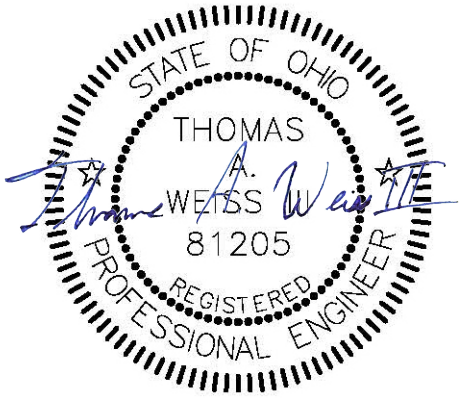
STORM WATER MANAGEMENT CALCULATIONS
for
MASSILLON WEST SIDE ELEMENTARY

Located in
CITY OF MASSILLON
STARK COUNTY, STATE OF OHIO

February 2, 2023



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Massillon West Side Elementary
Storm Water Management

Narrative

The storm water management basin presented in these calculations has been designed for the new Massillon Westside Elementary School building in the City of Massillon. The site is comprised of type “B”, “C” & “D” soils according to the USDA soil maps. The existing site includes existing buildings, driveways, lawn areas and some trees. The proposed site includes a new elementary school, parking and supporting facilities.

Based on the pre-developed and post-developed 1-yr runoff volumes for the site and associated improvements, the critical storm for the site was calculated as a 25-year storm.

The site disturbance is greater than 1 acre, therefore, water quality treatment is required. Water quality treatment is provided using Wet Extended Detention (24-hour drawdown) in accordance with the Ohio EPA General Construction Permit OHC000005.

The outflow from the detention basin is controlled through a 5” diameter orifice for water quality, a 10” orifice for the critical storm and an open top manhole riser for the remainder of the storm control.

The table below summarizes the final existing and proposed peak run-off rates for the proposed detention basin.

Storm Event (Year)	Pre-Developed Run-off Rates (C.F.S.)	Post-Developed Run-off Rates (C.F.S.)	Allowed Combined Release Rate (C.F.S.)	Peak Detention Basin Release Rates (C.F.S.)	Peak Storage Elevation (FT.)
1	6.47	30.97	6.47	1.38	1065.93
2	11.33	40.38	6.47	2.68	1066.35
5	19.78	54.71	6.47	4.19	1067.05
10	27.88	67.20	6.47	5.11	1067.69
25*	40.98	85.95	6.47	6.22	1068.65
50	52.85	101.99	52.85	17.72	1069.09
100	66.23	119.40	66.23	37.56	1069.50

* Indicates critical storm

The proposed detention pond discharges to the existing stream where all the site water drains towards currently.

Massillon West Side Elementary
Storm Water Management

Storm Water Quality Volume Calculation

The water quality volume for this site is calculated in accordance with the Ohio EPA General Construction Permit OHC000005 dated April 23, 2018.

Calculate the run-off coefficient "R_v":
$R_v = 0.05+0.9i$

R_v =Coefficient
i=Imperviousness ratio=imperviousness acreage / total acreage=(13.11/21.36)=0.614

$R_v = 0.05+0.9(0.614)$
$R_v = 0.6026$

Calculate the required "Water Quality Pond Volume" (WQV):
$WQV = (R_v \times P \times A) / 12$

WQV = Volume in Acre-Feet
R_v = Run-Off Coefficient= 0.6026
P = Precipitation Depth = 0.9 Inches
A = Drainage Area = 21.36 Acres

WQV = (0.6026 x 0.9 x 21.36) / 12
WQV = 0.9653652 Acre-Feet
WQV = 42,051.31 Cubic Feet

Required volume below the water surface (elevation 1064.00).

(42,051.31 * 1.00) + (42,051.31 * 0.20) = 50,461.57 Cubic Feet

The pond volume table states the permanent water pool volume is approximately 81,273 Cubic Feet.

Required volume above the water surface.

42,051.31 * 1.00 = 42,051.31 Cubic Feet

Apply the storage volume (42,051.31 c.f.) to the pond. The resulting water elevation is 1065.53. Interpolating from the provided Elevation vs. Area table, you will determine that at elevation 1065.53, the pond storage volume is approximately 42,185.43 c.f. which is above the required volume.

Using the Drain Time Calculator in Pond Pack software to demonstrate that it takes at least 24 hours to drain the pond from elevation 1065.53 through a 5" diameter orifice. 24 hours is the minimum drain time for wet extended detention. Following is a print out of the Time vs. Volume table from the Drain Time Calculator starting at elevation 1065.53 showing 5,301 c.f. of water is retained in the basin at 24 hours (1440 minutes). The table shows it will take longer than 24 hours to drain the pond from elevation 1065.53.

In addition, the minimum drain time, 50% of the above pool volume must remain in the water quality basin for the first 8 hours (480 minutes). The Time vs. Volume table from the Drain Time Calculator starting at elevation 1065.53 demonstrates that 21,457 c.f. is remaining in the basin beyond the initial 8 hours.

References:

1.) O.E.P.A. N.P.D.E.S. for Discharge of Storm Water from Construction Sites. (Permit OHC000005 effective April 23, 2018)
2.) Rainwater and Land Development Manual for Ohio. Post-Construction Storm Water Treatment Section. Water Quality Ponds.

Type.... Time vs. Volume
Name.... MDRAIN 1 OUT

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 5.00 min Time on left represents time for first value in each row.				
.00	41837	41582	41331	41084	40833
25.00	40582	40332	40085	39839	39593
50.00	39347	39104	38862	38620	38379
75.00	38137	37900	37658	37421	37180
100.00	36943	36710	36473	36240	36008
125.00	35775	35546	35314	35086	34857
150.00	34626	34397	34173	33946	33722
175.00	33498	33274	33051	32831	32611
200.00	32392	32172	31953	31738	31519
225.00	31303	31088	30877	30662	30451
250.00	30240	30029	29822	29611	29404
275.00	29198	28991	28784	28582	28375
300.00	28173	27974	27771	27572	27374
325.00	27175	26977	26782	26587	26389
350.00	26195	26001	25810	25616	25425
375.00	25238	25048	24861	24675	24488
400.00	24302	24119	23936	23754	23571
425.00	23389	23210	23028	22849	22674
450.00	22496	22321	22146	21971	21800
475.00	21629	21457	21287	21119	20948
500.00	20781	20614	20447	20280	20116
525.00	19953	19789	19629	19466	19307
550.00	19150	18991	18835	18678	18522
575.00	18370	18214	18062	17909	17757
600.00	17608	17460	17311	17162	17017
625.00	16872	16727	16582	16440	16299
650.00	16157	16019	15878	15740	15602
675.00	15468	15330	15196	15061	14927
700.00	14796	14665	14534	14404	14276
725.00	14149	14022	13898	13771	13647
750.00	13526	13403	13282	13162	13045
775.00	12925	12808	12691	12577	12464
800.00	12353	12243	12136	12029	11926
825.00	11822	11719	11618	11521	11424
850.00	11328	11234	11140	11047	10956
875.00	10866	10779	10692	10605	10521
900.00	10438	10357	10274	10193	10113
925.00	10036	9959	9881	9804	9731
950.00	9657	9583	9509	9439	9368
975.00	9301	9230	9163	9096	9029
1000.00	8965	8901	8837	8773	8712
1025.00	8648	8587	8530	8469	8411
1050.00	8354	8297	8239	8185	8127

480 min.
8 hrs.

Type.... Time vs. Volume
Name.... MDRAIN 1 OUT

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 5.00 min Time on left represents time for first value in each row.				
1075.00	8073	8019	7968	7914	7863
1100.00	7812	7761	7713	7662	7611
1125.00	7563	7516	7468	7420	7372
1150.00	7328	7280	7236	7191	7147
1175.00	7102	7058	7016	6972	6931
1200.00	6889	6848	6807	6766	6724
1225.00	6686	6645	6607	6569	6528
1250.00	6493	6455	6417	6379	6344
1275.00	6309	6271	6236	6201	6167
1300.00	6132	6100	6065	6034	5999
1325.00	5967	5936	5904	5872	5841
1350.00	5809	5778	5749	5717	5689
1375.00	5657	5629	5601	5572	5544
1400.00	5515	5487	5462	5433	5408
1425.00	5380	5354	5326	5301	5275
1450.00	5250	5225	5200	5178	5152
1475.00	5127	5105	5080	5058	5033
1500.00	5011	4985	4963	4941	4916
1525.00	4894	4872	4850	4828	4806
1550.00	4784	4762	4740	4721	4699
1575.00	4677	4655	4636	4614	4595
1600.00	4573	4554	4532	4513	4494
1625.00	4475	4453	4435	4416	4397
1650.00	4378	4359	4340	4321	4303
1675.00	4284	4268	4249	4230	4211
1700.00	4196	4177	4161	4142	4127
1725.00	4108	4092	4073	4058	4042
1750.00	4023	4007	3992	3976	3960
1775.00	3945	3929	3913	3897	3882
1800.00	3866	3850	3835	3819	3803
1825.00	3791	3775	3759	3744	3731
1850.00	3716	3703	3687	3675	3659
1875.00	3647	3631	3618	3606	3590
1900.00	3578	3565	3553	3537	3524
1925.00	3512	3499	3487	3474	3462
1950.00	3449	3437	3424	3412	3399
1975.00	3387	3374	3362	3352	3340
2000.00	3327	3315	3305	3293	3283
2025.00	3271	3258	3249	3236	3227
2050.00	3214	3205	3193	3183	3171
2075.00	3161	3152	3139	3130	3121
2100.00	3111	3099	3089	3080	3071
2125.00	3061	3052	3039	3030	3021
2150.00	3011	3002	2992	2983	2974

1440 mins
24 hrs.

Type.... Time vs. Volume
Name.... MDRAIN 1 OUT

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 5.00 min Time on left represents time for first value in each row.				
2175.00	2964	2955	2949	2939	2930
2200.00	2921	2911	2902	2896	2886
2225.00	2877	2867	2861	2852	2842
2250.00	2836	2827	2817	2811	2802
2275.00	2796	2786	2780	2771	2764
2300.00	2755	2749	2739	2733	2724
2325.00	2717	2711	2702	2696	2689
2350.00	2680	2674	2667	2658	2652
2375.00	2646	2639	2630	2624	2618
2400.00	2611	2605	2599	2593	2583
2425.00	2577	2571	2564	2558	2552
2450.00	2546	2540	2533	2527	2521
2475.00	2515	2508	2502	2496	2490
2500.00	2483	2477	2471	2465	2458
2525.00	2452	2446	2440	2437	2430
2550.00	2424	2418	2412	2405	2399
2575.00	2393	2387	2380	2374	2371
2600.00	2365	2359	2352	2346	2340
2625.00	2334	2327	2324	2318	2312
2650.00	2306	2299	2293	2290	2284
2675.00	2278	2271	2265	2262	2256
2700.00	2249	2243	2237	2234	2228
2725.00	2221	2215	2212	2206	2200
2750.00	2193	2190	2184	2178	2172
2775.00	2168	2162	2156	2153	2147
2800.00	2140	2134	2131	2125	2119
2825.00	2115	2109	2103	2100	2094
2850.00	2087	2084	2078	2072	2069
2875.00	2063	2056	2053	2047	2044
2900.00	2038	2031	2028	2022	2016
2925.00	2013	2006	2003	1997	1991
2950.00	1988	1982	1978	1972	1969
2975.00	1963	1957	1954	1947	1944
3000.00	1938	1935	1929	1926	1919
3025.00	1916	1910	1907	1901	1898
3050.00	1891	1888	1882	1879	1873
3075.00	1870	1863	1860	1854	1851
3100.00	1845	1842	1835	1832	1826
3125.00	1823	1817	1814	1810	1804
3150.00	1801	1795	1792	1786	1782
3175.00	1779	1773	1770	1764	1761
3200.00	1758	1751	1748	1742	1739
3225.00	1736	1730	1726	1720	1717
3250.00	1714	1708	1705	1702	1695

Type.... Time vs. Volume
Name.... MDRAIN 1 OUT

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 5.00 min Time on left represents time for first value in each row.				
3275.00	1692	1689	1683	1680	1677
3300.00	1670	1667	1664	1658	1655
3325.00	1652	1646	1642	1639	1633
3350.00	1630	1627	1624	1618	1614
3375.00	1611	1605	1602	1599	1596
3400.00	1590	1586	1583	1580	1574
3425.00	1571	1568	1565	1558	1555
3450.00	1552	1549	1543	1540	1537
3475.00	1534	1527	1524	1521	1518
3500.00	1515	1509	1506	1503	1499
3525.00	1496	1490	1487	1484	1481
3550.00	1478	1475	1468	1465	1462
3575.00	1459	1456	1453	1447	1444
3600.00	1440	1437	1434	1431	1428
3625.00	1422	1419	1416	1412	1409
3650.00	1406	1403	1400	1394	1391
3675.00	1388	1385	1381	1378	1375
3700.00	1372	1369	1366	1360	1357
3725.00	1353	1350	1347	1344	1341
3750.00	1338	1335	1332	1329	1325
3775.00	1322	1319	1316	1310	1307
3800.00	1304	1301	1298	1294	1291
3825.00	1288	1285	1282	1279	1276
3850.00	1273	1270	1267	1263	1260
3875.00	1257	1254	1251	1248	1245
3900.00	1242	1239	1235	1232	1229
3925.00	1226	1223	1220	1217	1214
3950.00	1211	1208	1204	1201	1198
3975.00	1198	1195	1192	1189	1186
4000.00	1183	1180	1176	1173	1170
4025.00	1167	1164	1161	1158	1155
4050.00	1152	1152	1149	1145	1142
4075.00	1139	1136	1133	1130	1127
4100.00	1124	1124	1121	1118	1114
4125.00	1111	1108	1105	1102	1099
4150.00	1099	1096	1093	1090	1087
4175.00	1083	1080	1077	1077	1074
4200.00	1071	1068	1065	1062	1062
4225.00	1059	1055	1052	1049	1046
4250.00	1043	1043	1040	1037	1034
4275.00	1031	1031	1028	1024	1021
4300.00	1018	1015	1015	1012	1009
4325.00	1006	1003	1003	1000	997
4350.00	993	990	990	987	984

Type.... Time vs. Volume
Name.... MDRAIN 1 OUT

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 5.00 min Time on left represents time for first value in each row.				
4375.00	981	981	978	975	972
4400.00	969	969	966	962	959
4425.00	959	956	953	950	950
4450.00	947	944	941	941	938
4475.00	935	931	931	928	925
4500.00	922	922	919	916	913
4525.00	913	910	907	904	904
4550.00	900	897	897	894	891
4575.00	888	888	885	882	882
4600.00	879	876	876	873	869
4625.00	866	866	863	860	860
4650.00	857	854	854	851	848
4675.00	848	845	842	842	838
4700.00	835	835	832	829	829
4725.00	826	823	823	820	817
4750.00	817	814	811	811	807
4775.00	804	804	801	801	798
4800.00	795	795	792	789	789
4825.00	786	786	783	780	780
4850.00	776	773	773	770	770
4875.00	767	764	764	761	761
4900.00	758	755	755	752	749
4925.00	749	745	745	742	742
4950.00	739	736	736	733	733
4975.00	730	727	727	724	724
5000.00	721	721	718	715	715
5025.00	711	711	708	708	705
5050.00	702	702	699	699	696
5075.00	696	693	693	690	687
5100.00	687	684	684	680	680
5125.00	677	677	674	674	671
5150.00	668	668	665	665	662
5175.00	662	659	659	656	656
5200.00	653	653	649	649	646
5225.00	646	643	643	640	640
5250.00	637	637	634	634	631
5275.00	631	628	628	625	625
5300.00	622	622	619	619	615
5325.00	615	612	612	609	609
5350.00	606	606	603	603	600
5375.00	600	597	597	594	594
5400.00	591	591	588	588	584
5425.00	584	584	581	581	578
5450.00	578	575	575	572	572

Type.... Time vs. Volume
Name.... MDRAIN 1 OUT

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 5.00 min Time on left represents time for first value in each row.				
5475.00	569	569	569	566	566
5500.00	563	563	560	560	557
5525.00	557	553	553	553	550
5550.00	550	547	547	544	544
5575.00	544	541	541	538	538
5600.00	535	535	535	532	532
5625.00	529	529	526	526	526
5650.00	523	523	519	519	519
5675.00	516	516	513	513	510
5700.00	510	510	507	507	504
5725.00	504	504	501	501	498
5750.00	498	498	495	495	492
5775.00	492	492	488	488	485
5800.00	485	485	482	482	482
5825.00	479	479	476	476	476
5850.00	473	473	473	470	470
5875.00	467	467	467	464	464
5900.00	464	461	461	458	458
5925.00	458	454	454	454	451
5950.00	451	451	448	448	445
5975.00	445	445	442	442	442
6000.00	439	439	439	436	436
6025.00	436	433	433	433	430
6050.00	430	430	427	427	427
6075.00	424	424	420	420	420
6100.00	417	417	417	414	414
6125.00	414	411	411	411	411
6150.00	408	408	408	405	405
6175.00	405	402	402	402	399
6200.00	399	399	396	396	396
6225.00	393	393	393	389	389
6250.00	389	389	386	386	386
6275.00	383	383	383	380	380
6300.00	380	377	377	377	377
6325.00	374	374	374	371	371
6350.00	371	368	368	368	368
6375.00	365	365	365	362	

Massillon West Side Elementary

Critical Storm Calculations
Run-off Volume Calculations

Massillon West Side Elementary

% Increase in Stormwater Volume

$$\%_{incr.}=[(V_{pst}-V_{pre})/V_{pre}]*100$$

$$\% = [(87{,}476-28{,}586)/ 28{,}586]*100 =206.00\%$$

◦˚◦ 25-yr. *critical* storm.

Type.... Runoff CN Vol (weighted)
Name.... PRE

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

COMPUTE RUNOFF VOLUME USING CN
(From Composite Weighted CN)
::

CN Data Form ID = Pre

Frequency = 1 years
Rain Depth = 2.0400 in

Soil/Surface Description	Adjusted CN	Area acres	Runoff in	Volume cu.ft
Meadow "B"	58.00	3.330		
Meadow "C"	71.00	1.360		
Meadow "D"	78.00	16.670		
COMPOSITE RUNOFF VOLUME --->	74	21.360	.3687	28586

::

Type.... Runoff CN Vol (weighted)
Name.... POST

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

COMPUTE RUNOFF VOLUME USING CN
(From Composite Weighted CN)
::

CN Data Form ID = Post

Frequency = 1 years
Rain Depth = 2.0400 in

Soil/Surface Description	Adjusted CN	Area acres	Runoff in	Volume cu.ft
Water	100.00	.580		
Impervious	98.00	13.110		
Lawn "D"	80.00	6.020		
Lawn "C"	74.00	.470		
Lawn "B"	61.00	1.180		
COMPOSITE RUNOFF VOLUME --->	90	21.360	1.1282	87476

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Massillon West Side Elementary
Storm Water Management

Pre-Developed Runoff Conditions
Time of Concentration Calculations
“CN” Calculations
Peak Runoff Rates

Type.... Tc Calcs
Name.... PRE DEVELOPED

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n .1500
Hydraulic Length 100.00 ft
2yr, 24hr P 2.4400 in
Slope .020000 ft/ft

Avg.Velocity .15 ft/sec

Segment #1 Time: 11.22 min

Segment #2: Tc: TR-55 Shallow

Hydraulic Length 307.00 ft
Slope .010000 ft/ft
Unpaved

Avg.Velocity 1.61 ft/sec

Segment #2 Time: 3.17 min

Segment #3: Tc: TR-55 Shallow

Hydraulic Length 374.00 ft
Slope .040000 ft/ft
Unpaved

Avg.Velocity 3.23 ft/sec

Segment #3 Time: 1.93 min

Type.... Tc Calcs
Name.... PRE DEVELOPED

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 220.00 ft
Slope .014000 ft/ft
Unpaved

Avg.Velocity 1.91 ft/sec

Segment #4 Time: 1.92 min

Segment #5: Tc: TR-55 Shallow

Hydraulic Length 114.00 ft
Slope .044000 ft/ft
Unpaved

Avg.Velocity 3.38 ft/sec

Segment #5 Time: .56 min

Segment #6: Tc: TR-55 Shallow

Hydraulic Length 187.00 ft
Slope .013000 ft/ft
Unpaved

Avg.Velocity 1.84 ft/sec

Segment #6 Time: 1.69 min

==========
Total Tc: 20.50 min
==========

Type.... Tc Calcs
Name.... PRE DEVELOPED

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

Type.... Runoff CN-Area
Name.... PRE DEVELOPED

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

RUNOFF CURVE NUMBER DATA
::

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Meadow "B"	58	3.330			58.00
Meadow "C"	71	1.360			71.00
Meadow "D"	78	16.670			78.00
COMPOSITE AREA & WEIGHTED CN --->		21.360			74.44 (74)

::

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1440.00 min Rain Depth = 2.0400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - PRE DEVELOPED 1
Tc = 20.50 min
Drainage Area = 21.360 acres Runoff CN= 74

==========
Computational Time Increment = 2.733 min
Computed Peak Time = 727.06 min
Computed Peak Flow = 6.47 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 729.00 min
Peak Flow, Interpolated Output = 6.42 cfs
==========

DRAINAGE AREA

ID:PRE DEVELOPED
CN = 74
Area = 21.360 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

.3687 in
28586 cu.ft

HYG Volume... 28569 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 20.500 min (ID: PRE DEVELOPED)
Computational Incr, Tm = 2.733 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 70.84 cfs
Unit peak time Tp = 13.667 min
Unit receding limb, Tr = 54.666 min
Total unit time, Tb = 68.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 1440.00 min Rain Depth = 2.4400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - PRE DEVELOPED 2
Tc = 20.50 min
Drainage Area = 21.360 acres Runoff CN= 74

==========
Computational Time Increment = 2.733 min
Computed Peak Time = 727.06 min
Computed Peak Flow = 11.33 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 726.00 min
Peak Flow, Interpolated Output = 11.07 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:PRE DEVELOPED
CN = 74
Area = 21.360 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

.5748 in
44569 cu.ft

HYG Volume... 44535 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 20.500 min (ID: PRE DEVELOPED)
Computational Incr, Tm = 2.733 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 70.84 cfs
Unit peak time Tp = 13.667 min
Unit receding limb, Tr = 54.666 min
Total unit time, Tb = 68.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 3.0400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - PRE DEVELOPED 5
Tc = 20.50 min
Drainage Area = 21.360 acres Runoff CN= 74

==========
Computational Time Increment = 2.733 min
Computed Peak Time = 727.06 min
Computed Peak Flow = 19.78 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 726.00 min
Peak Flow, Interpolated Output = 19.52 cfs
==========

DRAINAGE AREA

ID:PRE DEVELOPED
CN = 74
Area = 21.360 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

.9337 in
72397 cu.ft

HYG Volume... 72337 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 20.500 min (ID: PRE DEVELOPED)
Computational Incr, Tm = 2.733 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 70.84 cfs
Unit peak time Tp = 13.667 min
Unit receding limb, Tr = 54.666 min
Total unit time, Tb = 68.333 min

Type.... Unit Hyd. Summary
Name.... PRE DEVELOPED Tag: 10 Event: 10 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 1440.00 min Rain Depth = 3.5600 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - PRE DEVELOPED 10
Tc = 20.50 min
Drainage Area = 21.360 acres Runoff CN= 74

==========
Computational Time Increment = 2.733 min
Computed Peak Time = 727.06 min
Computed Peak Flow = 27.88 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 726.00 min
Peak Flow, Interpolated Output = 27.64 cfs
==========

DRAINAGE AREA

ID:PRE DEVELOPED
CN = 74
Area = 21.360 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

1.2815 in
99363 cu.ft

HYG Volume... 99279 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 20.500 min (ID: PRE DEVELOPED)
Computational Incr, Tm = 2.733 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 70.84 cfs
Unit peak time Tp = 13.667 min
Unit receding limb, Tr = 54.666 min
Total unit time, Tb = 68.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 1440.00 min Rain Depth = 4.3400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - PRE DEVELOPED 25
Tc = 20.50 min
Drainage Area = 21.360 acres Runoff CN= 74

==========
Computational Time Increment = 2.733 min
Computed Peak Time = 727.06 min
Computed Peak Flow = 40.98 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 726.00 min
Peak Flow, Interpolated Output = 40.79 cfs
==========

DRAINAGE AREA

ID:PRE DEVELOPED
CN = 74
Area = 21.360 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

1.8501 in
143453 cu.ft

HYG Volume... 143328 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 20.500 min (ID: PRE DEVELOPED)
Computational Incr, Tm = 2.733 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 70.84 cfs
Unit peak time Tp = 13.667 min
Unit receding limb, Tr = 54.666 min
Total unit time, Tb = 68.333 min

Type.... Unit Hyd. Summary
Name.... PRE DEVELOPED Tag: 50 Event: 50 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 50 year storm
Duration = 1440.00 min Rain Depth = 5.0100 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - PRE DEVELOPED 50
Tc = 20.50 min
Drainage Area = 21.360 acres Runoff CN= 74

==========
Computational Time Increment = 2.733 min
Computed Peak Time = 727.06 min
Computed Peak Flow = 52.85 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 726.00 min
Peak Flow, Interpolated Output = 52.73 cfs
==========

DRAINAGE AREA

ID:PRE DEVELOPED
CN = 74
Area = 21.360 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

2.3722 in
183936 cu.ft

HYG Volume... 183774 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 20.500 min (ID: PRE DEVELOPED)
Computational Incr, Tm = 2.733 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 70.84 cfs
Unit peak time Tp = 13.667 min
Unit receding limb, Tr = 54.666 min
Total unit time, Tb = 68.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 1440.00 min Rain Depth = 5.7400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - PRE DEVELOPED 100
Tc = 20.50 min
Drainage Area = 21.360 acres Runoff CN= 74

==========
Computational Time Increment = 2.733 min
Computed Peak Time = 727.06 min
Computed Peak Flow = 66.23 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 726.00 min
Peak Flow, Interpolated Output = 66.21 cfs
==========

DRAINAGE AREA

ID:PRE DEVELOPED
CN = 74
Area = 21.360 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

2.9675 in
230089 cu.ft

HYG Volume... 229886 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 20.500 min (ID: PRE DEVELOPED)
Computational Incr, Tm = 2.733 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 70.84 cfs
Unit peak time Tp = 13.667 min
Unit receding limb, Tr = 54.666 min
Total unit time, Tb = 68.333 min

Massillon West Side Elementary
Storm Water Management

Pst-Developed Runoff Conditions
Time of Concentration Calculations
“CN” Calculations
Peak Runoff Rates

Type.... Tc Calcs
Name.... POST DEVELOPED

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n .1500
Hydraulic Length 67.00 ft
2yr, 24hr P 2.4400 in
Slope .067000 ft/ft

Avg.Velocity .22 ft/sec

Segment #1 Time: 5.02 min

Segment #2: Tc: TR-55 Sheet

Mannings n .1500
Hydraulic Length 33.00 ft
2yr, 24hr P 2.4400 in
Slope .241000 ft/ft

Avg.Velocity .32 ft/sec

Segment #2 Time: 1.71 min

Segment #3: Tc: TR-55 Shallow

Hydraulic Length 184.00 ft
Slope .016000 ft/ft
Unpaved

Avg.Velocity 2.04 ft/sec

Segment #3 Time: 1.50 min

Segment #4: Tc: Length & Vel.

Hydraulic Length 674.00 ft
Avg.Velocity 2.50 ft/sec

Segment #4 Time: 4.49 min

Type.... Tc Calcs
Name.... POST DEVELOPED

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

Total Tc:	12.73 min

Type.... Tc Calcs
Name.... POST DEVELOPED

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

==== User Defined Length & Velocity ==========

Tc = (Lf / V) / (3600sec/hr)

Where: Tc = Time of concentration, hrs
Lf = Flow length, ft
V = Velocity, ft/sec

Type.... Runoff CN-Area
Name.... POST DEVELOPED

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

RUNOFF CURVE NUMBER DATA
::

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Lawn "B"	61	1.180			61.00
Lawn "C"	74	.470			74.00
Lawn "D"	80	6.020			80.00
Impervious	98	13.110			98.00
Water	100	.580			100.00
COMPOSITE AREA & WEIGHTED CN --->		21.360			90.41 (90)

::

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1440.00 min Rain Depth = 2.0400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - POST DEVELOPED 1
Tc = 12.73 min
Drainage Area = 21.360 acres Runoff CN= 90

==========
Computational Time Increment = 1.697 min
Computed Peak Time = 721.11 min
Computed Peak Flow = 30.97 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 720.00 min
Peak Flow, Interpolated Output = 30.47 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:POST DEVELOPED
CN = 90
Area = 21.360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

1.1282 in
87476 cu.ft

HYG Volume... 87471 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 12.726 min (ID: POST DEVELOPED)
Computational Incr, Tm = 1.697 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 114.11 cfs
Unit peak time Tp = 8.484 min
Unit receding limb, Tr = 33.935 min
Total unit time, Tb = 42.418 min

Type.... Unit Hyd. Summary
Name.... POST DEVELOPED Tag: 2 Event: 2 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 1440.00 min Rain Depth = 2.4400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - POST DEVELOPED 2
Tc = 12.73 min
Drainage Area = 21.360 acres Runoff CN= 90

==========
Computational Time Increment = 1.697 min
Computed Peak Time = 721.11 min
Computed Peak Flow = 40.38 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 720.00 min
Peak Flow, Interpolated Output = 39.85 cfs
==========

DRAINAGE AREA

ID:POST DEVELOPED
CN = 90
Area = 21.360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

1.4775 in
114563 cu.ft

HYG Volume... 114557 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 12.726 min (ID: POST DEVELOPED)
Computational Incr, Tm = 1.697 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 114.11 cfs
Unit peak time Tp = 8.484 min
Unit receding limb, Tr = 33.935 min
Total unit time, Tb = 42.418 min

Type.... Unit Hyd. Summary
Name.... POST DEVELOPED Tag: 5 Event: 5 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 3.0400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - POST DEVELOPED 5
Tc = 12.73 min
Drainage Area = 21.360 acres Runoff CN= 90

==========
Computational Time Increment = 1.697 min
Computed Peak Time = 721.11 min
Computed Peak Flow = 54.71 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 720.00 min
Peak Flow, Interpolated Output = 54.15 cfs
==========

DRAINAGE AREA

ID:POST DEVELOPED
CN = 90
Area = 21.360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

2.0209 in
156694 cu.ft

HYG Volume... 156685 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 12.726 min (ID: POST DEVELOPED)
Computational Incr, Tm = 1.697 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 114.11 cfs
Unit peak time Tp = 8.484 min
Unit receding limb, Tr = 33.935 min
Total unit time, Tb = 42.418 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 1440.00 min Rain Depth = 3.5600 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - POST DEVELOPED 10
Tc = 12.73 min
Drainage Area = 21.360 acres Runoff CN= 90

==========
Computational Time Increment = 1.697 min
Computed Peak Time = 721.11 min
Computed Peak Flow = 67.20 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 720.00 min
Peak Flow, Interpolated Output = 66.64 cfs
==========

DRAINAGE AREA

ID:POST DEVELOPED
CN = 90
Area = 21.360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

2.5042 in
194165 cu.ft

HYG Volume... 194154 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 12.726 min (ID: POST DEVELOPED)
Computational Incr, Tm = 1.697 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 114.11 cfs
Unit peak time Tp = 8.484 min
Unit receding limb, Tr = 33.935 min
Total unit time, Tb = 42.418 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 1440.00 min Rain Depth = 4.3400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - POST DEVELOPED 25
Tc = 12.73 min
Drainage Area = 21.360 acres Runoff CN= 90

==========
Computational Time Increment = 1.697 min
Computed Peak Time = 721.11 min
Computed Peak Flow = 85.95 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 720.00 min
Peak Flow, Interpolated Output = 85.39 cfs
==========

DRAINAGE AREA

ID:POST DEVELOPED
CN = 90
Area = 21.360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

3.2428 in
251434 cu.ft

HYG Volume... 251420 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 12.726 min (ID: POST DEVELOPED)
Computational Incr, Tm = 1.697 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 114.11 cfs
Unit peak time Tp = 8.484 min
Unit receding limb, Tr = 33.935 min
Total unit time, Tb = 42.418 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 50 year storm
Duration = 1440.00 min Rain Depth = 5.0100 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - POST DEVELOPED 50
Tc = 12.73 min
Drainage Area = 21.360 acres Runoff CN= 90

==========
Computational Time Increment = 1.697 min
Computed Peak Time = 721.11 min
Computed Peak Flow = 101.99 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 720.00 min
Peak Flow, Interpolated Output = 101.44 cfs
==========

DRAINAGE AREA

ID:POST DEVELOPED
CN = 90
Area = 21.360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

3.8860 in
301305 cu.ft

HYG Volume... 301287 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 12.726 min (ID: POST DEVELOPED)
Computational Incr, Tm = 1.697 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 114.11 cfs
Unit peak time Tp = 8.484 min
Unit receding limb, Tr = 33.935 min
Total unit time, Tb = 42.418 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 1440.00 min Rain Depth = 5.7400 in
Rain Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
HYG File - ID = 22-071_D.HYG - POST DEVELOPED 100
Tc = 12.73 min
Drainage Area = 21.360 acres Runoff CN= 90

==========
Computational Time Increment = 1.697 min
Computed Peak Time = 721.11 min
Computed Peak Flow = 119.40 cfs

Time Increment for HYG File = 3.00 min
Peak Time, Interpolated Output = 720.00 min
Peak Flow, Interpolated Output = 118.87 cfs
==========

DRAINAGE AREA

ID:POST DEVELOPED
CN = 90
Area = 21.360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

4.5929 in
356119 cu.ft

HYG Volume... 356098 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 12.726 min (ID: POST DEVELOPED)
Computational Incr, Tm = 1.697 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 114.11 cfs
Unit peak time Tp = 8.484 min
Unit receding limb, Tr = 33.935 min
Total unit time, Tb = 42.418 min

Massillon West Side Elementary
Storm Water Management

Retention Volume Calculations
Retention Basin Outlet Structure

Type.... Vol: Elev-Area
Name.... BELOW WS

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
1060.00	-----	15610	0	0	0
1061.00	-----	17882	50199	16733	16733
1062.00	-----	20255	57169	19056	35789
1063.00	-----	22729	64440	21480	57269
1064.00	-----	25302	72012	24004	81273

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Type.... Vol: Elev-Area
Name.... POND 10

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
1064.00	-----	25302	0	0	0
1065.00	-----	27977	79885	26628	26628
1066.00	-----	30751	88059	29353	55981
1067.00	-----	33627	96535	32178	88160
1068.00	-----	36602	105312	35104	123264
1069.00	-----	39679	114391	38130	161394
1070.00	-----	42856	123772	41257	202651
1070.50	-----	46036	133310	22218	224869

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Type.... Outlet Input Data
Name.... Outlet 1

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Title... Project Date: 2/3/2023
Project Engineer: Thomas Weiss
Project Title: Massillon Westside Elementary
Project Comments:

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 1064.00 ft
Increment = .10 ft
Max. Elev.= 1070.50 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Stand Pipe	4	--->	2	1068.650	1070.500
Orifice-Circular	3	--->	2	1065.530	1070.500
Orifice-Circular	1	--->	2	1064.000	1070.500
Culvert-Circular	2	--->	TW	1063.750	1070.500
Weir-XY Points	5	--->	TW	1069.500	1070.500

TW SETUP, DS Channel

Type.... Outlet Input Data
Name.... Outlet 1

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Title... Project Date: 2/3/2023
Project Engineer: Thomas Weiss
Project Title: Massillon Westside Elementary
Project Comments:

OUTLET STRUCTURE INPUT DATA

Structure ID = 4
Structure Type = Stand Pipe

# of Openings = 1
Invert Elev. = 1068.65 ft
Diameter = 48.00 in
Orifice Area = 12.5664 sq.ft
Orifice Coeff. = .670
Weir Length = 12.57 ft
Weir Coeff. = 3.100
K, Submerged = .000
K, Reverse = 1.000
Kb,Barrel = .000000 (per ft of full flow)
Barrel Length = .00 ft
Mannings n = .0000

Structure ID = 3
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 1065.53 ft
Diameter = 10.00 in
Orifice Coeff. = .670

Structure ID = 1
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 1064.00 ft
Diameter = 5.00 in
Orifice Coeff. = .670

Type.... Outlet Input Data
Name.... Outlet 1

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Title... Project Date: 2/3/2023
Project Engineer: Thomas Weiss
Project Title: Massillon Westside Elementary
Project Comments:

OUTLET STRUCTURE INPUT DATA

Structure ID = 2
Structure Type = Culvert-Circular

No. Barrels	=	1
Barrel Diameter	=	24.00 in
Upstream Invert	=	1063.75 ft
Dnstream Invert	=	1062.00 ft
Horiz. Length	=	91.00 ft
Barrel Length	=	91.02 ft
Barrel Slope	=	.01923 ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0120
Ke	=	.0000 (forward entrance loss)
Kb	=	.010575 (per ft of full flow)
Kr	=	.0000 (reverse entrance loss)
HW Convergence	=	.001 +/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0018
Inlet Control M	=	2.5000
Inlet Control c	=	.03000
Inlet Control Y	=	.7400
T1 ratio (HW/D)	=	1.072
T2 ratio (HW/D)	=	1.210
Slope Factor	=	-.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 1065.89 ft ---> Flow = 15.55 cfs
At T2 Elev = 1066.17 ft ---> Flow = 17.77 cfs

Type.... Outlet Input Data
Name.... Outlet 1

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Title... Project Date: 2/3/2023
Project Engineer: Thomas Weiss
Project Title: Massillon Westside Elementary
Project Comments:

OUTLET STRUCTURE INPUT DATA

Structure ID = 5
Structure Type = Weir-XY Points

# of Openings = 1
WEIR X-Y GROUND POINTS

X, ft	Elev, ft
.00	1070.50
4.00	1069.50
14.00	1069.50
18.00	1070.50

Lowest Elev. = 1069.50 ft

Weir Coeff. = 3.100000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 30
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .10 cfs
Max. Q tolerance = .10 cfs

Type.... Composite Rating Curve
Name.... Outlet 1

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Title... Project Date: 2/3/2023
Project Engineer: Thomas Weiss
Project Title: Massillon Westside Elementary
Project Comments:

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
1064.00	.00	Free Outfall		(no Q: 4,3,1,2,5)
1064.10	.02	Free Outfall	1,2	(no Q: 4,3,5)
1064.20	.08	Free Outfall	1,2	(no Q: 4,3,5)
1064.30	.17	Free Outfall	1,2	(no Q: 4,3,5)
1064.40	.27	Free Outfall	1,2	(no Q: 4,3,5)
1064.50	.39	Free Outfall	1,2	(no Q: 4,3,5)
1064.60	.46	Free Outfall	1,2	(no Q: 4,3,5)
1064.70	.51	Free Outfall	1,2	(no Q: 4,3,5)
1064.80	.57	Free Outfall	1,2	(no Q: 4,3,5)
1064.90	.61	Free Outfall	1,2	(no Q: 4,3,5)
1065.00	.65	Free Outfall	1,2	(no Q: 4,3,5)
1065.10	.69	Free Outfall	1,2	(no Q: 4,3,5)
1065.20	.73	Free Outfall	1,2	(no Q: 4,3,5)
1065.30	.76	Free Outfall	1,2	(no Q: 4,3,5)
1065.40	.80	Free Outfall	1,2	(no Q: 4,3,5)
1065.50	.84	Free Outfall	1,2	(no Q: 4,3,5)
1065.53	.84	Free Outfall	1,2	(no Q: 4,3,5)
1065.60	.88	Free Outfall	3,1,2	(no Q: 4,5)
1065.70	.98	Free Outfall	3,1,2	(no Q: 4,5)
1065.80	1.13	Free Outfall	3,1,2	(no Q: 4,5)
1065.90	1.32	Free Outfall	3,1,2	(no Q: 4,5)
1066.00	1.55	Free Outfall	3,1,2	(no Q: 4,5)
1066.10	1.81	Free Outfall	3,1,2	(no Q: 4,5)
1066.20	2.11	Free Outfall	3,1,2	(no Q: 4,5)
1066.30	2.43	Free Outfall	3,1,2	(no Q: 4,5)
1066.40	2.97	Free Outfall	3,1,2	(no Q: 4,5)
1066.50	3.18	Free Outfall	3,1,2	(no Q: 4,5)
1066.60	3.39	Free Outfall	3,1,2	(no Q: 4,5)
1066.70	3.59	Free Outfall	3,1,2	(no Q: 4,5)
1066.80	3.77	Free Outfall	3,1,2	(no Q: 4,5)
1066.90	3.95	Free Outfall	3,1,2	(no Q: 4,5)
1067.00	4.11	Free Outfall	3,1,2	(no Q: 4,5)
1067.10	4.27	Free Outfall	3,1,2	(no Q: 4,5)
1067.20	4.43	Free Outfall	3,1,2	(no Q: 4,5)

Type.... Composite Rating Curve
Name.... Outlet 1

File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Title... Project Date: 2/3/2023
Project Engineer: Thomas Weiss
Project Title: Massillon Westside Elementary
Project Comments:

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
1067.30	4.57	Free Outfall		3,1,2 (no Q: 4,5)
1067.40	4.72	Free Outfall		3,1,2 (no Q: 4,5)
1067.50	4.85	Free Outfall		3,1,2 (no Q: 4,5)
1067.60	4.98	Free Outfall		3,1,2 (no Q: 4,5)
1067.70	5.12	Free Outfall		3,1,2 (no Q: 4,5)
1067.80	5.24	Free Outfall		3,1,2 (no Q: 4,5)
1067.90	5.38	Free Outfall		3,1,2 (no Q: 4,5)
1068.00	5.49	Free Outfall		3,1,2 (no Q: 4,5)
1068.10	5.61	Free Outfall		3,1,2 (no Q: 4,5)
1068.20	5.73	Free Outfall		3,1,2 (no Q: 4,5)
1068.30	5.83	Free Outfall		3,1,2 (no Q: 4,5)
1068.40	5.96	Free Outfall		3,1,2 (no Q: 4,5)
1068.50	6.07	Free Outfall		3,1,2 (no Q: 4,5)
1068.60	6.17	Free Outfall		3,1,2 (no Q: 4,5)
1068.65	6.22	Free Outfall		3,1,2 (no Q: 4,5)
1068.70	6.70	Free Outfall		4,3,1,2 (no Q: 5)
1068.80	8.61	Free Outfall		4,3,1,2 (no Q: 5)
1068.90	11.27	Free Outfall		4,3,1,2 (no Q: 5)
1069.00	14.50	Free Outfall		4,3,1,2 (no Q: 5)
1069.10	18.00	Free Outfall		4,3,1,2 (no Q: 5)
1069.20	21.74	Free Outfall		4,3,1,2 (no Q: 5)
1069.30	25.70	Free Outfall		4,3,1,2 (no Q: 5)
1069.40	29.79	Free Outfall		4,3,1,2 (no Q: 5)
1069.50	37.56	Free Outfall		4,2 (no Q: 3,1,5)
1069.60	39.01	Free Outfall		4,2,5 (no Q: 3,1)
1069.70	41.36	Free Outfall		4,2,5 (no Q: 3,1)
1069.80	44.38	Free Outfall		4,2,5 (no Q: 3,1)
1069.90	48.01	Free Outfall		4,2,5 (no Q: 3,1)
1070.00	52.21	Free Outfall		4,2,5 (no Q: 3,1)
1070.10	56.95	Free Outfall		4,2,5 (no Q: 3,1)
1070.20	62.26	Free Outfall		4,2,5 (no Q: 3,1)
1070.30	68.12	Free Outfall		4,2,5 (no Q: 3,1)
1070.40	74.53	Free Outfall		4,2,5 (no Q: 3,1)
1070.50	81.48	Free Outfall		4,2,5 (no Q: 3,1)

Massillon West Side Elementary
Storm Water Management

Detention Basin Peak Release Rates

Type.... Pond Routing Summary
Name.... POND 10 OUT Tag: 1 Event: 1 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Storm... TypeII 24hr Tag: 1

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Inflow HYG file = NONE STORED - POND 10 IN 1
Outflow HYG file = NONE STORED - POND 10 OUT 1

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 1064.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 3.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY
==========
Peak Inflow = 30.47 cfs at 720.00 min
Peak Outflow = 1.38 cfs at 843.00 min

Peak Elevation = 1065.93 ft
Peak Storage = 53740 cu.ft
==========

MASS BALANCE (cu.ft)

+ Initial Vol = 0
+ HYG Vol IN = 87471
- Infiltration = 0
- HYG Vol OUT = 86506
- Retained Vol = 962

Unrouted Vol = -2 cu.ft (.003% of Inflow Volume)

Type.... Pond Routing Summary
Name.... POND 10 OUT Tag: 2 Event: 2 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Storm... TypeII 24hr Tag: 2

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Inflow HYG file = NONE STORED - POND 10 IN 2
Outflow HYG file = NONE STORED - POND 10 OUT 2

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 1064.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 3.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY
==========
Peak Inflow = 39.85 cfs at 720.00 min
Peak Outflow = 2.68 cfs at 789.00 min

Peak Elevation = 1066.35 ft
Peak Storage = 66839 cu.ft
==========

MASS BALANCE (cu.ft)

+ Initial Vol = 0
+ HYG Vol IN = 114557
- Infiltration = 0
- HYG Vol OUT = 113539
- Retained Vol = 1015

Unrouted Vol = -2 cu.ft (.002% of Inflow Volume)

Type.... Pond Routing Summary
Name.... POND 10 OUT Tag: 5 Event: 5 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Storm... TypeII 24hr Tag: 5

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Inflow HYG file = NONE STORED - POND 10 IN 5
Outflow HYG file = NONE STORED - POND 10 OUT 5

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 1064.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 3.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY
==========
Peak Inflow = 54.15 cfs at 720.00 min
Peak Outflow = 4.19 cfs at 771.00 min

Peak Elevation = 1067.05 ft
Peak Storage = 89772 cu.ft
==========

MASS BALANCE (cu.ft)

+ Initial Vol = 0
+ HYG Vol IN = 156685
- Infiltration = 0
- HYG Vol OUT = 155614
- Retained Vol = 1068

Unrouted Vol = -3 cu.ft (.002% of Inflow Volume)

Type.... Pond Routing Summary
Name.... POND 10 OUT Tag: 10 Event: 10 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Storm... TypeII 24hr Tag: 10

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Inflow HYG file = NONE STORED - POND 10 IN 10
Outflow HYG file = NONE STORED - POND 10 OUT 10

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 1064.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 3.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY
==========
Peak Inflow = 66.64 cfs at 720.00 min
Peak Outflow = 5.11 cfs at 774.00 min

Peak Elevation = 1067.69 ft
Peak Storage = 112191 cu.ft
==========

MASS BALANCE (cu.ft)

+ Initial Vol = 0
+ HYG Vol IN = 194154
- Infiltration = 0
- HYG Vol OUT = 193045
- Retained Vol = 1105

Unrouted Vol = -3 cu.ft (.002% of Inflow Volume)

Type.... Pond Routing Summary
Name.... POND 10 OUT Tag: 25 Event: 25 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Storm... TypeII 24hr Tag: 25

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Inflow HYG file = NONE STORED - POND 10 IN 25
Outflow HYG file = NONE STORED - POND 10 OUT 25

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 1064.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 3.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY
==========
Peak Inflow = 85.39 cfs at 720.00 min
Peak Outflow = 6.22 cfs at 771.00 min

Peak Elevation = 1068.65 ft
Peak Storage = 147595 cu.ft
==========

MASS BALANCE (cu.ft)

+ Initial Vol = 0
+ HYG Vol IN = 251420
- Infiltration = 0
- HYG Vol OUT = 250262
- Retained Vol = 1155

Unrouted Vol = -3 cu.ft (.001% of Inflow Volume)

Type.... Pond Routing Summary
Name.... POND 10 OUT Tag: 50 Event: 50 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Storm... TypeII 24hr Tag: 50

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Inflow HYG file = NONE STORED - POND 10 IN 50
Outflow HYG file = NONE STORED - POND 10 OUT 50

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 1064.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 3.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY
==========
Peak Inflow = 101.44 cfs at 720.00 min
Peak Outflow = 17.72 cfs at 744.00 min

Peak Elevation = 1069.09 ft
Peak Storage = 165054 cu.ft
==========

MASS BALANCE (cu.ft)

+ Initial Vol = 0
+ HYG Vol IN = 301287
- Infiltration = 0
- HYG Vol OUT = 300103
- Retained Vol = 1180

Unrouted Vol = -4 cu.ft (.001% of Inflow Volume)

Type.... Pond Routing Summary
Name.... POND 10 OUT Tag: 100 Event: 100 yr
File.... E:\2022\22-00-09\22-07\22-071\d-calcs\22-071_DET.PPW
Storm... TypeII 24hr Tag: 100

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\2022\22-00-09\22-07\22-071\d-calcs\
Inflow HYG file = NONE STORED - POND 10 IN 100
Outflow HYG file = NONE STORED - POND 10 OUT 100

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 1064.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 3.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY
==========
Peak Inflow = 118.87 cfs at 720.00 min
Peak Outflow = 37.56 cfs at 735.00 min

Peak Elevation = 1069.50 ft
Peak Storage = 181625 cu.ft
==========

MASS BALANCE (cu.ft)

+ Initial Vol = 0
+ HYG Vol IN = 356098
- Infiltration = 0
- HYG Vol OUT = 354891
- Retained Vol = 1204

Unrouted Vol = -2 cu.ft (.001% of Inflow Volume)

Massillon West Side Elementary
Storm Water Management

Sediment Basin Calculations

SEDIMENT BASIN CALCULATIONS
FOR
MASSILLON WESTSIDE ELEMENTARY SCHOOL
LOCATED IN
CITY OF MASSILLON, STARK COUNTY, OHIO

SEDIMENT STORAGE ZONE VOLUME:

METHOD 1:

Disturbed Area (DA) in drainage watershed: 13.60 acres.

SSZV = 1,000 c.f./acre * DA

SSZV = 1,000 c.f./acre * 13.60 acres

SSZV =13,600c.f.

At elevation 1064.00 – 81,273 c.f. is provided in the surface detention

DEWATERING ZONE VOLUME:

Total Drainage Area (TDA) of contributing area: 21.36 acres.

DZV = 1,800 c.f./acre * TDA acres

DZV = 1,800 c.f./acre * 21.36 acres

DZV = 38,448 c.f.

At elevation 1065.53 (above elevation 1064.00) – 42,185 c.f. is provided in the sediment basin

OUTLET DRAWDOWN:

Outlet must drawdown the dewatering zone between 48 hours and 7 days.
Floating skimmer method shall be used.
Skimmer bottom shall be at the top or above the sediment storage zone volume.

SKIMMER SIZING:

Dewatering calculations are based on the contractor using a “Faircloth Skimmer”.

DZV = 38,448 c.f.
Drawdown Time = 48 hours = 2 days

From sheet 2 of “Determining the Skimmer Size and the Required Orifice for the Faircloth Skimmer Surface Drain” a 4” diameter skimmer with a reduced orifice should be used.

ORIFICE SIZING:

Orifice Area = DZV / FACTOR

DZV = 38,448 c.f.
FACTOR = 3,202 c.f./sq. in.

OA = 38,448 c.f. / 3,202 c.f./sq. in. = 12.01 sq. in.

Orifice Diameter = sq. root (4 * OA / 3.14)

OD = sq. root (4 * 12.01 sq. in. / 3.14)

OD= 3.91 in.

RESULTS:

USE A 4” DIAMETER SKIMMER WITH A 3.91” DIAMETER ORIFICE.

Determining the Skimmer Size and the Required Orifice for the *Faircloth Skimmer®* Surface Drain

November 2007

Important note: *The orifice sizing chart in the Pennsylvania Erosion Control Manual and reproduced in the North Carolina Design Manual* ***DOES NOT APPLY*** *to our skimmers. It will give the wrong size orifice and not specify which size skimmer is required. Please use the information below to choose the size skimmer required for the basin volume provided and determine the orifice size required for the drawdown time, typically 4-7 days in Pennsylvania and 3 days in North Carolina.*

The **size** of a Faircloth Skimmer®, for example a 4" skimmer, refers to the maximum diameter of the skimmer inlet. The inlet on each of the 8 sizes offered can be reduced to adjust the flow rate by cutting a hole or ***orifice*** in a plug using an adjustable cutter (both supplied).

Determining the skimmer size needed and the orifice for that skimmer required to drain the sediment basin's volume in the required time involves two steps: **First**, determining the size skimmer required based on the volume to be drained and the number of days to drain it; and **Second,** calculate the orifice size to adjust the flow rate and "customize" the skimmer for the basin's volume. *The second step is not always necessary* if the flow rate for the skimmer with the inlet wide open equals or is close to the flow rate required for the basin volume and the drawdown time.

Both the skimmer size and the required orifice radius for the skimmer should be shown for each basin on the erosion and sediment control plan. Make it clear that the dimension is either the radius or the diameter. It is also helpful to give the basin volume in case there are questions. During the skimmer installation the required orifice can be cut in the plastic plug using the supplied adjustable cutter and installed in the skimmer using the instructions provided.

The plan review and enforcement authority may require the calculations showing that the skimmer used can drain the basin in the required time.

Determining the Skimmer Size

Step 1. Below are approximate **skimmer maximum flow capacities** based on typical draw down requirements, which can vary between States and jurisdictions and watersheds. If one 6" skimmer does not provide enough capacity, multiple skimmers can be used to drain the basin. For drawdown times not shown, multiply the 24-hour figure by the number of days required.

Example: A basin's volume is 29,600 cubic feet and it must be drained in 3 days. A 3" skimmer with the inlet wide open will work perfectly. (Actually, the chart below gives 29,322 cubic feet but this is well within the accuracy of the calculations and the basin's constructed volume.)
Example: A basin's volume is 39,000 cubic feet and it must be drained in 3 days. The 3"

skimmer is too small; a 4" skimmer has enough capacity but it is too large, so the inlet will need to be reduced using step 2 to adjust the flow rate for the basin's volume. (It needs a 3.2" diameter orifice.)

1½" skimmer:	1,728 cubic feet in **24 hours**	6,912 cubic feet in **4 days**
with a 1½" head	3,456 cubic feet in **2 days**	12,096 cubic feet in **7 days**
	5,184 cubic feet in **3 days**	
2" skimmer:	3,283 cubic feet in **24 hours**	13,132 cubic feet in **4 days**
with a 2" head	6,566 cubic feet in **2 days**	22,982 cubic feet in **7 days**
	9,849 cubic feet in **3 days**	
2½" skimmer:	6,234 cubic feet in **24 hours**	24,936 cubic feet in **4 days**
with a 2.5" head	12,468 cubic feet in **2 days**	43,638 cubic feet in **7 days**
	18,702 cubic feet in **3 days**	
3" skimmer:	9,774 cubic feet in **24 hours**	39,096 cubic feet in **4 days**
with a 3" head	19,547 cubic feet in **2 days**	68,415 cubic feet in **7 days**
	29,322 cubic feet in **3 days**	
4" skimmer:	20,109 cubic feet in **24 hours**	80,436 cubic feet in **4 days**
with a 4" head	40,218 cubic feet in **2 days**	140,763 cubic feet in **7 days**
	60,327 cubic feet in **3 days**	
5" skimmer:	32,832 cubic feet in **24 hours**	131,328 cubic feet in **4 days**
with a 4" head	65,664 cubic feet in **2 days**	229,824 cubic feet in **7 days**
	98,496 cubic feet in **3 days**	
6" skimmer:	51,840 cubic feet in **24 hours**	207,360 cubic feet in **4 days**
with a 5" head	103,680 cubic feet in **2 days**	362,880 cubic feet in **7 days**
	155,520 cubic feet in **3 days**	
8" skimmer:	97,978 cubic feet in **24 hours**	391,912 cubic feet in **4 days**
with a 6" head	195,956 cubic feet in **2 days**	685,846 cubic feet in **7 days**
	293,934 cubic feet in **3 days**	

Determining the Orifice

Step 2. To determine the orifice required to reduce the flow rate for the basin's volume and the number of days to drain the basin, simply use the formula volume ÷ **factor** (from the chart below) for the same size skimmer chosen in the first step and the same number of days. This calculation will give the **area** of the required orifice. Then calculate the orifice radius using Area = π r^2 and solving for *r,* $r = \sqrt{(Area / 3.14)}$ .The supplied cutter can be adjusted to this radius to cut the orifice in the plug. The instructions with the plug and cutter has a ruler divided into tenths of inches. Again, this step is not always necessary as explained above.

An alternative method is to use the orifice equation with the head for a particular skimmer shown on the previous page and determine the orifice needed to give the required flow for the volume and draw down time. C = 0.59 is used in this chart.

Example: A 4" skimmer is the smallest skimmer that will drain 39,000 cubic feet in 3 days but a 4" inlet will drain the basin too fast (in 1.9 days) To determine the orifice required use the factor of 4,803 from the chart below for a 4" skimmer and a drawdown time of 3 days. 39,000 cubic feet ÷ 4,803 = 8.12 square inches of orifice required. Calculate the orifice radius using Area = π r^2 and solving for r, $r = \sqrt{(8.12/3.14)}$ and r = 1.61". As a practical matter 1.6" is about as close as the cutter can be adjusted and the orifice cut..

Factors (in cubic feet of flow per square inch of opening through a **round** orifice with the head for that skimmer and for the drawdown times shown) for determining the **orifice radius** for a basin's volume to be drained. This quick method works because the orifice is centered and has a constant head (given above in Step 1).

1½" skimmer:	960 to drain in **24 hours**	3,840 to drain in **4 days**
	1,920 to drain in **2 days**	6,720 to drain in **7 days**
	2,880 to drain in **3 days**	
2" skimmer:	1,123 to drain in **24 hours**	4,492 to drain in **4 days**
	2,246 to drain in **2 days**	7,861 to drain in **7 days**
	3,369 to drain in **3 days**	
2½" skimmer:	1,270 to drain in **24 hours**	5,080 to drain in **4 days**
Revised 11-6-07	2,540 to drain in **2 days**	8,890 to drain in **7 days**
	3,810 to drain in **3 days**	
3" skimmer:	1,382 to drain in **24 hours**	5,528 to drain in **4 days**
	2,765 to drain in **2 days**	9,677 to drain in **7 days**
	4,146 to drain in **3 days**	
4" skimmer:	1,601 to drain in **24 hours**	6,404 to drain in **4 days**
Revised 11-6-07	3,202 to drain in **2 days**	11,207 to drain in **7 days**
	4,803 to drain in **3 days**	
5" skimmer:	1,642 to drain in **24 hours**	6,568 to drain in **4 days**
	3,283 to drain in **2 days**	11,491 to drain in **7 days**
	4,926 to drain in **3 days**	
6" skimmer:	1,814 to drain in **24 hours**	7,256 to drain in **4 days**
	3,628 to drain in **2 days**	12,701 to drain in **7 days**
	5,442 to drain in **3 days**	
8" skimmer:	1,987 to drain in **24 hours**	7,948 to drain in **4 days**
	3,974 to drain in **2 days**	13,909 to drain in **7 days**
	5,961 to drain in **3 days**	

J. W. Faircloth & Son, Inc.
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Hillsborough, North Carolina 27278

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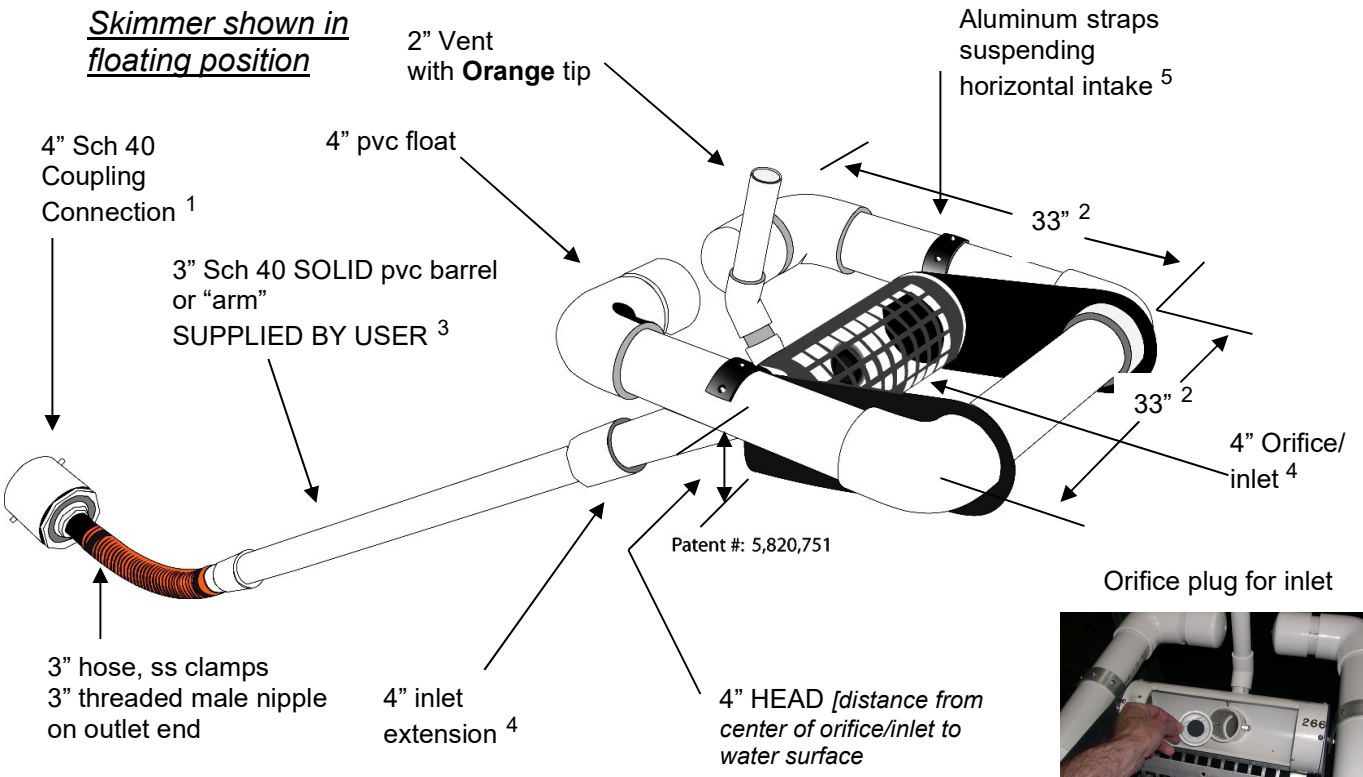
FairclothSkimmer.com

Orifice sizing Revised 2-2-01; 3-3-05; 2-1-07; 11-6-07; 3-20-20.

4” *Faircloth Skimmer®* Surface Drain Cut Sheet

J. W. Faircloth & Son, Inc.
www.FairclothSkimmer.com



Orifice plug for inlet

1. Coupling can be removed and hose attached to outlet using the threaded 3” nipple. Typical methods used: a) a metal structure with a steel stub out welded on the side at the bottom with a 3” threaded coupling or reducer(s); b) a concrete structure with a hole or orifice at the bottom - use a steel plate with a hole cut in it and coupling welded to it that will fit over the hole in the concrete and bolted to the structure with sealant; or c) it is possible to grout a 4” pvc pipe in a hole in the concrete to connect the skimmer but this is less secure than other methods.

2. Dimensions are approximate, not intended as plans for construction.

3. Barrel (solid, not foam core pipe) should be 1.4 times the depth of water with a minimum length of 8’ so the inlet can be pulled to the side for maintenance. If more than 10’ long, weight may have to be added to inlet to counter the increased buoyancy.

4. Orifice/inlet tapers down from 4” maximum inlet to a 3” barrel and hose. Barrel is smaller to reduce buoyancy and tendency to lift inlet but is sufficient for flow through inlet because of slope. The orifice/inlet can be reduced using the plug and cutter provided to control the outflow rate – see #6.

5. Horizontal intake is 8” pipe between the straps with slots cut in the inlet and aluminum screen door (smaller than shown in illustration) for access to the 4” inlet and orifice inside.

6. **Capacity:** 20,109 cubic feet per day maximum with 4” inlet and 4” head. Inlet can be reduced by installing a smaller orifice using the plug and cutter provided to adjust flow rate for the particular drawdown time required. Please use the sizing template at www.fairclothskimmer.com .

7. Ships assembled. User glues inlet extension and barrel, installs vent, cuts orifice in plug and attaches to outlet pipe or structure. Includes float, flexible hose, rope, orifice plug and cutter. Does NOT include 3” Sch 40 SOLID pvc barrel or “arm” SUPPLIED BY USER.

Massillon West Side Elementary
Storm Water Management

Storm Sewer Calculations

MASSILLON WESTSIDE ELEMENTARY
CITY OF MASSILLON
3/22/2023
PROJECT #22-071

C VALUES
LAWN = 0.40
WOODS = 0.35
IMPERVIOUS = 0.96

	AREAS					
STRUCTURE #	LAWN	IMPERVIOUS	DOWNSPOUT	WOODS	TOTAL	"C" VALUE
ST1	HEADWALL					
ST2	OUTLET STRUCTURE					
ST3	HEADWALL					
ST4	MANHOLE					
ST5	HEADWALL					
ST6	MANHOLE					
ST7	HEADWALL					
ST8	MANHOLE					
ST9	0.07	0.13		0.00	0.20	0.76
ST10	0.00	0.00	0.24	0.00	0.24	0.96
ST11	0.22	0.00	0.00	0.00	0.22	0.40
ST12	0.25	0.14		0.00	0.39	0.60
ST13	0.32	0.29		0.00	0.61	0.67
ST14	0.11	0.16		0.00	0.27	0.73
ST15	0.93	1.91	0.00	0.00	2.84	0.78
ST16			0.11	0.00	0.11	0.96
ST17	0.02	0.09		0.00	0.11	0.86
ST18	0.14	0.23		0.00	0.37	0.75
ST19	0.90	0.00	0.00	0.00	0.90	0.40
ST20	0.10	0.19		0.00	0.29	0.77
ST21	0.15	0.00	0.00	0.00	0.15	0.40
ST22	0.05	0.17		0.00	0.22	0.83
ST23	MANHOLE					
ST24	0.35	0.63		0.00	0.98	0.76
ST25	0.00	0.15	0.14	0.00	0.29	0.96
ST26	MANHOLE					
ST27	0.10	0.39		0.00	0.49	0.85
ST28	0.06	0.00		0.00	0.06	0.40
ST29	0.19	0.00	0.00	0.00	0.19	0.40
ST30			0.22	0.00	0.22	0.96
ST31			0.15	0.00	0.15	0.96
ST32			0.07	0.00	0.07	0.96
ST33			0.04	0.00	0.04	0.96
ST34			0.17	0.00	0.17	0.96
ST35			0.19	0.00	0.19	0.96
ST36			0.07	0.00	0.07	0.96
ST37			0.09	0.00	0.09	0.96
ST38			0.09	0.00	0.09	0.96

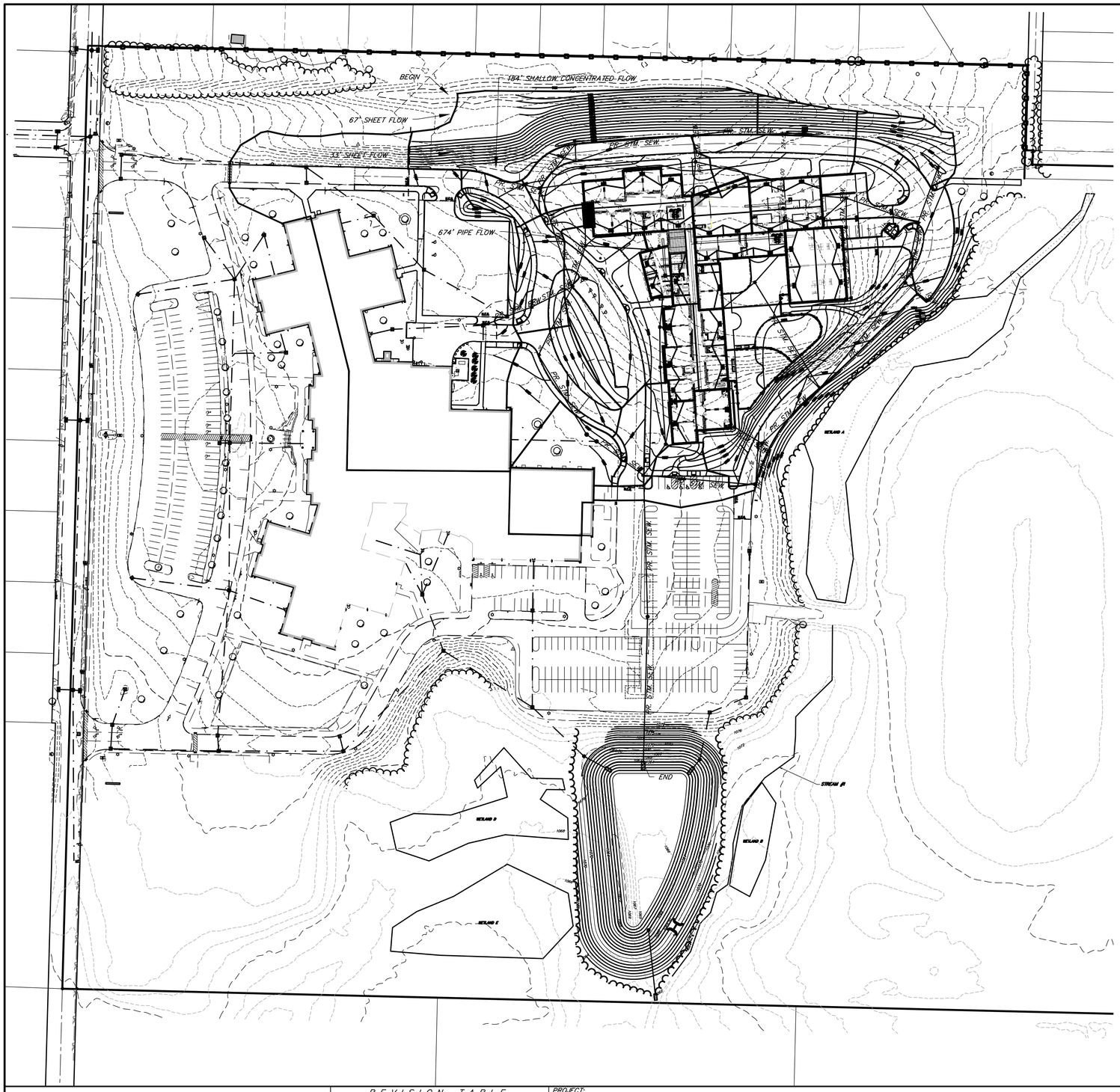
Lewis Land Professionals, Inc.
8691 Wadsworth Road Suite 100 Wadsworth, Ohio 44281
(330) 335-8232

STORM SEWER COMPUTATION SHEET

PROJECT:	Massillon Westside Elementary School								BY:	TAW			n=0.013 - RCP		
DATE:	3/27/2023	10-yr Design Storm							CHECKED BY:				n=0.012 - HDPE		
M.H. or C.B. No.	Drains to	DRAINAGE AREA					TIME		RAINFALL INTENSITY	DISCHARGE	PIPE	PIPE	PIPE	MEAN	CAPACITY	REMARKS
		ΔA	ΣA	C	ΔCA	ΣCA	ΔT	ΣT	I_s	Q_s	LEN-GTH	SLOPE	SIZE	VELOCITY	FLOWING FULL	
		ACRES	ACRES		ACRES	ACRES	MIN.	MIN.	IN./HR.	C.F.S.	FT.	FT./FT.	IN.	F.P.S.	C.F.S.	
ST38	ST37	0.09	0.09	0.96	0.09	0.09	10	10	4.90	0.42	100	0.0100	12	4.55	3.57	HDPE
ST37	ST36	0.09	0.18	0.96	0.09	0.17	10	10	4.90	0.85	41	0.0100	12	4.55	3.57	HDPE
ST36	ST28	0.07	0.25	0.96	0.07	0.24	10	10	4.90	1.18	107	0.0100	12	4.55	3.57	HDPE
ST29	ST28	0.19	0.19	0.40	0.08	0.08	10	10	4.90	0.37	83	0.0144	12	5.46	4.29	HDPE
ST28	ST26	0.06	0.50	0.40	0.02	0.34	10	10	4.90	1.67	86	0.0074	12	3.91	3.07	HDPE
ST27	ST26	0.49	0.49	0.85	0.42	0.42	10	10	4.90	2.04	40	0.0100	12	4.55	3.57	HDPE
ST26	ST24		0.99		0.00	0.76	10	10	4.90	3.71	192	0.0113	15	5.61	6.89	HDPE
ST25	ST24	0.29	0.29	0.96	0.28	0.28	10	10	4.90	1.36	175	0.0370	12	8.75	6.87	HDPE
ST24	ST23	0.98	2.26	0.76	0.74	1.78	10	10	4.90	8.72	113	0.0100	18	5.96	10.53	HDPE
ST35	ST23	0.19	0.19	0.96	0.18	0.18	10	10	4.90	0.89	45	0.0909	12	13.71	10.77	HDPE
ST23	ST22		2.45		0.00	1.96	10	10	4.90	9.61	59	0.0100	18	5.96	10.53	HDPE
ST22	ST9	0.22	2.67	0.83	0.18	2.14	10	10	4.90	10.51		0.0100	18	5.96	10.53	HDPE

M.H. or C.B. No.	Drains to	DRAINAGE AREA					TIME		RAINFALL INTENSITY	DISCHARGE	PIPE	PIPE	PIPE	MEAN	CAPACITY	REMARKS
		ΔA	ΣA	C	ΔCA	ΣCA	ΔT	ΣT	I_s	Q_s	LEN-GTH	SLOPE	SIZE	VELOCITY	FLOWING FULL	
ST21	ST20	0.19	0.19	0.40	0.08	0.08	10	10	4.90	0.37	157	0.0100	12	4.55	3.57	HDPE
ST30	ST20	0.22	0.22	0.96	0.21	0.21	10	10	4.90	1.03	37	0.0237	12	7.00	5.50	HDPE
ST20	ST18	0.29	0.70	0.77	0.22	0.51	10	10	4.90	2.50	165	0.0100	12	4.55	3.57	HDPE
ST19	ST18	0.90	0.90	0.40	0.36	0.36	10	10	4.90	1.76	5	0.0200	12	6.43	5.05	HDPE
ST18	ST16	0.37	1.97	0.75	0.28	1.15	10	10	4.90	5.63	80	0.0100	15	5.28	6.48	HDPE
ST17	ST16	0.11	0.11	0.86	0.09	0.09	10	10	4.90	0.46	55	0.0100	12	4.55	3.57	HDPE
ST16	ST13	0.11	2.19	0.96	0.11	1.35	10	10	4.90	6.61	147	0.0100	18	5.96	10.53	HDPE
ST31	ST13	0.15	0.15	0.96	0.14	0.14	10	10	4.90	0.71	61	0.0329	12	8.25	6.48	HDPE
ST15	ST14	2.84	2.84	0.78	2.22	2.22	10	10	4.90	10.85	36	0.0050	24	5.11	16.04	HDPE
ST14	ST13	0.27	3.11	0.73	0.20	2.41	10	10	4.90	11.82	65	0.0050	24	5.11	16.04	HDPE
ST13	ST12	0.61	6.06	0.67	0.41	4.31	10	10	4.90	21.13	107	0.0100	24	7.22	22.68	HDPE
ST12	ST11	0.39	6.45	0.60	0.23	4.55	10	10	4.90	22.28	131	0.0100	24	7.22	22.68	HDPE
ST11	ST10	0.22	6.67	0.40	0.09	4.64	10	10	4.90	22.71	17	0.0100	30	8.38	41.13	HDPE
ST10	ST9	0.24	6.91	0.96	0.23	4.87	10	10	4.90	23.84	82	0.0100	30	8.38	41.13	HDPE

M.H. or C.B. No.	Drains to	DRAINAGE AREA					TIME		RAINFALL INTENSITY	DISCHARGE	PIPE LEN-GTH	PIPE SLOPE	PIPE SIZE	MEAN VELOCITY	CAPACITY FLOWING FULL	REMARKS
		ΔA	ΣA	C	ΔCA	ΣCA	ΔT	ΣT	I_s	Q_s						
ST34	ST33	0.17	0.17	0.96	0.16	0.16	10	10	4.90	0.80	57	0.0100	12	4.55	3.57	HDPE
ST33	ST32	0.04	0.21	0.96	0.04	0.20	10	10	4.90	0.99	109	0.0100	12	4.55	3.57	HDPE
ST32	ST9	0.07	0.28	0.96	0.07	0.27	10	10	4.90	1.32	53	0.0100	12	4.55	3.57	HDPE
ST9	ST8	0.20	10.06	0.76	0.15	7.43	10	10	4.90	36.41	200	0.0100	30	8.38	41.13	HDPE
ST8	ST7		10.06		0.00	7.43	10	10	4.90	36.41	205	0.0244	30	13.09	64.24	HDPE



NORTH

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

– PLAN PREPARED BY –

LEWIS LAND PROFESSIONALS INC.

LEWIS LAND PROFESSIONALS

CIVIL ENGINEERING LAND SURVEYING
8691 WADSWORTH ROAD SUITE 100
WADSWORTH, OH 44281 (330) 335-8232

REVISION TABLE

NO.	DATE	DESCRIPTION	BY

PROJECT:
MASSILLON CSD WESTSIDE ELEMENTARY SCHOOL

TITLE:
STORM SEWER CALCULATIONS

SCALES:
HORIZONTAL 1"=80'

DRAWING FILE:
22-071_D-CALCS.DWG

M.C.S.E. NUMBER:
N/A

DATE:
3/24/2023

PROJECT NUMBER:
22-071

SHEET NUMBER:
1 of 1

Massillon West Side Elementary
Storm Water Management

Supporting Documents

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 Stark County, Ohio

Massillon West Elementary

January 27, 2023

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 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: Stark County, Ohio
Survey Area Data: Version 19, Sep 12, 2022

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

Date(s) aerial images were photographed: May 25, 2014—Aug 21, 2020

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
CdB	Canfield silt loam, 2 to 6 percent slopes	36.7	50.9%
CdC	Canfield silt loam, 6 to 12 percent slopes	2.6	3.6%
LoB	Loudonville silt loam, 2 to 6 percent slopes	3.2	4.4%
LoC	Loudonville silt loam, 6 to 12 percent slopes	8.2	11.4%
ReA	Ravenna silt loam, 0 to 2 percent slopes	6.7	9.2%
Se	Sebring silt loam, till substratum, 0 to 2 percent slopes	8.4	11.7%
WrB	Wheeling silt loam, 3 to 8 percent slopes	3.9	5.5%
WuC	Wooster silt loam, 6 to 12 percent slopes	1.2	1.7%
WuC2	Wooster silt loam, 6 to 12 percent slopes, moderately eroded	0.0	0.0%
WuD2	Wooster silt loam, 12 to 18 percent slopes, moderately eroded	1.1	1.5%
Totals for Area of Interest		**72.1**	**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.

Stark County, Ohio

CdB—Canfield silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2v03t
Elevation: 590 to 1,970 feet
Mean annual precipitation: 33 to 52 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Canfield

Setting

Landform: Till plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Till

Typical profile

Ap - 0 to 6 inches: silt loam
BE - 6 to 9 inches: silt loam
Bt1 - 9 to 15 inches: silt loam
2Bt2 - 15 to 21 inches: loam
2Bt3 - 21 to 26 inches: loam
2Btx1 - 26 to 38 inches: loam
2Btx2 - 38 to 45 inches: loam
2C1 - 45 to 62 inches: loam
2C2 - 62 to 80 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 15 to 30 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 10 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F139XY004OH - Moist Acidic Slopes

Hydric soil rating: No

Minor Components

Ravenna

Percent of map unit: 10 percent
Landform: Till plains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

CdC—Canfield silt loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2v040
Elevation: 590 to 1,970 feet
Mean annual precipitation: 33 to 52 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Canfield

Setting

Landform: Till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Till

Typical profile

Ap - 0 to 6 inches: silt loam
BE - 6 to 9 inches: silt loam
Bt1 - 9 to 15 inches: silt loam
2Bt2 - 15 to 21 inches: loam
2Bt3 - 21 to 26 inches: loam
2Btx1 - 26 to 38 inches: loam
2Btx2 - 38 to 45 inches: loam
2C1 - 45 to 62 inches: loam
2C2 - 62 to 80 inches: loam

Properties and qualities

Slope: 6 to 12 percent

Depth to restrictive feature: 15 to 30 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 10 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Ecological site: F139XY004OH - Moist Acidic Slopes
Hydric soil rating: No

Minor Components

Ravenna

Percent of map unit: 10 percent
Landform: Till plains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

LoB—Loudonville silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 9nq8
Elevation: 900 to 1,200 feet
Mean annual precipitation: 32 to 42 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 130 to 195 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Loudonville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loudonville

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear

Parent material: Till over residuum weathered from sandstone

Typical profile

H1 - 0 to 14 inches: silt loam
H2 - 14 to 28 inches: loam
H4 - 28 to 56 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
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
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F139XY007OH - Shallow Acidic Slopes
Hydric soil rating: No

Minor Components

Muskingum

Percent of map unit:
Landform: Hills

Gilpin

Percent of map unit:
Landform: Hills

Nearly level areas

Percent of map unit:

LoC—Loudonville silt loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 9nq9
Elevation: 900 to 1,200 feet
Mean annual precipitation: 32 to 42 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 130 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Loudonville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loudonville

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Till over residuum weathered from sandstone

Typical profile

H1 - 0 to 14 inches: silt loam
H2 - 14 to 28 inches: loam
H4 - 28 to 56 inches: unweathered bedrock

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
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
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F139XY007OH - Shallow Acidic Slopes
Hydric soil rating: No

Minor Components

Gilpin

Percent of map unit:
Landform: Hills

Muskingum

Percent of map unit:
Landform: Hills

ReA—Ravenna silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2v04m
Elevation: 590 to 1,970 feet
Mean annual precipitation: 33 to 52 inches
Mean annual air temperature: 43 to 52 degrees F

Frost-free period: 135 to 215 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Ravenna

Setting

Landform: Till plains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Till

Typical profile

Ap - 0 to 8 inches: silt loam
BE - 8 to 12 inches: silt loam
Bt - 12 to 22 inches: silt loam
Btx - 22 to 48 inches: loam
BC - 48 to 53 inches: loam
C - 53 to 74 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 14 to 30 inches to fragipan
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 7 to 11 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: D
Ecological site: F139XY004OH - Moist Acidic Slopes
Hydric soil rating: No

Minor Components

Frenchtown

Percent of map unit: 6 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Canfield

Percent of map unit: 4 percent
Landform: Till plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Se—Sebring silt loam, till substratum, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2v05b
Elevation: 590 to 1,970 feet
Mean annual precipitation: 33 to 52 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Sebring, Till Substratum

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Glaciolacustrine deposits over till

Typical profile

Ap - 0 to 9 inches: silt loam
BEg - 9 to 14 inches: silt loam
Btg - 14 to 38 inches: silty clay loam
BCg - 38 to 41 inches: silty clay loam
2Cg - 41 to 72 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 0 to 9 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 9 percent

Available water supply, 0 to 60 inches: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: F139XY011OH - Wet Calcareous Depression
Hydric soil rating: Yes

Minor Components

Fitchville

Percent of map unit: 10 percent
Landform: Lakebeds (relict), terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Luray

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

WrB—Wheeling silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w1vp
Elevation: 490 to 1,250 feet
Mean annual precipitation: 38 to 42 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 110 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Wheeling

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium over sandy and gravelly glaciofluvial deposits

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 48 inches: silt loam
2BC - 48 to 60 inches: gravelly very fine sandy loam
2C - 60 to 80 inches: stratified very gravelly loamy sand to gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Forage suitability group: Unnamed (G124XYA-1OH)
Other vegetative classification: Unnamed (G124XYA-1OH)
Hydric soil rating: No

Minor Components

Taggart

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Sciotoville

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

WuC—Wooster silt loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 9nt4
Elevation: 590 to 1,970 feet
Mean annual precipitation: 32 to 42 inches
Mean annual air temperature: 48 to 54 degrees F

Frost-free period: 140 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Wooster and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wooster

Setting

Landform: Till plains, moraines
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Till

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 21 inches: loam
H3 - 21 to 40 inches: loam
H4 - 40 to 60 inches: loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
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: About 48 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 6 percent
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F139XY005OH - Dry Acidic Till Plains
Forage suitability group: Unnamed (G139XYF-3OH)
Other vegetative classification: Unnamed (G139XYF-3OH)
Hydric soil rating: No

Minor Components

Ravenna

Percent of map unit:
Landform: Till plains

Moderately eroded areas

Percent of map unit:

WuC2—Wooster silt loam, 6 to 12 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 9nt5
Elevation: 590 to 1,970 feet
Mean annual precipitation: 32 to 42 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 140 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Wooster and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wooster

Setting

Landform: Till plains, moraines
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Till

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 21 inches: loam
H3 - 21 to 40 inches: loam
H4 - 40 to 60 inches: loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
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: About 48 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 6 percent
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F139XY005OH - Dry Acidic Till Plains
Forage suitability group: Unnamed (G139XYF-3OH)
Other vegetative classification: Unnamed (G139XYF-3OH)

Hydric soil rating: No

Minor Components

Ravenna

Percent of map unit:
Landform: Till plains

Chili

Percent of map unit:
Landform: Terraces

WuD2—Wooster silt loam, 12 to 18 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 9nt6
Elevation: 590 to 1,970 feet
Mean annual precipitation: 32 to 42 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 140 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Wooster and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wooster

Setting

Landform: Till plains, moraines
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Till

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 21 inches: loam
H3 - 21 to 40 inches: loam
H4 - 40 to 60 inches: loam

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
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: About 48 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum content: 6 percent
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F139XY004OH - Moist Acidic Slopes
Forage suitability group: Unnamed (G139XYF-3OH)
Other vegetative classification: Unnamed (G139XYF-3OH)
Hydric soil rating: No

Minor Components

Chili

Percent of map unit:
Landform: Terraces

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PRE-DEVELOPED CONDITIONS SUMMARY:
MEADOW "B" (CN=58) - 3.33 ACRES
MEADOW "C" (CN=71) - 1.36 ACRES
MEADOW "D" (CN=78) - 16.67 ACRES
TOTAL (CN=74) = 21.36 ACRES

GRAPHIC SCALE
80 0 40 80 160 320
(IN FEET)
1 inch = 80 ft.

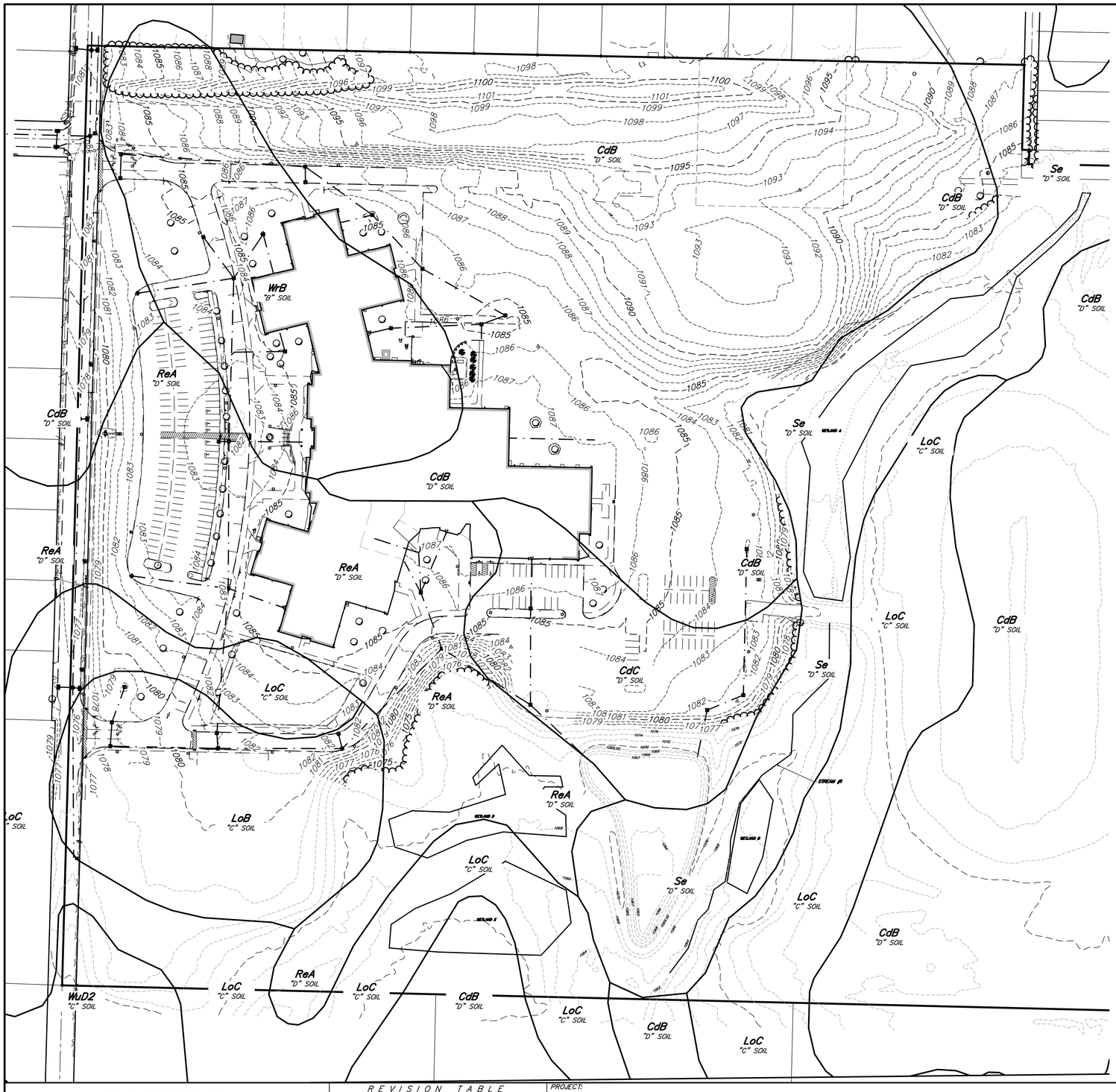
NORTH

— PLAN PREPARED BY —
LEWIS LAND PROFESSIONALS INC.
LEWIS LAND PROFESSIONALS
CIVIL ENGINEERING LAND SURVEYING
8691 WADSWORTH ROAD SUITE 100
WADSWORTH, OH 44281 (330) 335-8232

REVISION TABLE			
NO.	DATE	DESCRIPTION	BY
1	5/3/23	REV. PER STARK SWCD COMMENTS	TAW

PROJECT:
MASSILLON CSD WESTSIDE ELEMENTARY SCHOOL
TITLE:
EXISTING CONDITIONS

SCALES: HORIZONTAL 1"=80'
DRAWING FILE: 22-071_D-CALCS.DWG
M.C.S.E. NUMBER: N/A
DATE: 1/27/2023
PROJECT NUMBER: 22-071
SHEET NUMBER: 1 of 3



GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

NORTH

– PLAN PREPARED BY –

LEWIS LAND PROFESSIONALS INC.

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REVISION TABLE

NO.	DATE	DESCRIPTION	BY

PROJECT:
MASSILLON CSD WESTSIDE ELEMENTARY SCHOOL

TITLE:
EXISTING CONDITIONS

SCALES:
HORIZONTAL 1"=80'

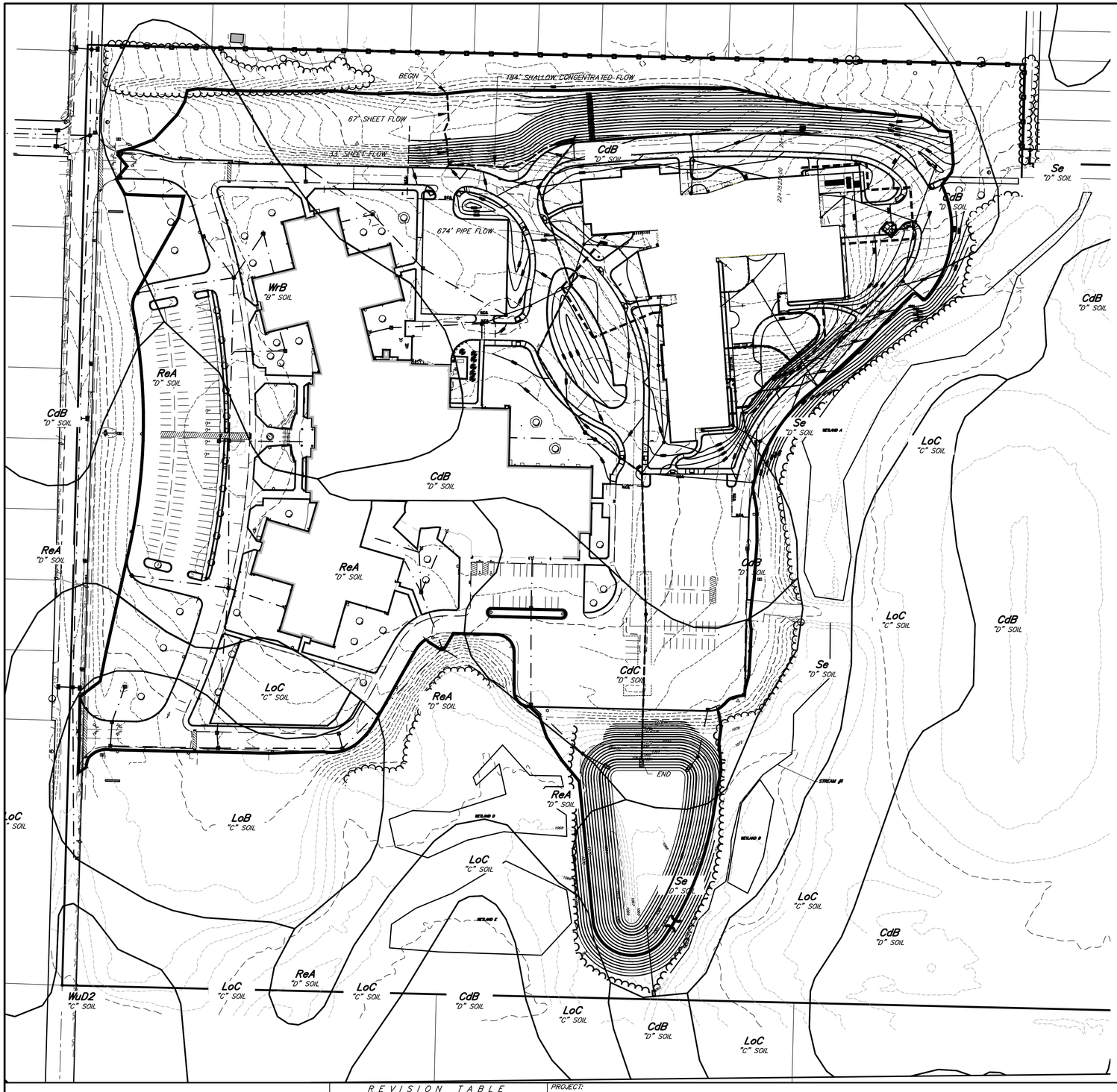
DRAWING FILE:
22-071_D-CALCS.DWG

M.C.S.E. NUMBER:
N/A

DATE:
1/27/2023

PROJECT NUMBER:
22-071

SHEET NUMBER:
2 of 3



POST-DEVELOPED CONDITIONS SUMMARY:
WATER (CN=100) = 0.58 ACRES
IMPERVIOUS (CN=98) = 13.11 ACRES
LAWN "B" (CN=61) = 1.18 ACRES
LAWN "C" (CN=74) = 0.47 ACRES
LAWN "D" (CN=80) = 6.02 ACRES
TOTAL (CN=90) = 21.36 ACRES

GRAPHIC SCALE
80 0 40 80 160 320
(IN FEET)
1 inch = 80 ft.

NORTH

– PLAN PREPARED BY –
LEWIS LAND PROFESSIONALS INC.
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8691 WADSWORTH ROAD SUITE 100
WADSWORTH, OH 44281 (330) 335-8232

REVISION TABLE

NO.	DATE	DESCRIPTION	BY
1	5/3/23	REV. PER STARK SWCD COMMENTS	TAW

PROJECT:
MASSILLON CSD WESTSIDE ELEMENTARY SCHOOL

TITLE:
POST-DEVELOPED CONDITIONS

SCALES: HORIZONTAL 1"=80'
DRAWING FILE: 22-071_D-CALCS.DWG
M.C.S.E. NUMBER: N/A
DATE: 1/27/2023
PROJECT NUMBER: 22-071
SHEET NUMBER: 3 of 3