05	0.04									832.31				833.24	835.14			0.015
D27	D9	100+00	0.39	0.25	10.00	5.32	5.64	1.3	1.4	12	26.0	0.0169	832.75	4.61	4.32	0.0021	833.29	835.90	2.61	2.15	CB 2-2B
begin		99+89	0.44	0.29									832.31				833.24	835.14			0.015
D9	D8	99+89	0.05	0.04	10.46	5.23	5.64	1.7	1.9	12	30.0	0.0050	832.31	3.08	2.35	0.0037	833.24	835.14	1.90	1.83	CB 3A
		99+37	0.48	0.33									832.16				833.13	834.14			0.015
D8	D7	99+37	0.05	0.04	10.62	5.20	5.64	1.9	2.1	12	47.0	0.0051	832.16	3.17	2.37	0.0046	833.13	834.14	1.01	0.98	CB 3A
		99+12	0.53	0.37									831.92				832.91	835.14			0.015
D7	D4	99+12	0.03	0.02	10.87	5.15	5.64	2.0	2.2	12	36.0	0.0075	831.92	3.74	2.88	0.0052	832.91	835.14	2.23	2.22	CB 3A
		99+15	0.56	0.39									831.65				832.73	834.45			0.015
D6	D5	100+32	0.04	0.04	10.00	5.32	5.64	0.2	0.2	12	61.0	0.0075	831.67	1.98	2.88	0.0000	832.74	834.89	2.15	2.22	CB 3A
begin		99+71	0.60	0.43									831.21				832.74	834.66			0.015
D5	D4	99+71	0.04	0.04	10.51	5.22	5.64	0.4	0.4	12	56.0	0.0075	831.21	2.42	2.88	0.0002	832.74	834.66	1.92	2.45	CB 3A
		99+15	0.64	0.47									830.79				832.73	834.45			0.015
D4	D3	99+15	0.04	0.03	11.03	5.12	5.64	2.6	2.8	12	117.8	0.0099	831.65	4.39	3.31	0.0083	832.73	834.45	1.72	1.80	CB 3A
		98+00	0.68	0.50									830.48				831.74	834.14			0.015

For storm sewers, provide sufficient slope to maintain a minimum velocity of 3 feet per second, for self-cleansing, as detailed in L&D Volume 2, Section 1104.2.1.G.

STORM SEWER SYSTEM

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D3	D2	98+00		0.17	0.15	11.48	5.04	5.64	3.3	3.7	12	83.5	0.0101	830.48	4.20	3.33	0.0143	831.74	834.14	2.40	2.66	CB 3A
		97+16		0.85	0.65									829.64				830.55	833.71			0.015
D2	D1	97+16		0.13	0.11	11.81	4.98	5.50	3.8	4.2	12	7.2	0.1518	829.64	13.58	12.94	0.0187	830.43	833.71	3.28	3.07	CB 3A
		97+15		0.98	0.77									828.55				830.29	833.55			0.015
D1	EX	97+15		0.00	0.00	11.82	4.98	5.50	3.8	4.2	15	108.6	0.0050	829.04	3.68	4.26	0.0057	830.29	833.55	3.26	3.26	MH 3
		96+06		0.98	0.77									828.50				829.63	832.98			0.015
EX	HW	96+06		0.13	0.00	12.31	4.89	5.50	3.8	4.2	15	111.7	0.0297	828.50	7.37	10.38	0.0057	829.63	832.98	3.35	3.23	CB 3
final		95+57		1.11	0.77									825.18				829.00	825.93			0.015

STORM SEWER SYSTEM

PID : 115388 **Date :** 12/31/2024 **Project :** GRE-68-12.65 **Location :** Greene County

Description : U.S. 68 Storm Sewer North of Bridge **Designer :** CEF

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 From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D11	D12	101+55	0.03	0.03	10.00	5.32	5.93	0.2	0.2	12	49.0	0.0100	831.59	2.08	3.32	0.0000	831.76	834.78	3.02	2.19	CB 3A
begin		102+03	0.03	0.03									831.10				831.69	834.60			0.015
D12	D13	102+03	0.04	0.04	10.39	5.24	5.85	0.4	0.4	12	57.0	0.0100	831.10	2.61	3.32	0.0002	831.34	834.60	3.26	2.50	CB 3A
		102+61	0.07	0.07									830.53				831.16	834.15			0.015
D19	D20	101+42	0.05	0.04	10.00	5.32	5.95	0.2	0.2	12	39.6	0.0100	831.98	2.28	3.32	0.0001	832.19	835.00	2.81	2.02	CB 3A
begin		101+82	0.12	0.11									831.59				832.19	834.78			0.015
D20	D21	101+82	0.07	0.07	10.29	5.26	5.87	0.6	0.6	12	68.6	0.0100	831.59	2.98	3.32	0.0004	831.89	834.78	2.89	2.19	CB 3A
		102+50	0.19	0.17									830.90				831.56	834.45			0.015
D21	D13	102+50	0.07	0.04	10.67	5.19	5.83	0.8	0.9	12	36.9	0.0100	830.90	3.28	3.33	0.0008	831.26	834.45	3.19	2.55	CB 3
		102+61	0.26	0.22									830.53				831.23	834.15			0.015
D13	D14	102+61	0.05	0.04	10.86	5.15	5.79	1.3	1.5	12	43.0	0.0100	830.53	3.79	3.32	0.0024	831.02	834.14	3.12	2.61	CB 3
		10+38	0.31	0.26									830.10				830.86	833.22			0.015
D14	D15	10+38	0.05	0.04	11.05	5.12	5.77	1.6	1.7	12	24.3	0.0100	830.10	3.94	3.32	0.0032	830.72	833.26	2.54	2.16	CB 3
		10+40	0.36	0.30									829.86				830.64	833.44			0.015
D15	D16	10+40	0.02	0.02	11.15	5.10	5.75	1.6	1.9	12	30.0	0.0267	829.86	5.75	5.42	0.0036	830.28	833.44	3.16	2.58	CB 3
final		11+17	0.38	0.32									829.06				829.85	830.86			0.015

STORM SEWER SYSTEM

PID : 115388 **Date :** 12/31/2024 **Project :** GRE-68-12.65 **Location :** Greene County

Description : U.S. 68 Storm Sewer North of Bridge **Designer :** CEF

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 From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D22	D23	103+33	0.03	0.02	10.00	5.32	5.94	0.1	0.1	12	42.1	0.0119	829.00	2.01	3.62	0.0000	829.14	834.26	5.12	4.26	CB 3A
begin		103+75	0.03	0.02									828.50				829.07	833.82			0.015
D23	D24	103+75	0.05	0.03	10.35	5.25	5.88	0.3	0.3	12	40.1	0.0125	828.50	2.62	3.71	0.0001	828.70	833.82	5.12	4.32	CB 3A
		104+15	0.08	0.05									828.00				828.61	833.27			0.015
D24	D25	104+15	0.05	0.03	10.60	5.20	5.83	0.4	0.5	12	45.1	0.0111	828.00	2.88	3.50	0.0002	828.26	833.27	5.01	4.27	CB 3A
		104+60	0.13	0.08									827.50				828.14	832.56			0.015
D25	D26	104+60	0.05	0.03	10.87	5.15	5.77	0.6	0.7	12	53.2	0.0094	827.50	2.94	3.22	0.0004	827.82	832.56	4.74	4.06	CB 3A
		105+00	0.17	0.11									827.00				827.67	831.56			0.015
D17	D18	104+08	0.08	0.07	10.00	5.32	5.88	0.4	0.4	12	95.0	0.0105	828.50	2.67	3.41	0.0002	828.74	832.64	3.90	3.14	CB 3A
begin		105+00	0.25	0.18									827.50				828.13	830.93			0.015
D18	D26	105+00	0.08	0.07	10.59	5.20	5.85	0.7	0.8	12	35.0	0.0143	827.50	3.61	3.97	0.0007	827.81	830.93	3.12	2.43	CB 3A
		105+00	0.32	0.25									827.00				827.69	831.56			0.015
D26	D27	105+00	0.05	0.03	11.17	5.09	5.62	1.4	1.6	12	195.1	0.0128	827.00	4.22	3.76	0.0026	827.47	831.56	4.09	3.56	CB 3a
final		107+00	0.37	0.28									824.50				825.27	828.00			0.015

INLET SPACING DESIGN

PID : 115388 **Date :** 12/05/2024 **Project :** GRE-68-12.65 **Location :** Greene County

Description : US 68 (RT) Sta. 100+93 to Sta. 96+06 **Designer :** BAA

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 5.00 **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.)
100+93	Begin																	
100+32	CB-3A	61.00	0.85	0.04	10.00	1.50	11.50	0.0045	0.0160	0.0160	1.00	0.1670	4.54	0.17	0.00	0.17	0.077	4.79
99+71	CB-3A	61.00	0.85	0.04	10.00	1.50	11.50	0.0045	0.0160	0.0160	1.00	0.1670	4.54	0.17	0.00	0.17	0.077	4.79
99+15	CB-3A	56.00	0.85	0.04	10.00	1.41	11.41	0.0045	0.0160	0.0160	1.00	0.1670	4.56	0.15	0.00	0.15	0.074	4.62
98+00	CB-3A	115.00	0.90	0.17	10.00	1.60	11.60	0.0045	0.0370	0.0370	1.00	0.1670	4.52	0.65	0.05	0.70	0.180	4.87
97+16	CB-3A	84.00	0.90	0.13	10.00	1.23	11.23	0.0045	0.0370	0.0370	1.00	0.1670	4.59	0.55	0.01	0.57	0.166	4.49
96+06	CB-3	110.00	0.90	0.13	10.00	1.62	11.62	0.0045	0.0370	0.0370	1.00	0.1670	4.52	0.56	0.00	0.56	0.165	4.47

A CB3 is utilized when there is a sag. For sag locations, the first time the basin in the sag is entered, the Sump Type should be “Sag”. When coming from the other direction, the same catch basin should be entered again using Sump Type of “Segment End”. This will tell the program to calculate the spread at the low point using a ponding equation and the output will include the results.

If there is just an exisitng CB3, but no sag, then no change is needed

INLET SPACING DESIGN

PID : 115388 **Date :** 12/05/2024 **Project :** GRE-68-12.65 **Location :** Greene County

Description : US 68 (LT) Sta. 100+93 to Sta. 99+10 **Designer :** BAA

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 5.00 **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.)
100+93	Begin																	
100+41	CB-3A	52.00	0.85	0.05	10.00	1.25	11.25	0.0045	0.0160	0.0160	1.00	0.1670	4.58	0.18	0.00	0.18	0.079	4.93
99+89	CB-3A	52.00	0.85	0.05	10.00	1.25	11.25	0.0045	0.0160	0.0160	1.00	0.1670	4.58	0.18	0.00	0.18	0.080	4.97
99+59	CB-3A	30.00	0.85	0.03	10.00	0.82	10.82	0.0045	0.0160	0.0160	1.00	0.1670	4.66	0.11	0.00	0.11	0.065	4.06
99+10	CB-3A	49.00	0.85	0.05	10.00	1.19	11.19	0.0045	0.0160	0.0160	1.00	0.1670	4.60	0.18	0.00	0.18	0.078	4.90

INLET SPACING DESIGN

PID : 115388 **Date :** 12/23/2024 **Project :** GRE-68-12.65 **Location :** Greene County

Description : US 68 (RT) Sta. 100+93 to Sta. 103+10 (Brush Row Road - LP) **Designer :** CEF

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 5.00 **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.)
100+93	Begin																	
101+55	CB-3A	62.00	0.90	0.04	2.04	1.47	10.00	0.0024	0.0300	0.0300	1.00	0.1670	4.82	0.19	0.00	0.19	0.114	3.80
102+04	CB-3A	49.00	0.90	0.03	2.04	1.05	10.00	0.0037	0.0300	0.0300	1.00	0.1670	4.82	0.15	0.00	0.15	0.096	3.22
102+61	CB-3A	57.00	0.90	0.04	2.32	1.03	10.00	0.0079	0.0160	0.0160	1.00	0.1670	4.82	0.17	0.00	0.17	0.070	4.38
10+38	CB-3	50.00	0.90	0.05	2.03	0.54	10.00	0.0178	0.0307	0.0307	1.00	0.1670	4.82	0.21	0.00	0.21	0.082	2.68

INLET SPACING DESIGN

PID : 115388 **Date :** 12/23/2024 **Project :** GRE-68-12.65 **Location :** Greene County

Description : US 68 (LT) Sta. 100+93 to Sta. 103+00 **Designer :** CEF

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 5.00 **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.)	
100+93	Begin																		
101+42	CB-3A	49.00	0.90	0.06	10.00	0.95	10.95	0.0059	0.0194	0.0194	1.00	0.1670	4.64	0.23	0.00	0.23	0.089	4.59	
101+80	CB-3A	38.00	0.90	0.05	10.00	0.73	10.73	0.0058	0.0250	0.0250	1.00	0.1670	4.68	0.19	0.00	0.19	0.092	3.66	
102+50	CB-3	70.00	0.90	0.07	10.00	1.29	11.29	0.0050	0.0240	0.0240	1.00	0.1670	4.58	******	******	0.30	0.109	4.56	Sag
102+50	CB-3	50.00	0.90	0.06	10.00	0.95	10.95	0.0050	0.0240	0.0240	1.00	0.1670	4.64	******	******	0.27	0.105	4.36	End
103+00	Begin																		

SUMP DATA

Total Flow (cfs) : 0.57 **Ponded Depth (ft.) :** 0.047 **Spread on Pavement (ft.) :** 1.84

INLET SPACING DESIGN

PID : 115388 **Date :** 12/23/2024 **Project :** GRE-68-12.65 **Location :** Greene County

Description : US 68 (RT) Sta. 103+47 to Sta. 105+13 **Designer :** CEF

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 5.00 **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.)
103+47	Begin																	
104+08	CB-3A	61.00	0.90	0.06	2.32	0.65	10.00	0.0154	0.0300	0.0300	1.00	0.1670	4.82	0.27	0.00	0.27	0.093	3.10
105+13	CB-3A	105.00	0.90	0.08	2.32	1.07	10.00	0.0160	0.0300	0.0300	1.00	0.1670	4.82	0.33	0.00	0.33	0.098	3.28

INLET SPACING DESIGN

PID : 115388 **Date :** 12/23/2024 **Project :** GRE-68-12.65 **Location :** Greene County

Description : US 68 (LT) Sta. 103+00 to Sta. 105+13 **Designer :** CEF

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 5.00 **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.)
103+00	Begin																	
103+33	CB-3A	33.00	0.65	0.03	10.00	0.73	10.73	0.0110	0.0100	0.0100	1.00	0.1670	4.68	0.10	0.00	0.10	0.046	4.55
103+75	CB-3	42.00	0.65	0.05	10.00	0.84	10.84	0.0120	0.0100	0.0100	1.00	0.1670	4.66	0.14	0.00	0.14	0.050	4.96
104+15	CB-3A	40.00	0.65	0.05	10.00	0.76	10.76	0.0138	0.0100	0.0100	1.00	0.1670	4.67	0.14	0.00	0.14	0.049	4.89
104+60	CB-3	45.00	0.65	0.05	10.00	0.81	10.81	0.0157	0.0100	0.0100	1.00	0.1670	4.66	0.14	0.00	0.14	0.048	4.80
105+13	CB-3A	63.00	0.65	0.05	10.00	1.06	11.06	0.0186	0.0100	0.0100	1.00	0.1670	4.62	0.14	0.00	0.14	0.047	4.67

III. BMP Design

To provide adequate BMP control for this projects earth disturbed area, a manufactured system has been provided. The manufactured system was the selected BMP due to right of way constraints, and lack of open flowing ditches along the corridor.

Ohio Department of Transportation - Office of Hydraulic Engineering

Post-Construction BMP Calculation Spreadsheet

Post Construction - Project Summary

Project Data		Units
Project EDA	2.08	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	0.39	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)	2.08	acres
Ain (New Impervious Area in New Permanent R/W)	0.39	acres
T% (Treatment Percent)	**32.63**	**%**
Treatment Requirement	**0.68**	**acres**

BMPs Provided

BMP Name	BMP Type	Contributing Drainage Area (acres)	Contributing Drainage Area in ODOT R/W (acres)
MS1	Manufactured System	1.22	1.00

Treatment Provided

Total Area with ODOT R/W Treated (acres)	**1.00**
Treatment Requirements (acres)	**0.68**
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

Water Quality Flow Rate (WQ_F)

Drainage Area #1	Area (acres)	Coefficient of Runoff (C)
Tributary Area within Existing R/W	0.58	0.9
Impervious Trib. Area Outside Existing R/W	0.42	0.9
Tributary Area Land Use #3	0.22	0.4
Tributary Area Land Use #4		
Total Tributary Area	1.22	0.811
BMP Type	Manufactured System	
Time of Concentration (minutes)	13	
Intensity, i (in/hr)	1.62	
Water Quality Flow (WQ_F)	**1.599**	**cfs**

Please confirm since the Storm Sewer calcs show 0.98 acres and 12 min for the time of concentration

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	1.22	1.00	1.599	2	2

Yellow: Requires Input (See instructions tab)

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

1.00	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**

IV. Appendix

GRE-68-12.65

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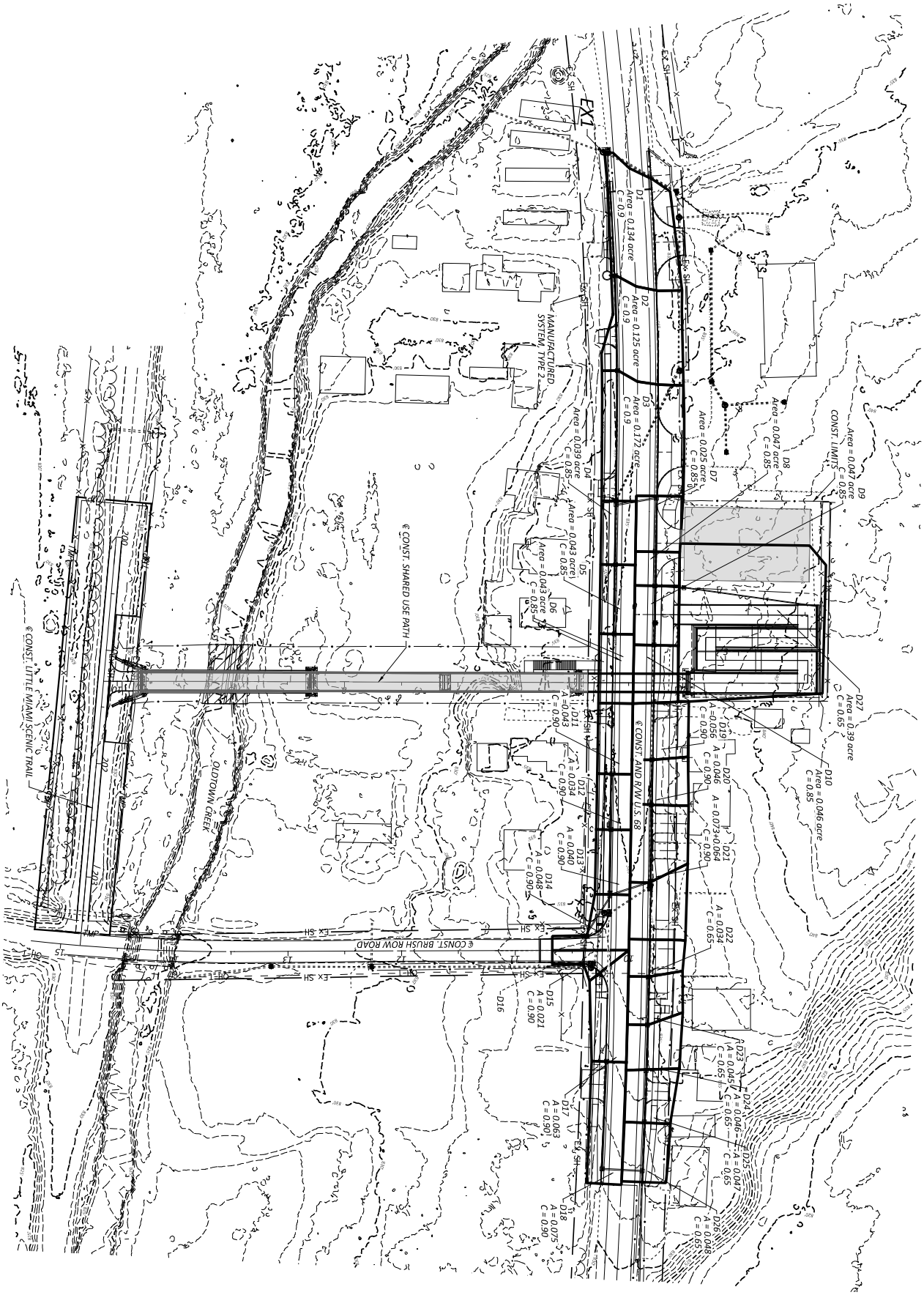

SHEET P.01 TOTAL P.01	PROJECT ID 115388	REVIEWER BAA 02/06/25	DESIGNED CEF	DESIGN AGENCY CARPENTER MARTY	DRAINAGE MAP STORM SEWER

HORIZONTAL SCALE IN FEET
0 40
20 80

GRE-68-12.65

MODEL: 115388_DB001 PAPERSIZE: 17x11 (in.) DATE: 2/7/2025 TIME: 12:07:10 PM USER: cflach
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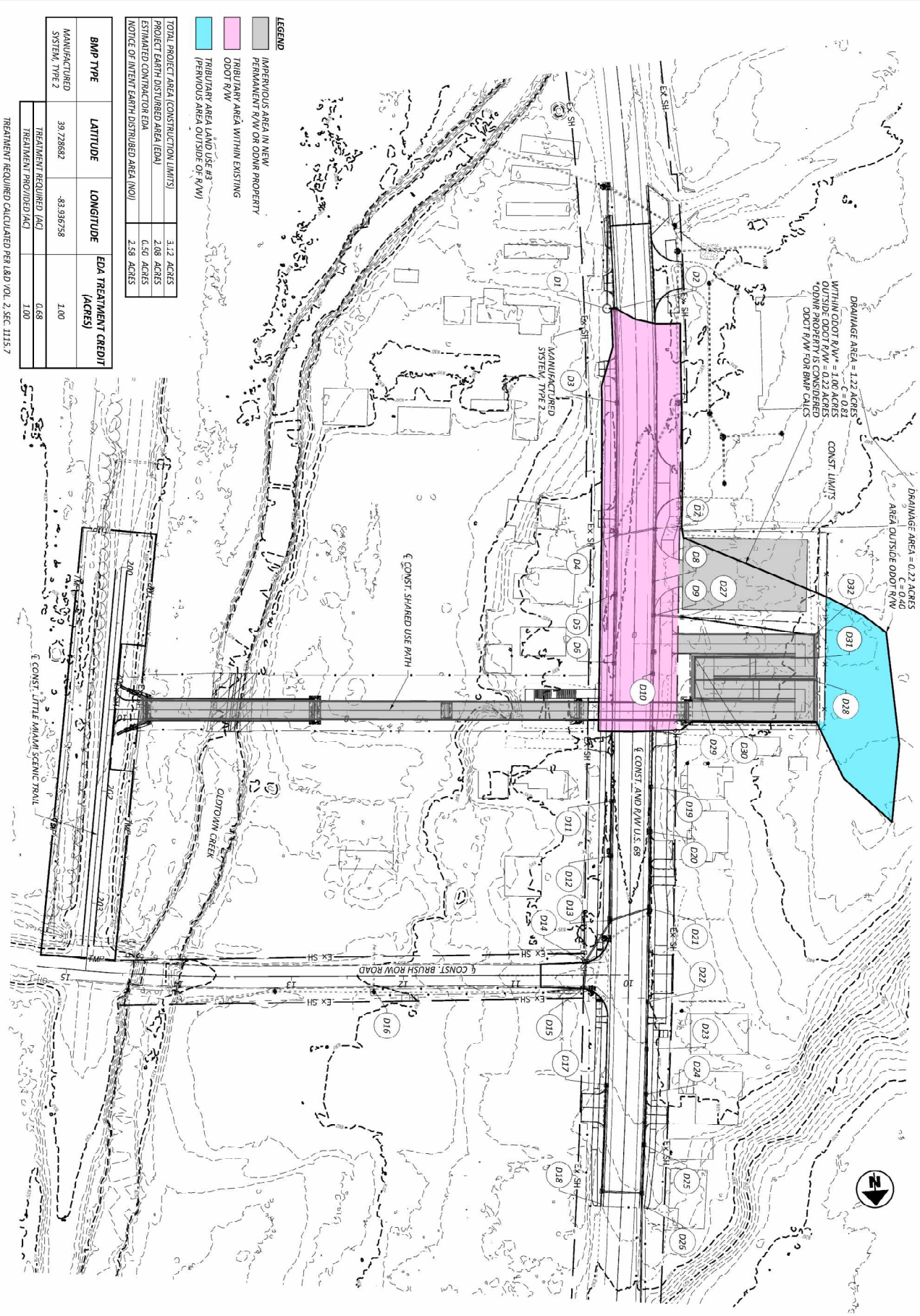

DRAINAGE MAP
BMP - MANUFACTURED SYSTEM

DESIGNER CEE
REVIEWER BAA 02/06/25
PROJECT ID 115388
SHEET P.01 TOTAL P.01
DESIGN AGENCY CARPENTER MARTY
HORIZONTAL SCALE IN FEET 0 20 40 80

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Greene County, Ohio

February 14, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,460 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Greene County, Ohio
Survey Area Data: Version 22, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 21, 2023—Aug 8, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CcD2	Casco-Eldean loams, 12 to 18 percent slopes, moderately eroded	0.9	1.5%
CdE2	Casco-Rodman loams, 18 to 50 percent slopes, moderately eroded	8.2	14.8%
EmA	Eldean silt loam, 0 to 2 percent slopes	6.9	12.3%
EmB	Eldean silt loam, 2 to 6 percent slopes	7.2	13.0%
EmB2	Eldean silt loam, 2 to 6 percent slopes, moderately eroded	3.7	6.7%
OcA	Ockley silt loam, Southern Ohio Till Plain, 0 to 2 percent slopes	4.4	8.0%
So	Sloan silty clay loam	9.2	16.6%
WeB	Wea silt loam, 0 to 2 percent slopes	15.1	27.2%
Totals for Area of Interest		**55.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the

scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Greene County, Ohio

CcD2—Casco-Eldean loams, 12 to 18 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 5p4r
Elevation: 340 to 1,500 feet
Mean annual precipitation: 28 to 40 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 135 to 200 days
Farmland classification: Farmland of local importance

Map Unit Composition

Casco and similar soils: 50 percent
Eldean and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Casco

Setting

Landform: Outwash terraces, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium over sandy and gravelly outwash

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 20 inches: clay loam
H3 - 20 to 60 inches: stratified gravel to sand

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: 10 to 24 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: F111XD018IN - Dry Outwash Upland
Hydric soil rating: No

Description of Eldean

Setting

Landform: Outwash terraces, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

H1 - 0 to 13 inches: loam
H2 - 13 to 33 inches: gravelly clay
H3 - 33 to 38 inches: very gravelly sandy loam
H4 - 38 to 60 inches: stratified sand to very gravelly loamy coarse sand

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 65 percent
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F111XD018IN - Dry Outwash Upland
Hydric soil rating: No

Minor Components

Silt loam surface layer

Percent of map unit: 8 percent

Gravelly loam surface layer

Percent of map unit: 7 percent

CdE2—Casco-Rodman loams, 18 to 50 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 5p4s

Elevation: 340 to 1,500 feet
Mean annual precipitation: 28 to 55 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 130 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Casco and similar soils: 50 percent
Rodman and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Casco

Setting

Landform: Outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium over sandy and gravelly outwash

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 20 inches: clay loam
H3 - 20 to 60 inches: stratified gravel to sand

Properties and qualities

Slope: 18 to 50 percent
Depth to restrictive feature: 10 to 24 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F111XD018IN - Dry Outwash Upland
Hydric soil rating: No

Description of Rodman

Setting

Landform: Terraces
Parent material: Sandy and gravelly outwash

Typical profile

H1 - 0 to 10 inches: gravelly loam
H2 - 10 to 60 inches: stratified sand to very gravelly loamy coarse sand

Properties and qualities

Slope: 18 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 45 percent
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R111XD021IN - Dry Outwash Mollisol
Hydric soil rating: No

Minor Components

Eroded areas with sand and gravel at the surface

Percent of map unit: 5 percent

Eldean

Percent of map unit: 5 percent
Landform: Kames, end moraines, outwash terraces
Ecological site: F111XD018IN - Dry Outwash Upland

Silt loam surface layer

Percent of map unit: 3 percent

Gravelly loam surface layer

Percent of map unit: 2 percent

EmA—Eldean silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2vzcs
Elevation: 670 to 1,160 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Eldean and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eldean

Setting

Landform: Outwash terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy outwash

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 31 inches: clay
BC - 31 to 38 inches: very gravelly loam
C - 38 to 79 inches: stratified sand to extremely gravelly coarse sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 65 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F111XA015IN - Dry Outwash Upland, R111XA017IN - Dry Outwash Mollisol
Hydric soil rating: No

Minor Components

Westland

Percent of map unit: 5 percent
Landform: Swales, outwash terraces, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear, concave
Ecological site: R111XA016IN - Outwash Mollisol
Hydric soil rating: Yes

Ockley

Percent of map unit: 5 percent
Landform: Outwash terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111XA015IN - Dry Outwash Upland
Hydric soil rating: No

Sleeth

Percent of map unit: 3 percent
Landform: Stream terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F111XA014IN - Outwash Upland
Hydric soil rating: No

Thackery

Percent of map unit: 2 percent
Landform: Outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F111XA014IN - Outwash Upland
Hydric soil rating: No

EmB—Eldean silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2vzct
Elevation: 670 to 1,160 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Eldean and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eldean

Setting

Landform: Outwash terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy outwash

Typical profile

Ap - 0 to 12 inches: silt loam
Bt - 12 to 27 inches: gravelly clay
BC - 27 to 30 inches: very gravelly clay loam
C - 30 to 79 inches: stratified sand to very gravelly loamy coarse sand to extremely gravelly loamy sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 65 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F111XA015IN - Dry Outwash Upland, R111XA017IN - Dry Outwash Mollisol
Hydric soil rating: No

Minor Components

Ockley

Percent of map unit: 5 percent
Landform: Outwash terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F111XA015IN - Dry Outwash Upland
Hydric soil rating: No

Thackery

Percent of map unit: 3 percent
Landform: Outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F111XA014IN - Outwash Upland
Hydric soil rating: No

Sleeth

Percent of map unit: 2 percent
Landform: Stream terraces
Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F111XA014IN - Outwash Upland
Hydric soil rating: No

EmB2—Eldean silt loam, 2 to 6 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 5p55
Elevation: 670 to 1,160 feet
Mean annual precipitation: 29 to 40 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 151 to 192 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Eldean and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eldean

Setting

Landform: Moraines, outwash terraces, kames
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

H1 - 0 to 13 inches: silt loam
H2 - 13 to 33 inches: gravelly clay loam
H3 - 33 to 38 inches: very gravelly sandy loam
H4 - 38 to 60 inches: stratified sand to very gravelly loamy coarse sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 65 percent
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F111XD018IN - Dry Outwash Upland
Hydric soil rating: No

Minor Components

Loam surface layer
Percent of map unit: 3 percent

Gravelly loam surface layer
Percent of map unit: 2 percent

OcA—Ockley silt loam, Southern Ohio Till Plain, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2t4lh
Elevation: 400 to 1,300 feet
Mean annual precipitation: 35 to 45 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 125 to 190 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Ockley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ockley

Setting
Landform: Outwash terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash over stratified sandy and gravelly outwash

Typical profile
Ap - 0 to 9 inches: silt loam
Bt1 - 9 to 20 inches: silty clay loam
2Bt2 - 20 to 64 inches: gravelly clay loam
3C - 64 to 79 inches: gravelly loamy sand

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 70 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 50 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Ecological site: F111XA015IN - Dry Outwash Upland
Hydric soil rating: No

Minor Components

Fox

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, talf
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F111XA015IN - Dry Outwash Upland
Hydric soil rating: No

Eldean

Percent of map unit: 5 percent
Landform: Outwash terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111XA015IN - Dry Outwash Upland
Hydric soil rating: No

Sleeth

Percent of map unit: 5 percent
Landform: Stream terraces, outwash terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111XA014IN - Outwash Upland
Hydric soil rating: No

So—Sloan silty clay loam

Map Unit Setting

National map unit symbol: 5p6x
Elevation: 700 to 1,000 feet
Mean annual precipitation: 31 to 45 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 145 to 200 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Sloan and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sloan

Setting

Landform: Flood plains
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 24 inches: silty clay loam
H2 - 24 to 45 inches: silty clay loam
H3 - 45 to 60 inches: stratified loam to silt loam to sandy loam to clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Available water supply, 0 to 60 inches: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F111XD003IN - Wet Alluvium
Hydric soil rating: Yes

Minor Components

Eel

Percent of map unit: 4 percent
Landform: Flood-plain steps, flood plains
Ecological site: F111XD004IN - Dry Alluvium
Hydric soil rating: No

Ross

Percent of map unit: 4 percent
Landform: Terraces, flood plains
Ecological site: F111XD004IN - Dry Alluvium
Hydric soil rating: No

Silt loam surface layer

Percent of map unit: 4 percent
Landform: Flood plains
Hydric soil rating: Yes

High water table year round

Percent of map unit: 4 percent
Landform: Flood plains
Hydric soil rating: Yes

Algiers

Percent of map unit: 4 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111XD003IN - Wet Alluvium
Hydric soil rating: No

WeB—Wea silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2w3ql
Elevation: 600 to 1,000 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Wea and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wea

Setting

Landform: Outwash terraces

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy outwash over gravelly outwash

Typical profile

Ap - 0 to 8 inches: silt loam
A - 8 to 12 inches: silt loam
AB - 12 to 17 inches: silt loam
Bt1 - 17 to 38 inches: clay loam
2Bt2 - 38 to 49 inches: gravelly clay loam
2BC - 49 to 55 inches: gravelly clay loam
2C - 55 to 79 inches: stratified very gravelly coarse sand to gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 45 to 70 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 55 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Ecological site: R111XA017IN - Dry Outwash Mollisol
Hydric soil rating: No

Minor Components

Warsaw

Percent of map unit: 6 percent
Landform: Outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R111XA017IN - Dry Outwash Mollisol
Hydric soil rating: No

Ross, rarely flooded

Percent of map unit: 2 percent
Landform: Drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111XA005IN - Dry Alluvium
Hydric soil rating: No

Westland

Percent of map unit: 2 percent
Landform: Swales, outwash terraces, depressions
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear, concave
Ecological site: R111XA016IN - Outwash Mollisol
Hydric soil rating: Yes

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