EXHIBIT A-73

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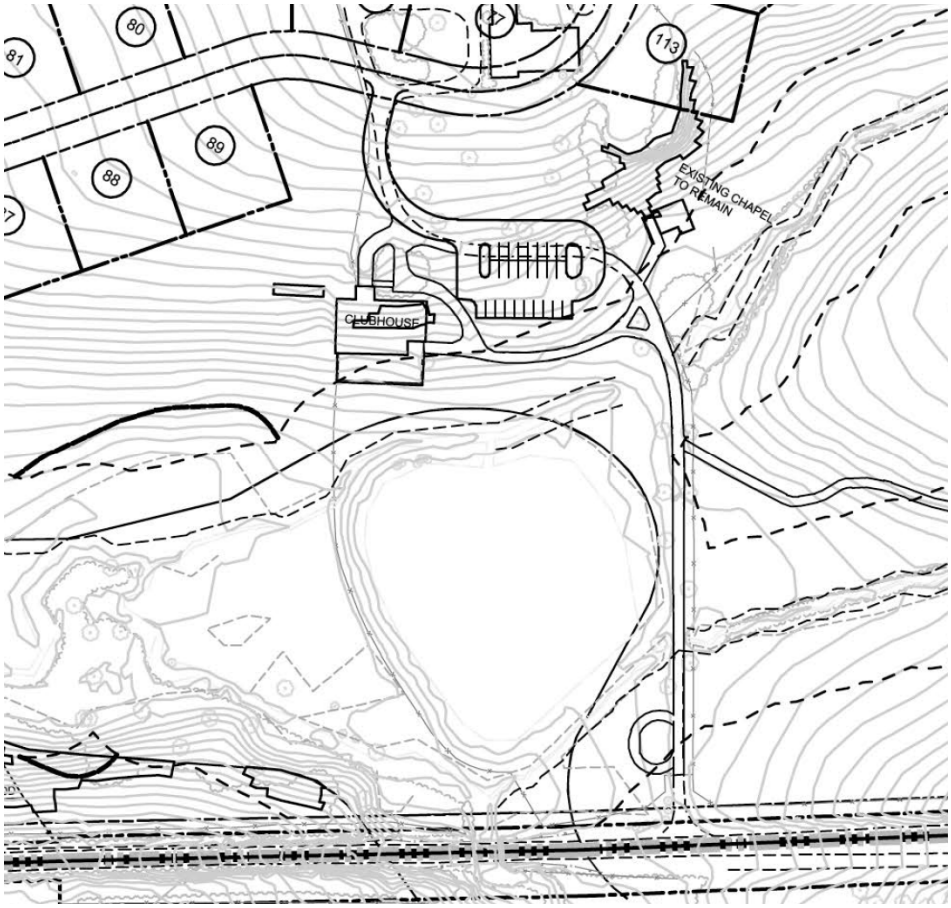
CONDITIONAL USE

STORMWATER MANAGEMENT NARRATIVE

FOR

THE ROBINSON TRACT



LOCATED IN:

WESTTOWN TOWNSHIP, CHESTER COUNTY,
STATE OF PENNSYLVANIA

Jeffrey M. Madden
Professional Engineer
Pennsylvania License No.
PE 070760

August 2019
Revised: November 2019
Revised: October 2020

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Appendices

I

Site Information

Location and Surrounding Uses

The Robinson Tract in Westtown Township, PA comprises a ± 322.4 acre tract also known as tax parcel numbers 67-4-30, 67-4-31, 67-4-32, 64-4-33, 67-4-33.1, 67-4-134, 67-4-29, 67-4-29.1, 67-4-29.2, 67-4-29.3, and 67-4-29.4. This property is located in the A/C Agricultural / Cluster District with a Flexible Development Option. The product mix is 182 single family, 135 single family attached (carriage homes), and 2 existing dwellings to remain. The development also proposes existing barns and buildings to remain and to be converted into community centers with –yet to be determined- outdoor recreational facilities, and common open space. It is located on the southern corners of West Pleasant Grove Road and Wilmington Pike (S.R. 202), and bounded on the south west by South New Street, and Street Road (S.R. 926) on the south east. The project is located in the Brandywine Creek (WWF, MF, western part) and the Chester Creek (TSF, MF, easterly part) watersheds.

Existing Conditions

The site is generally gently sloped with some steeper areas towards the on-site Radley Run and the Tributary 00074 to Radley Run. A small section of the site drains towards an unnamed tributary of the Chester Creek across S.R. 202. The site is currently used for crop farming and includes an equestrian facility with stables, barns, and a chapel. The site also includes two existing residence with ancillary buildings that will remain. Existing site cover consists of Cultivated Land, and impervious areas including existing house, ancillary structures, the equestrian buildings and portions of the surrounding roads as described above.

Soil Types

The soils information for the project is found in the USDA-NRCS Custom Soil Resource Report for Chester County, Pennsylvania. A copy of the Custom Soil Resource Report is included as appendix 1. The following soil types are found on the site:

Soil Type	Symbol	Soil Group
Baile Silt Loam	Ba	D
Chester Silt Loam, 3 to 8 percent slopes	CdB	B
Chrome Silt Loam, 3 to 8 percent slopes	ChB	D
Chrome Silt Loam, 8 to 15 percent slopes	ChC	D
Chrome Silt Loam, 15 to 25 percent slopes	ChD	D
Codorus Silt Loam	Co	C
Gaila Silt Loam, 15 to 25 percent slopes	GaD	B
Gladstone Gravelly Loam, 3 to 8 percent slopes	GdB	B
Gladstone Gravelly Loam, 8 to 15 percent slopes	GdC	A
Gladstone Gravelly Loam, 15 to 25 percent slopes	GdB	A
Glenelg Silt Loam, 3 to 8 percent slopes	GgB	C
Glenelg Silt Loam, 8 to 15 percent slopes	GgC	B
Glenville Silt Loam, 3 to 8 percent slopes	GlB	D
Glenville Silt Loam, 8 to 15 percent slopes	GlC	D
Hatboro Silt Loam	Ha	D
Water	W	

II

Hydrology

Stormwater Management Design Criteria

The Stormwater Management Plan described herein has been designed according to the following publications and criteria:

- Chapter 144, Stormwater Management of the Township of Westtown Ordinance, adopted by the BOS 12-16-2013 by Ord. No 2013-5, with amendments as noted where applicable. Chapter 149, Subdivision of Land of the Township of Westtown Ordinance, adopted by the BOS 8-21-1995, with amendments as noted where applicable. Any and all ordinance chapters of the Township of Westtown where applicable.
- Pennsylvania Stormwater Best Management Practices Manual – Final Draft -April 2006
- "Urban Hydrology for Small Watersheds" (Technical Release No. 55), published by the United States Department of Agriculture, Soil Conservation Service, dated June 1986.

Site Hydrology

The site is currently being farmed for crops, and contains an equestrian facility. The site is traversed by the Radley Run flowing west. The majority of the site (POI A, POI B, and POI D) drains towards the Brandywine Creek watershed and has a Chapter 93 classification of WWF, MF. A smaller portion (POI C) of the site drains across S.R. 202 to a tributary (00615) to Chester Creek watershed and has a Chapter 93 classification of TSF, MF.

Drainage Areas

The site has been analyzed using 4 main study points, POI A, POI B, POI D (Brandywine Creek watershed), and POI C (Chester Creek watershed). There is no offsite area analyzed because it flows through the existing creek and bypasses the area used for the development. The portion of the site located along West Street Road, south of the Bradley Creek area is not being developed and has therefore not been included in the overall Stormwater Management Analysis.

Per Chapter 144 of the ordinance, the reductions shown in the table below have been applied to the Brandywine Watershed.

Predevelopment Design Storm	Post-Construction Design Storm (new Development)
2-year	1-year
5-year	5-year
10-year	10-year
25-year	25-year
50-year	50-year
100-year	100-year

Per the Chester Creek Act 167, there must be a 50% reduction in the rate to the Chester Creek for all storms. For the Chester Creek, the calculated Runoff curve number for Pre-Developed C1 has been considered as Meadow, B Soil with a CN value of 58.

"The Robinson Tract – Watershed Summaries' table, included in the appendix section, summarizes the peak runoff rates and reductions for each point of interest and each separate watershed. As demonstrated in the table, the post-developed peak rate has been reduced per the above table for each study point and each watershed.

Because this is a cluster-style design, where a large area of the site is to remain as open space (min. 60%) the areas within the drainage areas that are located outside of the Limit-Of-Disturbance (LOD) are not included in the area to be reduced. The *'Allowable Post Developed Flows – SCS'* located in the appendix section, shows how the weighted allowable has been calculated.

Preliminary Infiltration Testing

Preliminary infiltration testing has been performed in the general locations of the basin. General testing results are listed in the Preliminary Geotechnical Exploration Report, and range from 0.5"/hr to 6"/hr. For the purpose of this preliminary analysis, a minimum 0.5"/hr infiltration rate has been used, which is generally consistent with the test-results. The test results are included in the appendix section.

Additional impervious surface

To allow for additional impervious on-lot surfaces that might be requested by future home owners, additional impervious is proposed on top of the base footprints. Below is the list of impervious used for each dwelling type for this preliminary analysis:

Estate Lots:
Minimum lot size is 115'x125' = 14,375 sf
Impervious proposed per lot = 2,400 sf base house, 1,350 sf options, 1,200 sf driveway, 170 sf service walk, 630 sf additional impervious for a total of 5,750 sf, or 40% of the lot size.

Executive lots:
Minimum lot size is 90'x125' = 11,250 sf
Impervious proposed per lot = 2,400 sf base house, 800 sf options, 530 sf driveway, 80 sf service walk, 690 sf additional impervious for a total of 4,500 sf, or 40% of the lot size.

Carriage Homes:
Assumed lot size is 30'x110' = 3,300 sf
Impervious proposed per unit = 2,200 sf base house, 500 sf driveway, 100 sf service walk, 500 sf additional impervious for a total of 3,300 sf.

Water Quality Management

Infiltration is provided in all proposed basins. Per section 144-305.A of the Stormwater Management Ordinance, "the post-construction total runoff volume shall not exceed the predevelopment total runoff volume for all storms equal to or less than the two-year, twenty-four-hour duration precipitation (design storm)."
The watershed volume summary can be found in the appendix section. The volumes have been taken from the Hydrograph Summary reports, also located in the appendix section of this report.

Thermal Effects

Thermal effects will be taken into consideration during the design. In order to eliminate raising temperatures, the following (not limited to) will proposed:

- Rooftop disconnection. The rainfall falling on the roofs is dispersed through the gutter system onto the lawn areas, where it will be cooled by the soil and grass cover before it enters the subsoil storm system.
- Subsoil storm sewer system. Water coming from lawn areas and paved road/parking areas is diverted into the subsoil storm sewer where it will be cooled by the pipe system before it enters the pond areas.
- Plantings along the pond perimeter will provide shading to help keep the water cool.

III

Closed Conveyance System

Design Criteria

All closed conveyances will be designed according to Section 144-311 of the Westtown Township Stormwater Management Ordinance.

Storm pipes are required to be designed for a 25-year-return frequency storm. No pipes will be designed under pressure flow. Closed conveyances are limited to a minimum 0.5% longitudinal slope to promote adequate flow velocities within the system, which are required by code to be a minimum of three (3) feet per second, and a maximum of eleven (11) feet per second. Storm sewer will be reinforced concrete (RCP) and will be in accordance with the requirements of PennDOT Pub 408 and PennDOT Pub 72, latest editions. The minimum diameter will be fifteen inches (15”). Storm sewer cover will be a minimum of 24”. A minimum one foot of freeboard between the HGL of the design storm and the ground elevation will be provided throughout all proposed storm sewer conveyance systems.

IV

Open Conveyance System

Design Criteria and Methodology

Wherever possible, overland runoff will be directed to the discharge points via open channels or swales.

All swales will be lined with NA-Green S75 or C125 lining where required (or equal after township engineer approval).

Summary Report

1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	53.81	1	729	272,499	------	------	------	Pre Developed Area A1
2	SCS Runoff	21.72	1	725	80,660	------	------	------	Pre Developed Area A2
3	Combine	73.70	1	728	353,160	1, 2	------	------	Pre Developed Area A (A1 + A2)
4	SCS Runoff	1.234	1	727	8,773	------	------	------	Pre Developed Area B1
5	SCS Runoff	1.034	1	726	5,997	------	------	------	Pre Developed Area B2
6	Combine	2.266	1	726	14,770	4, 5	------	------	Pre Developed Area B (B1 + B2)
7	SCS Runoff	0.950	1	725	6,882	------	------	------	Pre Developed Area C1
8	SCS Runoff	2.838	1	718	6,135	------	------	------	Pre Developed Area D1
10	SCS Runoff	8.934	1	720	21,277	------	------	------	Basin A-1A
11	Reservoir	0.000	1	842	0	10	319.59	16,678	Route Basin A-1A
12	Reach	0.000	1	730	0	11	------	------	Reach Basin A-1A
14	SCS Runoff	13.56	1	720	32,134	------	------	------	Basin A-1B
15	Reservoir	0.885	1	787	13,592	14	314.88	15,165	Route Basin A-1B
16	Reach	0.648	1	848	13,561	15	------	------	Reach Basin A-1B
18	SCS Runoff	5.219	1	720	11,865	------	------	------	Basin A2
19	Reservoir	0.507	1	752	4,322	18	293.68	5,701	Route Basin A2
20	Reach	0.281	1	800	4,296	19	------	------	Reach Basin A2
22	SCS Runoff	4.169	1	718	9,272	------	------	------	Basin A5
23	Reservoir	0.000	1	903	0	22	331.28	7,256	Route Basin A5
24	Reach	0.000	1	903	0	23	------	------	Reach Basin A5
26	SCS Runoff	58.05	1	720	134,492	------	------	------	Basin A6
27	Reservoir	0.000	1	719	0	26	300.14	106,006	Route Basin A6
28	Diversion1	0.000	1	n/a	0	27	------	------	Wier B to Basin A7
29	Diversion2	0.000	1	719	0	27	------	------	Basin A6 Outlet
30	Reach	0.000	1	719	0	29	------	------	Reach Basin A6
32	SCS Runoff	36.96	1	720	84,157	------	------	------	Basin A7
33	Combine	36.96	1	720	84,157	28, 32	------	------	Total flow to Basin A7
34	Reservoir	0.000	1	722	0	33	273.13	66,065	Route Basin A7
35	Reach	0.000	1	n/a	0	34	------	------	Reach Basin A7
37	SCS Runoff	34.99	1	720	80,598	------	------	------	Basin A8

Hydrograph Summary Report

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
38	Reservoir	0.015	1	1442	203	37	276.05	62,223	Route Basin A8
39	Reach	0.014	1	1449	183	38	------	------	Reach Basin A8
41	SCS Runoff	10.35	1	720	24,783	------	------	------	Basin A9
42	Reservoir	0.000	1	722	0	41	296.34	17,209	Route Basin A9
43	Reach	0.000	1	712	0	42	------	------	Reach Basin A9
45	SCS Runoff	9.554	1	720	21,916	------	------	------	Basin A10
46	Reservoir	0.000	1	2210	0	45	308.69	15,775	Route Basin A10
47	Reach	0.000	1	792	0	46	------	------	Reach Basin A10
49	SCS Runoff	35.10	1	728	137,978	------	------	------	Bypass A11
51	SCS Runoff	6.883	1	721	18,698	------	------	------	Bypass A12
52	Reach	1.893	1	732	18,677	51	------	------	Reach Bypass A12
54	Combine	0.893	1	836	17,857	12, 16, 20,	------	------	Post Developed A1 (1)
55	Combine	36.92	1	728	156,838	24, 30, 35, 39, 49, 52,	------	------	Post Developed A1 (2)
57	Combine	36.92	1	728	174,695	54, 55,	------	------	POST DEVELOPED A1 - TOTAL
59	SCS Runoff	24.87	1	723	77,148	------	------	------	Bypass A13
61	Combine	0.000	1	792	0	43, 47,	------	------	Post Developed A2
63	Combine	24.87	1	723	77,148	59, 61,	------	------	POST DEVELOPED A2 - TOTAL
65	Combine	59.31	1	726	251,843	57, 63,	------	------	POST DEVELOPED A - TOTAL (A1
67	SCS Runoff	1.335	1	726	8,786	------	------	------	POST DEVELOPED B - Bypass B1
69	SCS Runoff	0.456	1	720	1,378	------	------	------	POST DEVELOPED B - Bypass B2
71	Combine	1.513	1	725	10,164	67, 69,	------	------	POST DEVELOPED B- TOTAL (B1 +
73	SCS Runoff	15.52	1	718	31,463	------	------	------	Basin C1
74	Reservoir	0.000	1	875	0	73	349.17	23,896	Route Basin C1
76	SCS Runoff	0.460	1	720	1,902	------	------	------	Bypass C2
78	Combine	0.460	1	720	1,902	74, 76,	------	------	POST DEVELOPED C - TOTAL

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
80	SCS Runoff	1.623	1	718	3,433	------	------	------	POST DEVELOPED D - Bypass D1

Hydrograph Summary Report

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	110.05	1	728	456,637	------	------	------	Pre Developed Area A1
2	SCS Runoff	39.87	1	724	129,978	------	------	------	Pre Developed Area A2
3	Combine	146.96	1	727	586,615	1, 2	------	------	Pre Developed Area A (A1 + A2)
4	SCS Runoff	3.886	1	725	16,711	------	------	------	Pre Developed Area B1
5	SCS Runoff	2.802	1	725	11,015	------	------	------	Pre Developed Area B2
6	Combine	6.688	1	725	27,726	4, 5	------	------	Pre Developed Area B (B1 + B2)
7	SCS Runoff	3.402	1	723	13,460	------	------	------	Pre Developed Area C1
8	SCS Runoff	4.591	1	718	9,465	------	------	------	Pre Developed Area D1
10	SCS Runoff	13.83	1	720	31,867	------	------	------	Basin A-1A
11	Reservoir	0.000	1	816	0	10	320.30	25,326	Route Basin A-1A
12	Reach	0.000	1	n/a	0	11	------	------	Reach Basin A-1A
14	SCS Runoff	20.85	1	720	47,924	------	------	------	Basin A-1B
15	Reservoir	4.741	1	731	29,136	14	315.05	18,168	Route Basin A-1B
16	Reach	2.123	1	767	29,117	15	------	------	Reach Basin A-1B
18	SCS Runoff	7.395	1	720	16,730	------	------	------	Basin A2
19	Reservoir	3.845	1	726	9,136	18	293.90	6,446	Route Basin A2
20	Reach	1.066	1	745	9,121	19	------	------	Reach Basin A2
22	SCS Runoff	6.973	1	718	14,557	------	------	------	Basin A5
23	Reservoir	0.000	1	1438	0	22	332.00	11,307	Route Basin A5
24	Reach	0.000	1	1438	0	23	------	------	Reach Basin A5
26	SCS Runoff	86.11	1	720	195,979	------	------	------	Basin A6
27	Reservoir	1.487	1	967	36,690	26	300.53	132,881	Route Basin A6
28	Diversion1	0.000	1	n/a	0	27	------	------	Wier B to Basin A7
29	Diversion2	1.487	1	967	36,690	27	------	------	Basin A6 Outlet
30	Reach	1.473	1	994	36,680	29	------	------	Reach Basin A6
32	SCS Runoff	52.67	1	720	119,188	------	------	------	Basin A7
33	Combine	52.67	1	720	119,188	28, 32	------	------	Total flow to Basin A7
34	Reservoir	0.883	1	961	22,570	33	273.61	82,184	Route Basin A7
35	Reach	0.878	1	970	22,566	34	------	------	Reach Basin A7
37	SCS Runoff	51.33	1	720	116,554	------	------	------	Basin A8

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
38	Reservoir	0.180	1	1441	11,302	37	276.71	89,366	Route Basin A8
39	Reach	0.180	1	1444	11,287	38	------	------	Reach Basin A8
41	SCS Runoff	16.14	1	720	37,279	------	------	------	Basin A9
42	Reservoir	0.000	1	717	0	41	297.02	28,551	Route Basin A9
43	Reach	0.000	1	705	0	42	------	------	Reach Basin A9
45	SCS Runoff	13.89	1	720	31,488	------	------	------	Basin A10
46	Reservoir	0.179	1	984	2,325	45	309.21	22,232	Route Basin A10
47	Reach	0.144	1	1056	2,300	46	------	------	Reach Basin A10
49	SCS Runoff	59.01	1	727	212,853	------	------	------	Bypass A11
51	SCS Runoff	12.29	1	720	30,086	------	------	------	Bypass A12
52	Reach	4.057	1	730	30,068	51	------	------	Reach Bypass A12
54	Combine	3.104	1	756	74,917	12, 16, 20,	------	------	Post Developed A1 (1)
55	Combine	62.96	1	727	276,775	24, 30, 35, 39, 49, 52,	------	------	Post Developed A1 (2)
57	Combine	63.61	1	728	351,692	54, 55,	------	------	POST DEVELOPED A1 - TOTAL
59	SCS Runoff	41.43	1	723	119,305	------	------	------	Bypass A13
61	Combine	0.144	1	1056	2,300	43, 47,	------	------	Post Developed A2
63	Combine	41.43	1	723	121,604	59, 61,	------	------	POST DEVELOPED A2 - TOTAL
65	Combine	100.60	1	725	473,296	57, 63,	------	------	POST DEVELOPED A - TOTAL (A1
67	SCS Runoff	3.976	1	725	16,518	------	------	------	POST DEVELOPED B - Bypass B1
69	SCS Runoff	1.013	1	719	2,430	------	------	------	POST DEVELOPED B - Bypass B2
71	Combine	4.447	1	723	18,948	67, 69,	------	------	POST DEVELOPED B- TOTAL (B1 +
73	SCS Runoff	22.60	1	718	45,414	------	------	------	Basin C1
74	Reservoir	0.000	1	729	0	73	349.68	34,333	Route Basin C1
76	SCS Runoff	1.328	1	719	3,584	------	------	------	Bypass C2
78	Combine	1.328	1	719	3,584	74, 76,	------	------	POST DEVELOPED C - TOTAL

Hydrograph Summary Report

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
80	SCS Runoff	2.552	1	718	5,211	------	------	------	POST DEVELOPED D - Bypass D1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	215.76	1	727	788,594	------	------	------	Pre Developed Area A1
2	SCS Runoff	71.92	1	724	216,899	------	------	------	Pre Developed Area A2
3	Combine	282.36	1	726	1,005,494	1, 2	------	------	Pre Developed Area A (A1 + A2)
4	SCS Runoff	9.742	1	724	32,009	------	------	------	Pre Developed Area B1
5	SCS Runoff	6.486	1	723	20,508	------	------	------	Pre Developed Area B2
6	Combine	16.22	1	724	52,517	4, 5	------	------	Pre Developed Area B (B1 + B2)
7	SCS Runoff	8.933	1	722	26,301	------	------	------	Pre Developed Area C1
8	SCS Runoff	7.530	1	718	15,181	------	------	------	Pre Developed Area D1
10	SCS Runoff	21.93	1	720	49,718	------	------	------	Basin A-1A
11	Reservoir	0.350	1	1000	11,553	10	320.90	33,877	Route Basin A-1A
12	Reach	0.334	1	1092	11,512	11	------	------	Reach Basin A-1A
14	SCS Runoff	32.87	1	720	74,468	------	------	------	Basin A-1B
15	Reservoir	21.24	1	725	55,412	14	315.33	23,062	Route Basin A-1B
16	Reach	8.201	1	737	55,399	15	------	------	Reach Basin A-1B
18	SCS Runoff	10.88	1	719	24,614	------	------	------	Basin A2
19	Reservoir	8.987	1	723	16,949	18	294.08	7,313	Route Basin A2
20	Reach	3.492	1	732	16,937	19	------	------	Reach Basin A2
22	SCS Runoff	11.72	1	718	23,729	------	------	------	Basin A5
23	Reservoir	0.884	1	755	8,687	22	332.03	11,552	Route Basin A5
24	Reach	0.533	1	804	8,666	23	------	------	Reach Basin A5
26	SCS Runoff	131.64	1	720	297,795	------	------	------	Basin A6
27	Reservoir	12.00	1	753	135,552	26	300.77	149,628	Route Basin A6
28	Diversion1	1.431	1	753	7,877	27	------	------	Wier B to Basin A7
29	Diversion2	10.57	1	753	127,675	27	------	------	Basin A6 Outlet
30	Reach	9.724	1	768	127,669	29	------	------	Reach Basin A6
32	SCS Runoff	77.85	1	719	176,113	------	------	------	Basin A7
33	Combine	77.85	1	719	183,989	28, 32	------	------	Total flow to Basin A7
34	Reservoir	7.385	1	757	85,619	33	273.94	93,480	Route Basin A7
35	Reach	7.312	1	764	85,617	34	------	------	Reach Basin A7
37	SCS Runoff	77.70	1	720	175,796	------	------	------	Basin A8

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
38	Reservoir	0.318	1	1442	32,285	37	277.93	139,522	Route Basin A8
39	Reach	0.318	1	1446	32,203	38	------	------	Reach Basin A8
41	SCS Runoff	25.74	1	720	58,401	------	------	------	Basin A9
42	Reservoir	0.515	1	938	14,473	41	297.58	37,809	Route Basin A9
43	Reach	0.509	1	964	14,459	42	------	------	Reach Basin A9
45	SCS Runoff	20.86	1	719	47,190	------	------	------	Basin A10
46	Reservoir	2.353	1	745	17,752	45	309.31	23,458	Route Basin A10
47	Reach	1.632	1	768	17,740	46	------	------	Reach Basin A10
49	SCS Runoff	99.85	1	727	341,422	------	------	------	Bypass A11
51	SCS Runoff	21.63	1	720	50,140	------	------	------	Bypass A12
52	Reach	8.406	1	728	50,125	51	------	------	Reach Bypass A12
54	Combine	17.54	1	756	220,184	12, 16, 20,	------	------	Post Developed A1 (1)
55	Combine	108.35	1	727	509,367	24, 30, 35, 39, 49, 52,	------	------	Post Developed A1 (2)
57	Combine	116.89	1	728	729,551	54, 55,	------	------	POST DEVELOPED A1 - TOTAL
59	SCS Runoff	69.45	1	723	191,798	------	------	------	Bypass A13
61	Combine	1.637	1	769	32,199	43, 47,	------	------	Post Developed A2
63	Combine	69.45	1	723	223,996	59, 61,	------	------	POST DEVELOPED A2 - TOTAL
65	Combine	177.66	1	725	953,546	57, 63,	------	------	POST DEVELOPED A - TOTAL (A1
67	SCS Runoff	9.666	1	724	31,309	------	------	------	POST DEVELOPED B - Bypass B1
69	SCS Runoff	2.050	1	718	4,379	------	------	------	POST DEVELOPED B - Bypass B2
71	Combine	10.79	1	723	35,688	67, 69,	------	------	POST DEVELOPED B- TOTAL (B1 +
73	SCS Runoff	33.99	1	718	68,372	------	------	------	Basin C1
74	Reservoir	0.106	1	1182	4,732	73	350.34	51,001	Route Basin C1
76	SCS Runoff	3.035	1	718	6,807	------	------	------	Bypass C2
78	Combine	3.035	1	718	11,539	74, 76,	------	------	POST DEVELOPED C - TOTAL

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
80	SCS Runoff	4.093	1	718	8,231	------	------	------	POST DEVELOPED D - Bypass D1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	315.00	1	727	1,099,838	------	------	------	Pre Developed Area A1
2	SCS Runoff	101.14	1	724	297,127	------	------	------	Pre Developed Area A2
3	Combine	409.40	1	726	1,396,966	1, 2	------	------	Pre Developed Area A (A1 + A2)
4	SCS Runoff	15.65	1	723	47,006	------	------	------	Pre Developed Area B1
5	SCS Runoff	10.11	1	723	29,706	------	------	------	Pre Developed Area B2
6	Combine	25.76	1	723	76,712	4, 5	------	------	Pre Developed Area B (B1 + B2)
7	SCS Runoff	14.52	1	721	38,988	------	------	------	Pre Developed Area C1
8	SCS Runoff	10.14	1	718	20,359	------	------	------	Pre Developed Area D1
10	SCS Runoff	29.03	1	720	65,668	------	------	------	Basin A-1A
11	Reservoir	0.737	1	898	26,382	10	321.36	40,519	Route Basin A-1A
12	Reach	0.714	1	974	26,347	11	------	------	Reach Basin A-1A
14	SCS Runoff	43.38	1	720	98,137	------	------	------	Basin A-1B
15	Reservoir	35.02	1	723	78,863	14	315.51	26,082	Route Basin A-1B
16	Reach	15.17	1	733	78,852	15	------	------	Reach Basin A-1B
18	SCS Runoff	13.85	1	719	31,456	------	------	------	Basin A2
19	Reservoir	12.21	1	722	23,725	18	294.16	7,960	Route Basin A2
20	Reach	5.697	1	731	23,714	19	------	------	Reach Basin A2
22	SCS Runoff	15.97	1	718	32,101	------	------	------	Basin A5
23	Reservoir	4.948	1	725	17,013	22	332.15	12,588	Route Basin A5
24	Reach	1.878	1	745	17,000	23	------	------	Reach Basin A5
26	SCS Runoff	171.35	1	719	387,585	------	------	------	Basin A6
27	Reservoir	47.25	1	729	223,719	26	301.09	172,034	Route Basin A6
28	Diversion1	13.44	1	729	27,251	27	------	------	Wier B to Basin A7
29	Diversion2	33.81	1	729	196,468	27	------	------	Basin A6 Outlet
30	Reach	25.65	1	739	196,464	29	------	------	Reach Basin A6
32	SCS Runoff	99.45	1	719	225,617	------	------	------	Basin A7
33	Combine	99.45	1	719	252,868	28, 32	------	------	Total flow to Basin A7
34	Reservoir	23.05	1	737	153,330	33	274.45	113,814	Route Basin A7
35	Reach	22.71	1	742	153,328	34	------	------	Reach Basin A7
37	SCS Runoff	100.70	1	719	227,847	------	------	------	Basin A8

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
38	Reservoir	1.807	1	958	75,849	37	278.36	159,698	Route Basin A8
39	Reach	1.805	1	965	75,785	38	------	------	Reach Basin A8
41	SCS Runoff	34.17	1	720	77,312	------	------	------	Basin A9
42	Reservoir	1.430	1	813	32,539	41	297.92	43,544	Route Basin A9
43	Reach	1.404	1	835	32,528	42	------	------	Reach Basin A9
45	SCS Runoff	26.92	1	719	60,943	------	------	------	Basin A10
46	Reservoir	11.50	1	727	31,336	45	309.52	26,194	Route Basin A10
47	Reach	5.206	1	737	31,328	46	------	------	Reach Basin A10
49	SCS Runoff	136.45	1	727	457,874	------	------	------	Bypass A11
51	SCS Runoff	30.09	1	720	68,640	------	------	------	Bypass A12
52	Reach	12.76	1	728	68,626	51	------	------	Reach Bypass A12
54	Combine	46.83	1	737	342,376	12, 16, 20, 24, 30,	------	------	Post Developed A1 (1)
55	Combine	159.58	1	728	755,613	35, 39, 49, 52,	------	------	Post Developed A1 (2)
57	Combine	195.43	1	730	1,097,987	54, 55,	------	------	POST DEVELOPED A1 - TOTAL
59	SCS Runoff	94.56	1	722	257,531	------	------	------	Bypass A13
61	Combine	5.359	1	738	63,856	43, 47,	------	------	Post Developed A2
63	Combine	94.65	1	723	321,387	59, 61,	------	------	POST DEVELOPED A2 - TOTAL
65	Combine	268.64	1	727	1,419,374	57, 63,	------	------	POST DEVELOPED A - TOTAL (A1
67	SCS Runoff	15.36	1	723	45,748	------	------	------	POST DEVELOPED B - Bypass B1
69	SCS Runoff	3.028	1	718	6,241	------	------	------	POST DEVELOPED B - Bypass B2
71	Combine	17.13	1	722	51,989	67, 69,	------	------	POST DEVELOPED B- TOTAL (B1 +
73	SCS Runoff	43.76	1	718	88,525	------	------	------	Basin C1
74	Reservoir	0.201	1	1175	13,630	73	350.85	66,173	Route Basin C1
76	SCS Runoff	4.712	1	718	9,956	------	------	------	Bypass C2
78	Combine	4.712	1	718	23,586	74, 76,	------	------	POST DEVELOPED C - TOTAL

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
80	SCS Runoff	5.451	1	718	10,947	------	------	------	POST DEVELOPED D - Bypass D1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	473.81	1	727	1,602,480	------	------	------	Pre Developed Area A1
2	SCS Runoff	147.31	1	723	425,159	------	------	------	Pre Developed Area A2
3	Combine	612.16	1	726	2,027,639	1, 2	------	------	Pre Developed Area A (A1 + A2)
4	SCS Runoff	25.42	1	723	72,027	------	------	------	Pre Developed Area B1
5	SCS Runoff	16.03	1	723	44,924	------	------	------	Pre Developed Area B2
6	Combine	41.46	1	723	116,951	4, 5	------	------	Pre Developed Area B (B1 + B2)
7	SCS Runoff	23.82	1	721	60,278	------	------	------	Pre Developed Area C1
8	SCS Runoff	14.16	1	718	28,505	------	------	------	Pre Developed Area D1
10	SCS Runoff	39.99	1	719	90,500	------	------	------	Basin A-1A
11	Reservoir	1.168	1	857	48,864	10	322.28	54,900	Route Basin A-1A
12	Reach	1.146	1	951	48,830	11	------	------	Reach Basin A-1A
14	SCS Runoff	59.61	1	719	134,930	------	------	------	Basin A-1B
15	Reservoir	51.38	1	722	115,319	14	315.72	29,790	Route Basin A-1B
16	Reach	26.53	1	731	115,309	15	------	------	Reach Basin A-1B
18	SCS Runoff	18.30	1	719	41,873	------	------	------	Basin A2
19	Reservoir	16.64	1	721	34,033	18	294.27	8,733	Route Basin A2
20	Reach	8.900	1	730	34,023	19	------	------	Reach Basin A2
22	SCS Runoff	22.57	1	718	45,349	------	------	------	Basin A5
23	Reservoir	16.48	1	721	30,204	22	332.40	14,615	Route Basin A5
24	Reach	6.231	1	729	30,195	23	------	------	Reach Basin A5
26	SCS Runoff	231.77	1	719	525,981	------	------	------	Basin A6
27	Reservoir	126.04	1	726	360,024	26	301.58	205,668	Route Basin A6
28	Diversion1	43.92	1	726	65,898	27	------	------	Wier B to Basin A7
29	Diversion2	82.11	1	726	294,126	27	------	------	Basin A6 Outlet
30	Reach	63.71	1	732	294,123	29	------	------	Reach Basin A6
32	SCS Runoff	131.79	1	719	301,116	------	------	------	Basin A7
33	Combine	151.16	1	721	367,014	28, 32	------	------	Total flow to Basin A7
34	Reservoir	59.14	1	731	266,208	33	275.41	153,355	Route Basin A7
35	Reach	57.94	1	734	266,206	34	------	------	Reach Basin A7
37	SCS Runoff	135.46	1	719	307,848	------	------	------	Basin A8

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
38	Reservoir	5.916	1	804	153,129	37	278.88	185,116	Route Basin A8
39	Reach	5.909	1	809	153,080	38	------	------	Reach Basin A8
41	SCS Runoff	47.21	1	719	106,799	------	------	------	Basin A9
42	Reservoir	2.537	1	784	60,827	41	298.55	57,794	Route Basin A9
43	Reach	2.514	1	809	60,818	42	------	------	Reach Basin A9
45	SCS Runoff	36.04	1	719	82,029	------	------	------	Basin A10
46	Reservoir	27.68	1	723	52,142	45	309.76	29,085	Route Basin A10
47	Reach	14.46	1	731	52,136	46	------	------	Reach Basin A10
49	SCS Runoff	193.75	1	726	641,067	------	------	------	Bypass A11
51	SCS Runoff	43.36	1	720	98,149	------	------	------	Bypass A12
52	Reach	20.04	1	727	98,137	51	------	------	Reach Bypass A12
54	Combine	105.38	1	731	522,479	12, 16, 20,	------	------	Post Developed A1 (1)
55	Combine	259.44	1	728	1,158,489	24, 30, 35, 39, 49, 52,	------	------	Post Developed A1 (2)
57	Combine	360.03	1	729	1,680,971	54, 55,	------	------	POST DEVELOPED A1 - TOTAL
59	SCS Runoff	133.95	1	722	361,022	------	------	------	Bypass A13
61	Combine	15.30	1	731	112,954	43, 47,	------	------	Post Developed A2
63	Combine	140.46	1	723	473,976	59, 61,	------	------	POST DEVELOPED A2 - TOTAL
65	Combine	473.94	1	727	2,154,947	57, 63,	------	------	POST DEVELOPED A - TOTAL (A1
67	SCS Runoff	24.73	1	723	69,764	------	------	------	POST DEVELOPED B - Bypass B1
69	SCS Runoff	4.600	1	718	9,291	------	------	------	POST DEVELOPED B - Bypass B2
71	Combine	27.53	1	722	79,055	67, 69,	------	------	POST DEVELOPED B- TOTAL (B1 +
73	SCS Runoff	58.46	1	718	119,477	------	------	------	Basin C1
74	Reservoir	0.297	1	1188	27,830	73	351.70	91,275	Route Basin C1
76	SCS Runoff	7.448	1	718	15,197	------	------	------	Bypass C2
78	Combine	7.480	1	718	43,027	74, 76,	------	------	POST DEVELOPED C - TOTAL

Hydrograph Summary Report

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
80	SCS Runoff	7.533	1	718	15,195	------	------	------	POST DEVELOPED D - Bypass D1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	616.65	1	726	2,058,785	------	------	------	Pre Developed Area A1
2	SCS Runoff	188.71	1	723	540,308	------	------	------	Pre Developed Area A2
3	Combine	794.12	1	726	2,599,094	1, 2	------	------	Pre Developed Area A (A1 + A2)
4	SCS Runoff	34.42	1	723	95,324	------	------	------	Pre Developed Area B1
5	SCS Runoff	21.44	1	723	59,001	------	------	------	Pre Developed Area B2
6	Combine	55.86	1	723	154,324	4, 5	------	------	Pre Developed Area B (B1 + B2)
7	SCS Runoff	32.40	1	721	80,187	------	------	------	Pre Developed Area C1
8	SCS Runoff	17.67	1	718	35,749	------	------	------	Pre Developed Area D1
10	SCS Runoff	49.54	1	719	112,402	------	------	------	Basin A-1A
11	Reservoir	1.433	1	854	68,238	10	323.05	69,335	Route Basin A-1A
12	Reach	1.413	1	947	68,206	11	------	------	Reach Basin A-1A
14	SCS Runoff	73.71	1	719	167,343	------	------	------	Basin A-1B
15	Reservoir	56.06	1	719	147,426	14	316.15	37,857	Route Basin A-1B
16	Reach	33.57	1	735	147,416	15	------	------	Reach Basin A-1B
18	SCS Runoff	22.08	1	719	50,902	------	------	------	Basin A2
19	Reservoir	20.27	1	721	42,961	18	294.35	9,327	Route Basin A2
20	Reach	11.57	1	729	42,951	19	------	------	Reach Basin A2
22	SCS Runoff	28.35	1	718	57,186	------	------	------	Basin A5
23	Reservoir	19.29	1	722	41,982	22	332.68	16,938	Route Basin A5
24	Reach	10.38	1	729	41,973	23	------	------	Reach Basin A5
26	SCS Runoff	283.73	1	719	647,088	------	------	------	Basin A6
27	Reservoir	181.20	1	725	479,541	26	301.95	231,321	Route Basin A6
28	Diversion1	74.42	1	725	105,959	27	------	------	Wier B to Basin A7
29	Diversion2	106.78	1	725	373,582	27	------	------	Basin A6 Outlet
30	Reach	91.40	1	731	373,579	29	------	------	Reach Basin A6
32	SCS Runoff	159.35	1	719	366,639	------	------	------	Basin A7
33	Combine	210.47	1	721	472,597	28, 32	------	------	Total flow to Basin A7
34	Reservoir	85.01	1	730	370,784	33	276.34	193,468	Route Basin A7
35	Reach	84.05	1	734	370,783	34	------	------	Reach Basin A7
37	SCS Runoff	165.29	1	719	377,701	------	------	------	Basin A8

Hydrograph Summary Report

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
38	Reservoir	11.84	1	759	221,189	37	279.43	211,927	Route Basin A8
39	Reach	11.81	1	765	221,145	38	------	------	Reach Basin A8
41	SCS Runoff	58.58	1	719	132,838	------	------	------	Basin A9
42	Reservoir	3.290	1	780	85,726	41	299.19	72,627	Route Basin A9
43	Reach	3.266	1	803	85,718	42	------	------	Reach Basin A9
45	SCS Runoff	43.86	1	719	100,406	------	------	------	Basin A10
46	Reservoir	38.95	1	722	70,258	45	309.88	30,714	Route Basin A10
47	Reach	22.85	1	729	70,252	46	------	------	Reach Basin A10
49	SCS Runoff	244.28	1	726	803,973	------	------	------	Bypass A11
51	SCS Runoff	55.10	1	719	124,679	------	------	------	Bypass A12
52	Reach	26.83	1	727	124,667	51	------	------	Reach Bypass A12
54	Combine	143.33	1	731	674,127	12, 16, 20,	------	------	Post Developed A1 (1)
55	Combine	347.48	1	727	1,520,569	24, 30, 35, 39, 49, 52,	------	------	Post Developed A1 (2)
57	Combine	485.40	1	729	2,194,695	54, 55,	------	------	POST DEVELOPED A1 - TOTAL
59	SCS Runoff	168.55	1	722	453,113	------	------	------	Bypass A13
61	Combine	24.12	1	729	155,970	43, 47,	------	------	Post Developed A2
63	Combine	184.42	1	723	609,082	59, 61,	------	------	POST DEVELOPED A2 - TOTAL
65	Combine	640.23	1	727	2,803,781	57, 63,	------	------	POST DEVELOPED A - TOTAL (A1
67	SCS Runoff	33.33	1	723	92,071	------	------	------	POST DEVELOPED B - Bypass B1
69	SCS Runoff	6.017	1	718	12,090	------	------	------	POST DEVELOPED B - Bypass B2
71	Combine	37.08	1	722	104,161	67, 69,	------	------	POST DEVELOPED B- TOTAL (B1 +
73	SCS Runoff	71.07	1	717	146,488	------	------	------	Basin C1
74	Reservoir	0.356	1	1205	37,699	73	352.39	113,973	Route Basin C1
76	SCS Runoff	9.946	1	718	20,068	------	------	------	Bypass C2
78	Combine	10.09	1	718	57,767	74, 76,	------	------	POST DEVELOPED C - TOTAL

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
80	SCS Runoff	9.340	1	718	18,956	------	------	------	POST DEVELOPED D - Bypass D1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	777.65	1	726	2,573,182	------	------	------	Pre Developed Area A1
2	SCS Runoff	234.60	1	723	669,267	------	------	------	Pre Developed Area A2
3	Combine	997.42	1	725	3,242,449	1, 2	------	------	Pre Developed Area A (A1 + A2)
4	SCS Runoff	44.64	1	723	122,054	------	------	------	Pre Developed Area B1
5	SCS Runoff	27.58	1	722	75,080	------	------	------	Pre Developed Area B2
6	Combine	72.20	1	723	197,134	4, 5	------	------	Pre Developed Area B (B1 + B2)
7	SCS Runoff	42.16	1	721	103,100	------	------	------	Pre Developed Area C1
8	SCS Runoff	21.51	1	718	43,797	------	------	------	Pre Developed Area D1
10	SCS Runoff	59.93	1	719	136,598	------	------	------	Basin A-1A
11	Reservoir	1.686	1	857	89,497	10	323.93	85,821	Route Basin A-1A
12	Reach	1.667	1	946	89,465	11	------	------	Reach Basin A-1A
14	SCS Runoff	89.04	1	719	203,122	------	------	------	Basin A-1B
15	Reservoir	54.95	1	736	182,864	14	316.48	46,254	Route Basin A-1B
16	Reach	39.57	1	738	182,854	15	------	------	Reach Basin A-1B
18	SCS Runoff	26.15	1	719	60,758	------	------	------	Basin A2
19	Reservoir	24.25	1	721	52,703	18	294.44	9,939	Route Basin A2
20	Reach	14.36	1	728	52,695	19	------	------	Reach Basin A2
22	SCS Runoff	34.69	1	718	70,380	------	------	------	Basin A5
23	Reservoir	24.15	1	721	55,103	22	332.97	19,378	Route Basin A5
24	Reach	14.54	1	731	55,094	23	------	------	Reach Basin A5
26	SCS Runoff	339.99	1	719	780,155	------	------	------	Basin A6
27	Reservoir	224.60	1	724	611,315	26	302.29	260,045	Route Basin A6
28	Diversion1	106.44	1	724	158,131	27	------	------	Wier B to Basin A7
29	Diversion2	118.16	1	724	453,184	27	------	------	Basin A6 Outlet
30	Reach	108.03	1	731	453,181	29	------	------	Reach Basin A6
32	SCS Runoff	189.01	1	719	438,221	------	------	------	Basin A7
33	Combine	272.84	1	720	596,353	28, 32	------	------	Total flow to Basin A7
34	Reservoir	105.23	1	731	493,418	33	277.42	244,529	Route Basin A7
35	Reach	104.66	1	734	493,416	34	------	------	Reach Basin A7
37	SCS Runoff	197.52	1	719	454,333	------	------	------	Basin A8

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
38	Reservoir	21.70	1	745	296,070	37	280.08	244,398	Route Basin A8
39	Reach	21.59	1	749	296,032	38	------	------	Reach Basin A8
41	SCS Runoff	70.97	1	719	161,631	------	------	------	Basin A9
42	Reservoir	3.986	1	778	113,157	41	299.92	89,800	Route Basin A9
43	Reach	3.964	1	800	113,149	42	------	------	Reach Basin A9
45	SCS Runoff	52.29	1	719	120,540	------	------	------	Basin A10
46	Reservoir	48.54	1	721	90,108	45	309.99	32,016	Route Basin A10
47	Reach	31.49	1	727	90,103	46	------	------	Reach Basin A10
49	SCS Runoff	299.86	1	726	984,976	------	------	------	Bypass A11
51	SCS Runoff	68.24	1	719	154,384	------	------	------	Bypass A12
52	Reach	34.59	1	727	154,372	51	------	------	Reach Bypass A12
54	Combine	173.71	1	731	833,290	12, 16, 20,	------	------	Post Developed A1 (1)
55	Combine	439.96	1	727	1,928,798	24, 30, 35, 39, 49, 52,	------	------	Post Developed A1 (2)
57	Combine	606.65	1	728	2,762,088	54, 55,	------	------	POST DEVELOPED A1 - TOTAL
59	SCS Runoff	206.55	1	722	555,481	------	------	------	Bypass A13
61	Combine	33.20	1	728	203,251	43, 47,	------	------	Post Developed A2
63	Combine	232.24	1	723	758,732	59, 61,	------	------	POST DEVELOPED A2 - TOTAL
65	Combine	806.33	1	726	3,520,820	57, 63,	------	------	POST DEVELOPED A - TOTAL (A1
67	SCS Runoff	43.08	1	723	117,625	------	------	------	POST DEVELOPED B - Bypass B1
69	SCS Runoff	7.604	1	718	15,270	------	------	------	POST DEVELOPED B - Bypass B2
71	Combine	48.00	1	721	132,896	67, 69,	------	------	POST DEVELOPED B- TOTAL (B1 +
73	SCS Runoff	84.81	1	717	176,111	------	------	------	Basin C1
74	Reservoir	0.408	1	1286	45,739	73	353.10	139,496	Route Basin C1
76	SCS Runoff	12.77	1	718	25,649	------	------	------	Bypass C2
78	Combine	12.99	1	718	71,388	74, 76,	------	------	POST DEVELOPED C - TOTAL

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
80	SCS Runoff	11.31	1	718	23,121	------	------	------	POST DEVELOPED D - Bypass D1

Allowable Flows and Volumes

2

The Robinson Tract

Westtown Township
Chester County, PA

Date: 8-Aug-19
By: J.W.J.
Chk'd: --
Rev'd: 9-Oct-20

Allowable Post Developed Flows - SCS

Area Summaries

Area	Pre Q -1 yr (cfs)	Pre Q -2 yr (cfs)	Pre Q -5 yr (cfs)	Pre Q -10 yr (cfs)	Pre Q -25 yr (cfs)	Pre Q - 50 yr (cfs)	Pre Q - 100 yr (cfs)	Pre Total Area (Ac.)	Total Area Disturbed (Ac.)	% of shed (%)	Total Area Undisturbed (Ac.)	% of shed (%)
POI A1	53.81	110.05	215.76	315.00	473.81	616.65	777.65	199.02	139.64	70.2%	59.38	29.8%
POI A2	21.72	39.87	71.92	101.14	147.31	188.71	234.60	47.92	15.06	31.4%	32.86	68.6%
POI A - Total	73.70	146.96	282.36	409.40	612.16	794.12	997.42	246.94	154.70	62.6%	92.24	37.4%
POI B1	1.23	3.89	9.74	15.65	25.42	34.42	44.64	11.60	0.73	6.3%	10.87	93.7%
POI B2	1.03	2.80	6.49	10.11	16.03	21.44	27.58	6.79	5.58	82.2%	1.21	17.8%
POI B - Total	2.27	6.69	16.22	25.76	41.46	55.86	72.20	18.39	6.31	34.3%	12.08	65.7%
POI C1	0.95	3.40	8.93	14.52	23.82	32.40	42.16	9.95	#VALUE!	#VALUE!	N/A	#VALUE!
POI D1	2.84	4.59	7.53	10.14	14.16	17.67	21.51	2.81	1.87	66.5%	0.94	33.5%

Weighted Allowable

Area	Post Q-2 yr (cfs)	Post Q-5 yr (cfs)	Post Q-10 yr (cfs)	Post Q-25 yr (cfs)	Post Q-50 yr (cfs)	Post Q-100 yr (cfs)
POI A1	70.59	215.76	315.00	473.81	616.65	777.65
POI A2	34.17	71.92	101.14	147.31	188.71	234.60
POI A - Total	101.06	282.36	409.40	612.16	794.12	997.42
POI B1	3.72	9.74	15.65	25.42	34.42	44.64
POI B2	1.35	6.49	10.11	16.03	21.44	27.58
POI B - Total	5.17	16.22	25.76	41.46	55.86	72.20
POI C1	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
POI D1	3.42	7.53	10.14	14.16	17.67	21.51

Note 1: The allowable post developed flow for the 2-year post developed storm is calculated by using the 1-year pre developed design flow multiplied with the percent **UN-**disturbed of the shed. That number is then added to the product of the actual year frequency storm multiplied by the percent disturbed of the shed.
As follows: (Q-1-pre * % disturbed) + (Q-2-pre * % undisturbed) = Q-2 post-allowable

Note 2: Per Table 308.1 of Chapter 144, Stormwater Management, the peak rate control standards are 2-year post reduced to the 1-year pre, and for the 5-, 10-, 25-, 50-, and 100-year post developed storms are to be reduced to the 5-, 10-, 25-, 50-, and 100-year pre development runoff, respectively.

The Robinson Tract
Westtown Township
Chester County, PA

Date: 8-Aug-19
By: J.W.J.
Chk'd: --
Rev'd: 9-Oct-20

CREBILLY FARM - WATERSHED SUMMARIES to Brandywine Creek Watershed								
WATERSHED DESCRIPTION		PEAK RUNOFF RATES (CFS)						
		1 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
POI A1	Pre-Developed Study Point No. A1 (Hyd. No. 1)	53.81	110.05	215.76	315.00	473.81	616.65	777.65
	Post Developed flow to POI A1 (Hyd. No. 57)	--	63.61	116.89	195.43	360.03	485.40	606.65
	ALLOWABLE POST DEVELOPED FLOW (from allowable excel sheet)	--	*70.59*	*215.76*	*315.00*	*473.81*	*616.65*	*777.65*
POI A2	Pre-Developed Study Point No. A2 (Hyd. No. 2)	21.72	39.87	71.92	101.14	147.31	188.71	234.60
	Post Developed flow to POI A2 (Hyd. No. 63)	--	41.43	69.45	94.65	140.46	184.42	232.24
	ALLOWABLE POST DEVELOPED FLOW (from allowable excel sheet)	--	*34.17*	*71.92*	*101.14*	*147.31*	*188.71*	*234.60*
POI A - TOTAL	**Pre-Developed Study Point No. A (Hyd. No. 3)**	**73.70**	**146.96**	**282.36**	**409.40**	**612.16**	**794.12**	**997.42**
	Post Developed flow to POI A (Hyd. No. 65)	**--**	**100.60**	**177.66**	**268.64**	**473.94**	**640.23**	**806.33**
	ALLOWABLE POST DEVELOPED FLOW (from allowable excel sheet)	**--**	***101.06***	***282.36***	***409.40***	***612.16***	***794.12***	***997.42***
POI B1	Pre-Developed flow to POI B1 (on-site) (Hyd. No. 4)	1.23	3.89	9.74	15.65	25.42	34.42	44.64
	Total flow to POI B1 (Hyd. Nos. 67)	--	3.98	9.67	15.36	24.73	33.33	43.08
	ALLOWABLE POST DEVELOPED FLOW (from allowable excel sheet)	--	*3.72*	*9.74*	*15.65*	*25.42*	*34.42*	*44.64*
POI B2	Pre-Developed Study Point No. B2 (Hyd. No. 5)	1.03	2.80	6.49	10.11	16.03	21.44	27.58
	Post Developed flow to POI B2 (Hyd. No. 69)	--	1.01	2.05	3.03	4.60	6.02	7.60
	ALLOWABLE POST DEVELOPED FLOW (from allowable excel sheet)	--	*1.35*	*6.49*	*10.11*	*16.03*	*21.44*	*27.58*
POI B - TOTAL	**Pre-Developed Study Point No. B (Hyd. No. 6)**	**2.27**	**6.69**	**16.22**	**25.76**	**41.46**	**55.86**	**72.20**
	Post Developed flow to POI B (Hyd. No. 71)	**--**	**4.45**	**10.79**	**17.13**	**27.53**	**37.08**	**48.00**
	ALLOWABLE POST DEVELOPED FLOW (from allowable excel sheet)	**--**	***5.17***	***16.22***	***25.76***	***41.46***	***55.86***	***72.20***
POI D1	**Pre-Developed Study Point No. D1 (Hyd. No. 8)**	**2.84**	**4.59**	**7.53**	**10.14**	**14.16**	**17.67**	**21.51**
	Post Developed flow to POI D1 (Hyd. No. 80)	**--**	**2.55**	**4.09**	**5.45**	**7.53**	**9.34**	**11.31**
	ALLOWABLE POST DEVELOPED FLOW (from allowable excel sheet)	**--**	***3.42***	***7.53***	***10.14***	***14.16***	***17.67***	***21.51***

		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
TOTAL PRE DEVELOPED		158.24	306.11	445.30	667.78	867.65	1091.13
TOTAL ALLOWABLE POST DEVELOP		109.66	306.11	445.30	667.78	867.65	1091.13
TOTAL POST DEVELOPED		107.60	192.54	291.22	509.00	686.65	865.64

CREBILLY FARM - WATERSHED SUMMARIES to Chester Creek Watershed								
WATERSHED DESCRIPTION		PEAK RUNOFF RATES (CFS)						
		1 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
POI C1	**Pre-Developed Study Point No. C1 (Hyd. No. 7)**	**0.95**	**3.40**	**8.93**	**14.52**	**23.82**	**32.40**	**42.16**
	Post Developed flow to POI C1 (Hyd. No. 78)	**--**	**1.33**	**3.04**	**4.71**	**7.48**	**10.09**	**12.99**
	ALLOWABLE POST DEVELOPED FLOW (50% of Pre Developed)	***0.48***	***1.70***	***4.47***	***7.26***	***11.91***	***16.20***	***21.08***

The Robinson Tract
Westtown Township
Chester County, PA

Date: 8-Aug-19
By: J.W.J.
Chk'd: --
Rev'd: 9-Oct-20

CREBILLY FARM - WATERSHED VOLUME SUMMARIES to Brandywine Creek Watershed		
WATERSHED DESCRIPTION		2 Year
POI A1	Pre-Developed Study Point No. A1 (Hyd. No. 1)	456,637
	Post Developed flow to POI A1 (Hyd. No. 57)	351,692
POI A2	Pre-Developed Study Point No. A2 (Hyd. No. 2)	129,978
	Post Developed flow to POI A2 (Hyd. No. 63)	121,604
POI A - TOTAL	Pre-Developed Study Point No. A (Hyd. No. 3)	586,615
	Post Developed flow to POI A (Hyd. No. 65)	473,296
POI B1	Pre-Developed flow to POI B1 (on-site) (Hyd. No. 4)	16,711
	Total flow to POI B1 (Hyd. Nos. 67)	16,518
POI B2	Pre-Developed Study Point No. B2 (Hyd. No. 5)	11,015
	Post Developed flow to POI B2 (Hyd. No. 69)	2,430
POI B - TOTAL	Pre-Developed Study Point No. B (Hyd. No. 6)	27,726
	Post Developed flow to POI B (Hyd. No. 71)	18,948
POI D1	Pre-Developed Study Point No. D1 (Hyd. No. 8)	9,465
	Post Developed flow to POI D1 (Hyd. No. 80)	5,211

	2-year
TOTAL PRE DEVELOPED	1,238,147
TOTAL POST DEVELOP	989,699

CREBILLY FARM - WATERSHED VOLUME SUMMARIES to Chester Creek Watershed		
WATERSHED DESCRIPTION		2 Year
POI C1	Pre-Developed Study Point No. C1 (Hyd. No. 7)	13,460
	Post Developed flow to POI C1 (Hyd. No. 78)	3,584

Pre-developed Tc

3

TR55 Tc Worksheet

Hyd. No. 1

Pre Developed Area A1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.27		0.00		0.00		
Land slope (%)	= 1.50		0.00		0.00		
Travel Time (min)	**= 12.02**	**+**	**0.00**	**+**	**0.00**	**=**	**12.02**
Shallow Concentrated Flow							
Flow length (ft)	= 443.00		202.00		0.00		
Watercourse slope (%)	= 2.82		5.45		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.71		3.77		0.00		
Travel Time (min)	**= 2.73**	**+**	**0.89**	**+**	**0.00**	**=**	**3.62**
Channel Flow							
X sectional flow area (sqft)	= 16.00		22.00		0.00		
Wetted perimeter (ft)	= 12.00		15.00		0.00		
Channel slope (%)	= 2.55		0.24		0.00		
Manning's n-value	= 0.030		0.015		0.015		
Velocity (ft/s)	=9.62						
			6.29				
					0.00		
Flow length (ft)	({0})2162.0		341.0		0.0		
Travel Time (min)	**= 3.75**	**+**	**0.90**	**+**	**0.00**	**=**	**4.65**

Total Travel Time, Tc ..... 20.29 min

TR55 Tc Worksheet

Hyd. No. 2

Pre Developed Area A2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.27		0.00		0.00		
Land slope (%)	= 7.00		0.00		0.00		
Travel Time (min)	**= 6.49**	**+**	**0.00**	**+**	**0.00**	**=**	**6.49**
Shallow Concentrated Flow							
Flow length (ft)	= 233.00		196.00		0.00		
Watercourse slope (%)	= 7.30		10.20		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=4.36		5.15		0.00		
Travel Time (min)	**= 0.89**	**+**	**0.63**	**+**	**0.00**	**=**	**1.52**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 12.00		0.00		0.00		
Channel slope (%)	= 1.38		0.00		0.00		
Manning's n-value	= 0.030		0.015		0.015		
Velocity (ft/s)	=7.07						
			0.00				
					0.00		
Flow length (ft)	({0})3114.0		0.0		0.0		
Travel Time (min)	**= 7.34**	**+**	**0.00**	**+**	**0.00**	**=**	**7.34**

Total Travel Time, Tc ..... 15.40 min

TR55 Tc Worksheet

Hyd. No. 4

Pre Developed Area B1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.27		0.00		0.00		
Land slope (%)	= 3.00		0.00		0.00		
Travel Time (min)	**= 9.11**	**+**	**0.00**	**+**	**0.00**	**=**	**9.11**
Shallow Concentrated Flow							
Flow length (ft)	= 1024.00		0.00		0.00		
Watercourse slope (%)	= 4.49		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.42		0.00		0.00		
Travel Time (min)	**= 4.99**	**+**	**0.00**	**+**	**0.00**	**=**	**4.99**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 14.10 min

TR55 Tc Worksheet

Hyd. No. 5

Pre Developed Area B2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.27		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 10.71**	**+**	**0.00**	**+**	**0.00**	**=**	**10.71**
Shallow Concentrated Flow							
Flow length (ft)	= 622.00		0.00		0.00		
Watercourse slope (%)	= 3.54		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.04		0.00		0.00		
Travel Time (min)	**= 3.41**	**+**	**0.00**	**+**	**0.00**	**=**	**3.41**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 14.10 min

TR55 Tc Worksheet

Hyd. No. 7

Pre Developed Area C1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.27		0.00		0.00		
Land slope (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 9.78**	**+**	**0.00**	**+**	**0.00**	**=**	**9.78**
Shallow Concentrated Flow							
Flow length (ft)	= 430.00		0.00		0.00		
Watercourse slope (%)	= 5.80		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.89		0.00		0.00		
Travel Time (min)	**= 1.84**	**+**	**0.00**	**+**	**0.00**	**=**	**1.84**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 11.60 min

Pre-developed Cn

4

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Pre Developed A1**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious	98	0.00	0.00
---	Pond	98	1.17	114.66
A	Woods - Good Condition	30	0.00	0.00
B	Woods - Good Condition	55	3.70	203.50
C	Woods - Good Condition	70	0.33	23.10
D	Woods - Good Condition	77	3.99	307.23
A	Meadow	30	0.00	0.00
B	Meadow	58	121.02	7019.16
C	Meadow	71	20.20	1434.20
D	Meadow	78	48.61	3791.58
		Totals =	199.02	12893.43

$$\text{Composite Cn} = \frac{12893.43}{199.02} = 64.78$$

USE Cn = 64.8

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Pre Developed A2**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious	98	1.98	194.04
A	Woods - Good Condition	30	0.00	0.00
B	Woods - Good Condition	55	1.61	88.55
C	Woods - Good Condition	70	0.00	0.00
D	Woods - Good Condition	77	9.20	708.40
A	Meadow	30	0.00	0.00
B	Meadow	58	25.34	1469.72
C	Meadow	71	0.20	14.20
D	Meadow	78	9.59	748.02
		Totals =	47.92	3222.93

$$\text{Composite Cn} = \frac{3222.93}{47.92} = 67.26$$

USE Cn = 67.3

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Pre Developed B1**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious	98	0.27	26.46
A	Woods - Good Condition	30	0.00	0.00
B	Woods - Good Condition	55	0.00	0.00
C	Woods - Good Condition	70	0.00	0.00
D	Woods - Good Condition	77	0.00	0.00
A	Meadow	30	0.00	0.00
B	Meadow	58	11.33	657.14
C	Meadow	71	0.00	0.00
D	Meadow	78	0.00	0.00
		Totals =	11.60	683.60

$$\text{Composite Cn} = \frac{683.60}{11.60} = 58.93$$

USE Cn = 58.9

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Pre Developed B2**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious	98	0.39	38.22
A	Woods - Good Condition	30	0.00	0.00
B	Woods - Good Condition	55	0.00	0.00
C	Woods - Good Condition	70	0.00	0.00
D	Woods - Good Condition	77	0.00	0.00
A	Meadow	30	0.00	0.00
B	Meadow	58	6.40	371.20
C	Meadow	71	0.00	0.00
D	Meadow	78	0.00	0.00
		Totals =	6.79	409.42

$$\text{Composite Cn} = \frac{409.42}{6.79} = 60.30$$

USE Cn = 60.3

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Pre Developed C1**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious	98	0.00	0.00
A	Woods - Good Condition	30	0.00	0.00
B	Woods - Good Condition	55	0.00	0.00
C	Woods - Good Condition	70	0.00	0.00
D	Woods - Good Condition	77	0.00	0.00
A	Meadow	30	0.00	0.00
B	Meadow	58	4.85	281.30
B	Meadow (orig C-Soil 71)	58	5.05	292.90
B	Meadow (orig D-Soil 78)	58	0.05	2.90
		Totals =	9.95	577.10

$$\text{Composite Cn} = \frac{577.10}{9.95} = 58.00$$

USE Cn = 58.0

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Pre Developed D1**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious	98	0.00	0.00
A	Woods - Good Condition	30	0.00	0.00
B	Woods - Good Condition	55	0.00	0.00
C	Woods - Good Condition	70	0.00	0.00
D	Woods - Good Condition	77	0.00	0.00
A	Meadow	30	0.00	0.00
B	Meadow	58	0.08	4.64
C	Meadow	71	2.73	193.83
D	Meadow	78	0.00	0.00
		Totals =	2.81	198.47

$$\text{Composite Cn} = \frac{198.47}{2.81} = 70.63$$

USE Cn = 70.6

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

Post-developed Cn

5

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin A-1B**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	1.80	176.40
--	Impervious in ROW	98	1.76	172.48
B	On-Site Disturbed Lawn (good)	61	6.99	426.39
C	On-Site Disturbed Lawn (good)	74	1.89	139.86
B	On-Site Meadow (good)	58	0.00	0.00
C	On-Site Meadow (good)	71	0.00	0.00
D	On-Site Meadow (good)	78	0.00	0.00

Totals = 12.44 915.13

Composite Cn = $\frac{915.13}{12.44}$ = 73.56

USE Cn = 73.6

---

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin A-1A**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	1.52	148.96
--	Impervious in ROW	98	1.27	124.46
B	On-Site Disturbed Lawn (good)	61	5.66	345.26
C	On-Site Disturbed Lawn (good)	74	0.00	0.00
B	On-Site Meadow (good)	58	0.00	0.00
C	On-Site Meadow (good)	71	0.00	0.00
D	On-Site Meadow (good)	78	0.00	0.00

Totals = 8.45 | 618.68

Composite Cn = $\frac{618.68}{8.45}$ = 73.22

USE Cn = 73.2

---

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin A2**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	0.36	35.28
--	Impervious in ROW	98	1.16	113.68
B	On-Site Disturbed Lawn (good)	61	1.46	89.06
D	On-Site Disturbed Lawn (good)	80	0.18	14.40
B	On-Site Meadow (good)	58	0.05	2.90
D	On-Site Meadow (good)	78	0.00	0.00

Totals =	3.21	255.32

Composite Cn = $\frac{255.32}{3.21}$ = 79.54

USE Cn = 79.5

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin A5**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	0.44	43.12
--	Impervious in ROW	98	0.32	31.36
B	On-Site Disturbed Lawn (good)	61	2.55	155.55
D	On-Site Disturbed Lawn (good)	80	0.55	44.00
B	On-Site Meadow (good)	58	0.71	41.18
C	On-Site Meadow (good)	71	0.00	0.00
D	On-Site Meadow (good)	78	0.12	9.36

Totals = 4.69 324.57

Composite Cn = $\frac{324.57}{4.69}$ = 69.20

USE Cn = 69.2

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin A6**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	9.51	931.98
--	Impervious in ROW	98	6.00	588.00
B	On-Site Disturbed Lawn (good)	61	23.41	1428.01
C	On-Site Disturbed Lawn (good)	74	3.53	261.22
D	On-Site Disturbed Lawn (good)	80	2.73	218.40
Totals =			45.18	3427.61

$$\text{Composite Cn} = \frac{3427.61}{45.18} = 75.87$$

USE Cn = 75.9

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin A7**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	4.85	475.30
--	Impervious in ROW	98	2.65	259.70
A	On-Site Disturbed Lawn (good)	39	0.00	
B	On-Site Disturbed Lawn (good)	61	8.36	509.96
D	On-Site Disturbed Lawn (good)	80	7.77	621.60
B	On-Site Meadow (good)	58	0.00	0.00
D	On-Site Meadow (good)	78	0.00	0.00

Totals =	23.63	1866.56

Composite Cn = $\frac{1866.56}{23.63}$ = 78.99

USE Cn = 79.0

---

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin A8**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	4.51	441.98
--	Impervious in ROW	98	2.70	264.60
--	Impervious Parking Lot	98	0.67	65.66
--	Impervious Amenity Center	98	0.39	38.22
B	On-Site Disturbed Lawn (good)	61	12.05	735.05
C	On-Site Disturbed Lawn (good)	74	0.80	59.20
D	On-Site Disturbed Lawn (good)	80	4.70	376.00
B	On-Site Meadow (good)	58	0.00	0.00
C	On-Site Meadow (good)	71	0.00	0.00
D	On-Site Meadow (good)	78	0.00	0.00
Totals =			25.82	1980.71

$$\text{Composite Cn} = \frac{1980.71}{25.82} = 76.71$$

USE Cn = 76.7

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin A9**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	2.24	219.52
--	Impervious in ROW	98	0.78	76.44
--	Impervious pleasant grove Rd	98	0.18	17.64
--	Impervious Road Widening	98	0.09	8.82
B	On-Site Disturbed Lawn (good)	61	6.09	371.49
D	On-Site Disturbed Lawn (good)	80	0.00	0.00
B	Meadow	58	0.72	41.76

Totals = 10.10 735.67

Composite Cn = $\frac{735.67}{10.10}$ = 72.84

USE Cn = 72.8

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin A10**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	1.71	167.58
--	Impervious in ROW	98	1.00	98.00
--	Impervious pleasant grove Rd	98	0.22	21.56
--	Impervious Road Widening	98	0.08	7.84
B	On-Site Disturbed Lawn (good)	61	3.60	219.60
B	Woods - Good Condition	55	0.13	7.15
B	Meadow	58	0.00	0.00

Totals =	6.74	521.73

Composite Cn = $\frac{521.73}{6.74}$ = 77.41

USE Cn = 77.4

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Bypass A11**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	2.00	196.00
--	Impervious in ROW	98	0.00	0.00
B	On-Site Disturbed Lawn (good)	61	8.91	543.51
C	On-Site Disturbed Lawn (good)	74	0.40	29.60
D	On-Site Disturbed Lawn (good)	80	4.86	388.80
---	Pond	98	1.17	114.66
B	On-Site Meadow (good)	58	13.98	810.84
C	On-Site Meadow (good)	71	8.01	568.71
D	On-Site Meadow (good)	78	18.58	1449.24
B	Woods - Good Condition	55	2.66	146.30
D	Woods - Good Condition	77	3.98	306.46
Totals =			64.55	4554.12

$$\text{Composite Cn} = \frac{4554.12}{64.55} = 70.55$$

USE Cn = 70.6

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Bypass A12**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	0.00	0.00
B	On-Site Disturbed Lawn (good)	61	1.13	68.93
C	On-Site Disturbed Lawn (good)	74	0.46	34.04
D	On-Site Disturbed Lawn (good)	80	0.38	30.40
B	On-Site Meadow (good)	58	3.02	175.16
C	On-Site Meadow (good)	71	1.55	110.05
D	On-Site Meadow (good)	78	3.26	254.28
B	Woods - Good Condition	55	1.03	56.65
C	Woods - Good Condition	70	0.33	23.10
Totals =			11.16	752.61

$$\text{Composite Cn} = \frac{752.61}{11.16} = 67.44$$

USE Cn = 67.4

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Bypass A13**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	0.44	43.12
--	Impervious in ROW	98	0.00	0.00
B	On-Site Disturbed Lawn (good)	61	3.46	211.06
C	On-Site Disturbed Lawn (good)	74	0.00	0.00
D	On-Site Disturbed Lawn (good)	80	0.73	58.40
B	On-Site Meadow (good)	58	12.90	748.20
C	On-Site Meadow (good)	71	0.16	11.36
D	On-Site Meadow (good)	78	8.22	641.16
B	Woods - Good Condition	55	0.38	20.90
C	Woods - Good Condition	70	0.00	0.00
D	Woods - Good Condition	77	8.49	653.73
--	Impervious - Existing remaining	98	1.86	182.28
--	Impervious - Road Widening	98	0.31	30.38
	Totals =		36.95	2600.59

$$\text{Composite Cn} = \frac{2600.59}{36.95} = 70.38$$

USE Cn = 70.4

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Bypass B1**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious - New Road	98	0.27	26.46
--	Impervious-Road Widening	98	0.11	10.78
A	Woods - Good Condition	30	0.00	0.00
B	Woods - Good Condition	55	0.00	0.00
C	Woods - Good Condition	70	0.00	0.00
D	Woods - Good Condition	77	0.00	0.00
A	Meadow	30	0.00	0.00
B	Meadow	58	10.60	614.80
C	Meadow	71	0.00	0.00
D	Meadow	78	0.00	0.00
		Totals =	10.98	652.04

$$\text{Composite Cn} = \frac{652.04}{10.98} = 59.38$$

USE Cn = 59.4

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Bypass B2**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious - W. Pleasant Grove Road	98	0.08	7.84
--	Impervious- Road Widening	98	0.05	4.90
B	On-Site Meadow (good)	58	1.13	65.54
Totals =			1.26	78.28

Composite Cn = $\frac{78.28}{1.26}$ = 62.13

USE Cn = 62.1

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Basin C1**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	1.67	163.66
--	Impervious in ROW	98	0.66	64.68
B	On-Site Disturbed Lawn (good)	61	2.18	132.98
C	On-Site Disturbed Lawn (good)	74	5.15	381.10
B	On-Site Meadow (good)	58	0.00	0.00
C	On-Site Meadow (good)	71	0.00	0.00

Totals =	9.66	742.42

$$\text{Composite Cn} = \frac{742.42}{9.66} = 76.86$$

USE Cn = 76.9

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 8/8/2019
Chk'd:
Rev'd: 11/11/19

Watershed: **Bypass C2**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	0.00	0.00
B	On-Site Disturbed Lawn (good)	61	0.44	26.84
C	On-Site Disturbed Lawn (good)	74	0.04	2.96
B	On-Site to Meadow (good)	58	0.20	11.60
B	On-Site Meadow (good)	58	1.57	91.06
C	On-Site Meadow (good)	71	0.08	5.68

Totals =	2.33	138.14

Composite Cn = $\frac{138.14}{2.33}$ = 59.29

USE Cn = 59.3

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

ESE Consultants, Inc.

The Robinson Tract
Westtown Township
Chester County, Pennsylvania

By: J.W.J.
Date: 10/1/2016
Chk'd:
Rev'd: 11/11/19

Watershed: **Bypass D1**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (acres)	Product of CN x Area
--	Impervious on lot	98	0.00	0.00
C	On-Site Disturbed Lawn (good)	74	0.49	36.26
D	On-Site Disturbed Lawn (good)	80	0.00	0.00
B	On-Site Meadow (good)	58		0.00
C	On-Site Meadow (good)	71	0.94	66.74
D	On-Site Meadow (good)	78	0.00	0.00
B	Woods - Good Condition	55	0.00	0.00
C	Woods - Good Condition	70	0.00	0.00
Totals =			1.43	103.00

Composite Cn = $\frac{103.00}{1.43}$ = 72.03

USE Cn = 72.0

24 hr RAINFALL for Westtown Township

(per NOA Atlas 14)

1 year	2 year	5 year	10 year	25 year	50 year	100 year
2.71	3.27	4.11	4.80	5.81	6.66	7.57

Pond Report

6

Pond Report

Pond No. 1 - Basin A-1A

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 318.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	318.00	9,146	0	0
2.00	320.00	13,026	20,953	20,953
4.00	322.00	17,345	28,752	49,705
6.00	324.00	22,104	37,382	87,086
8.00	326.00	27,276	46,820	133,907

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	6.00	0.00	0.00
Span (in)	= 24.00	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 318.00	320.50	0.00	0.00
Length (ft)	= 65.00	0.00	0.00	0.00
Slope (%)	= 1.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

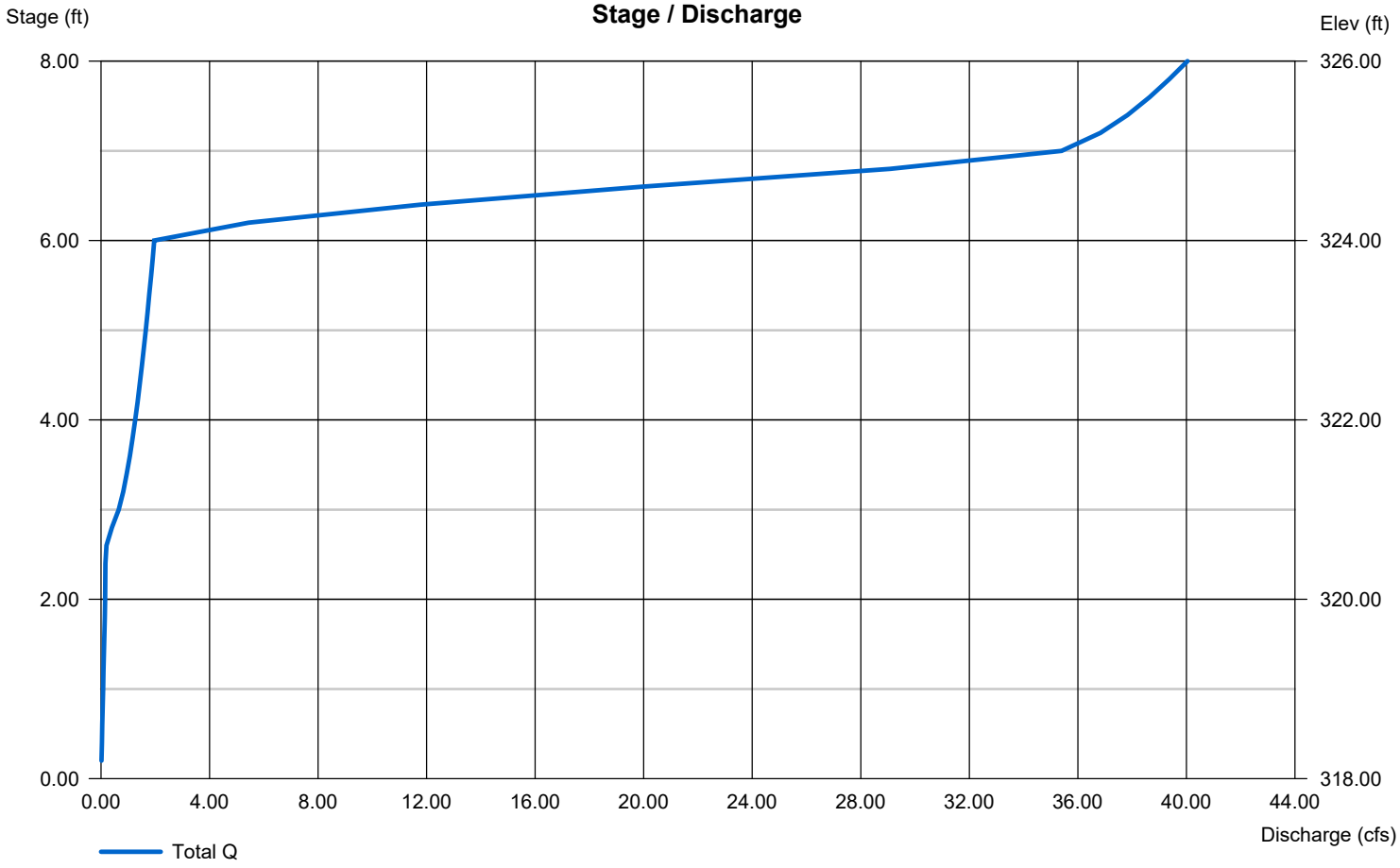
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.50	0.00	0.00	0.00
Crest El. (ft)	= 324.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Pond No. 3 - Basin A-1B

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 314.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	314.00	14,689	0	0
2.00	316.00	21,993	34,612	34,612
4.00	318.00	29,699	48,920	83,531

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 42.00	0.00	0.00	0.00
Span (in)	= 42.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 312.00	0.00	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

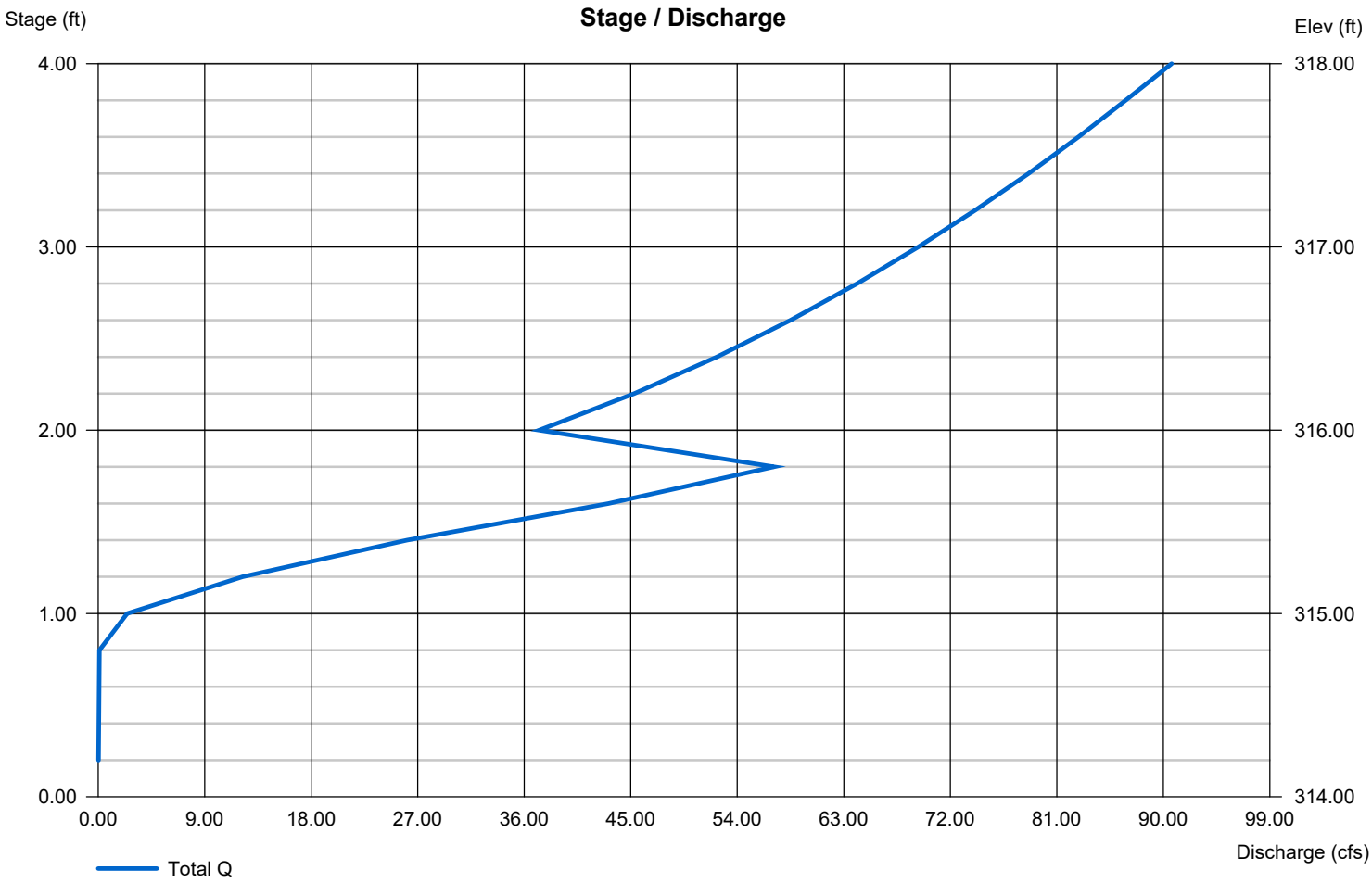
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 22.00	0.00	0.00	0.00
Crest El. (ft)	= 314.90	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Pond No. 2 - Basin A2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 292.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	292.00	2,180	0	0
2.00	294.00	5,160	6,772	6,772
4.00	296.00	10,456	14,541	21,313

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 30.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 290.00	0.00	0.00	0.00
Length (ft)	= 65.00	0.00	0.00	0.00
Slope (%)	= 1.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

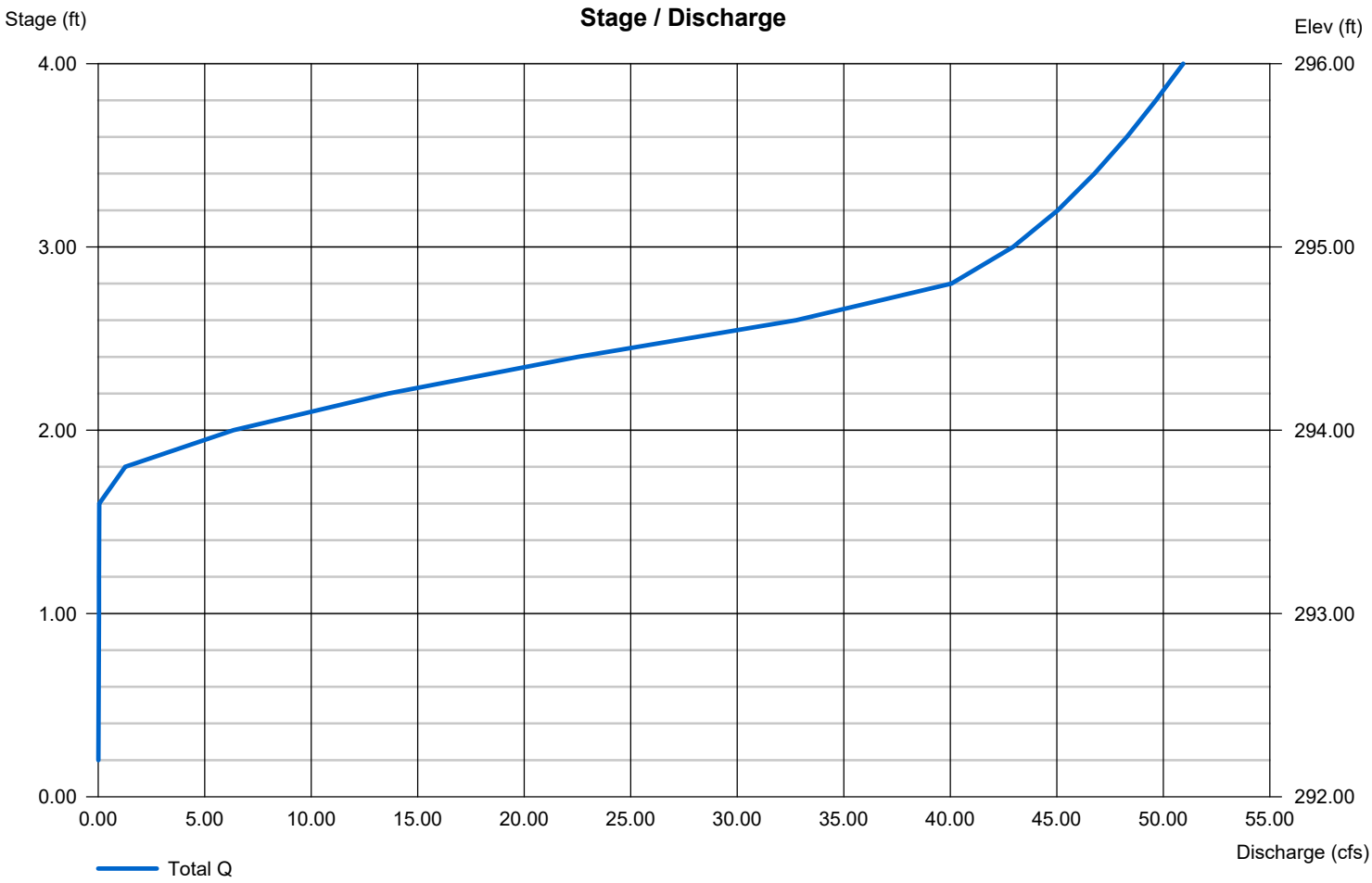
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.50	0.00	0.00	0.00
Crest El. (ft)	= 293.70	0.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Pond No. 5 - Basin A5

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 330.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	330.00	4,698	0	0
2.00	332.00	7,323	11,327	11,327
4.00	334.00	10,349	16,704	28,031
5.00	335.00	12,014	10,612	38,643

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 30.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 330.00	0.00	0.00	0.00
Length (ft)	= 94.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

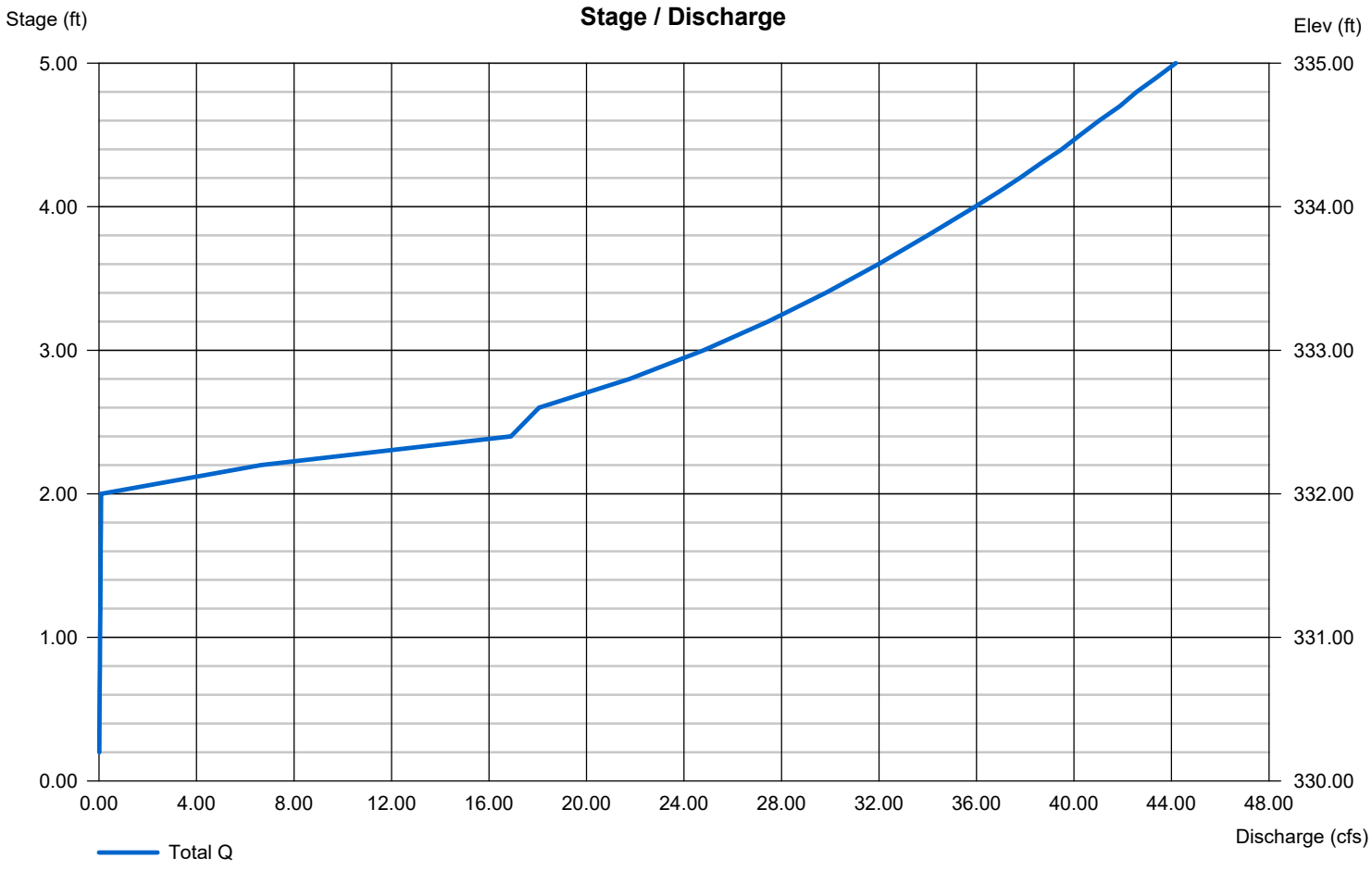
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 22.00	0.00	0.00	0.00
Crest El. (ft)	= 332.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Pond No. 6 - Basin A6

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 298.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	298.00	42,727	0	0
2.00	300.00	59,036	96,249	96,249
4.00	302.00	87,916	138,683	234,932
6.00	304.00	97,890	176,413	411,345

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 48.00	0.00	0.00	0.00
Span (in)	= 48.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 296.00	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

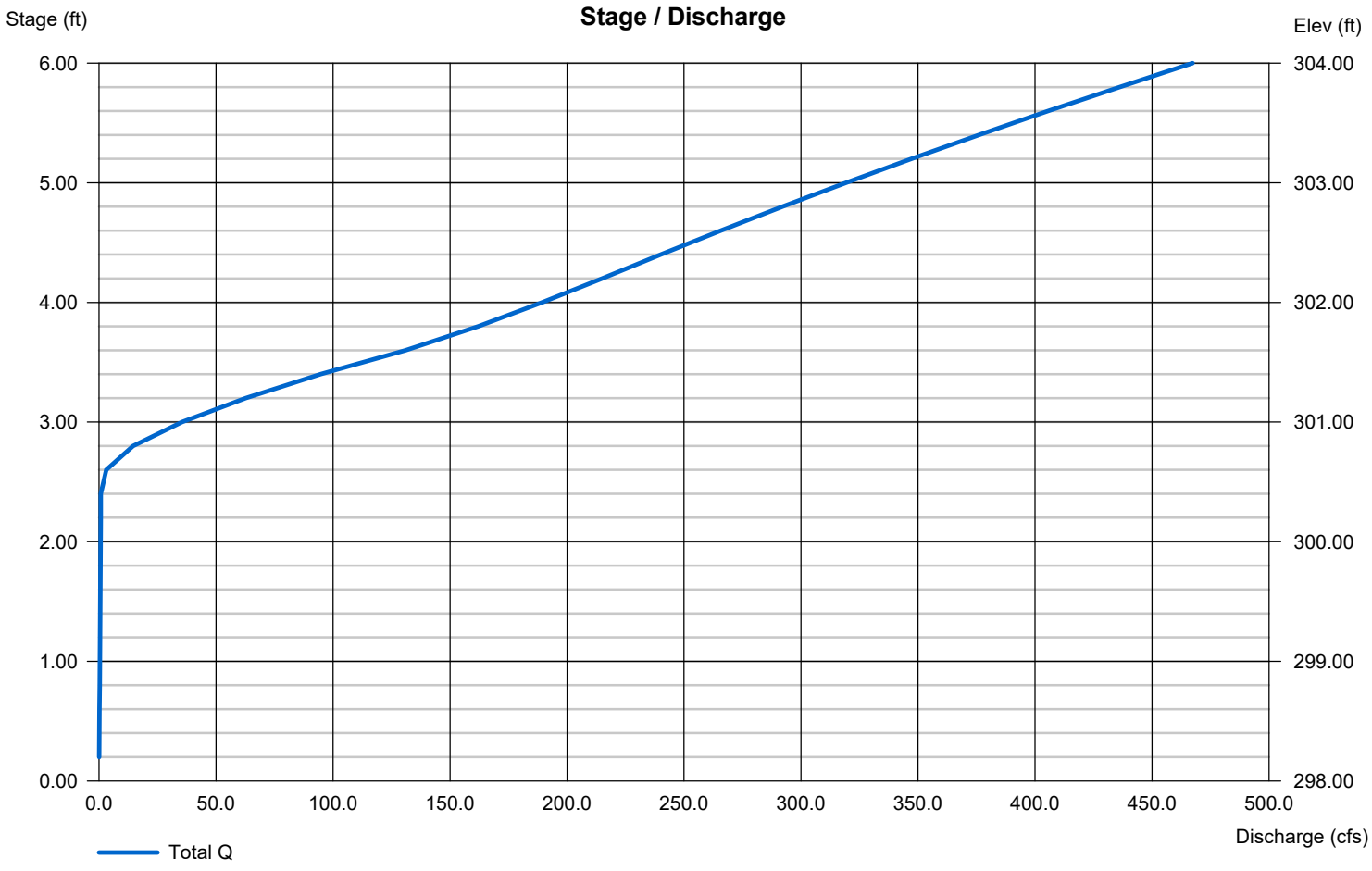
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 22.00	16.00	0.00	0.00
Crest El. (ft)	= 300.50	300.70	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Pond No. 7 - Basin A7

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 271.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	271.00	26,861	0	0
1.00	272.00	31,651	27,759	27,759
3.00	274.00	39,878	67,795	95,555
5.00	276.00	46,398	81,876	177,431
7.00	278.00	53,320	94,646	272,077
8.00	279.00	56,932	52,355	324,432

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 42.00	0.00	0.00	0.00
Span (in)	= 42.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 270.00	0.00	0.00	0.00
Length (ft)	= 80.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

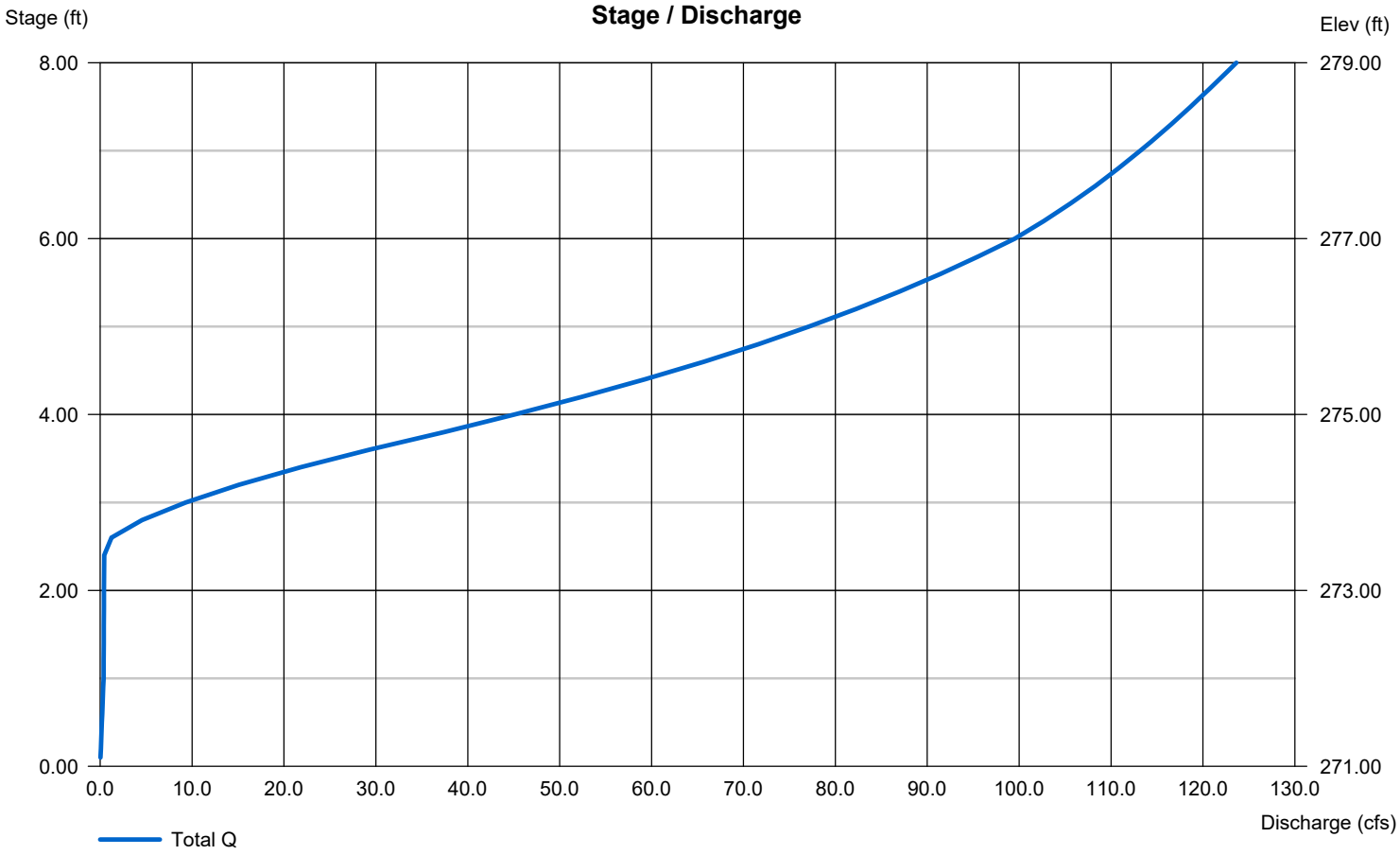
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	7.50	0.00	0.00
Crest El. (ft)	= 277.00	273.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Pond No. 8 - Basin A8

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 274.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	274.00	25,126	0	0
2.00	276.00	38,898	60,342	60,342
4.00	278.00	47,527	81,959	142,301
6.00	280.00	54,999	97,304	239,605
8.00	282.00	65,961	114,743	354,348

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	3.00	0.00	0.00
Span (in)	= 30.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 272.00	276.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

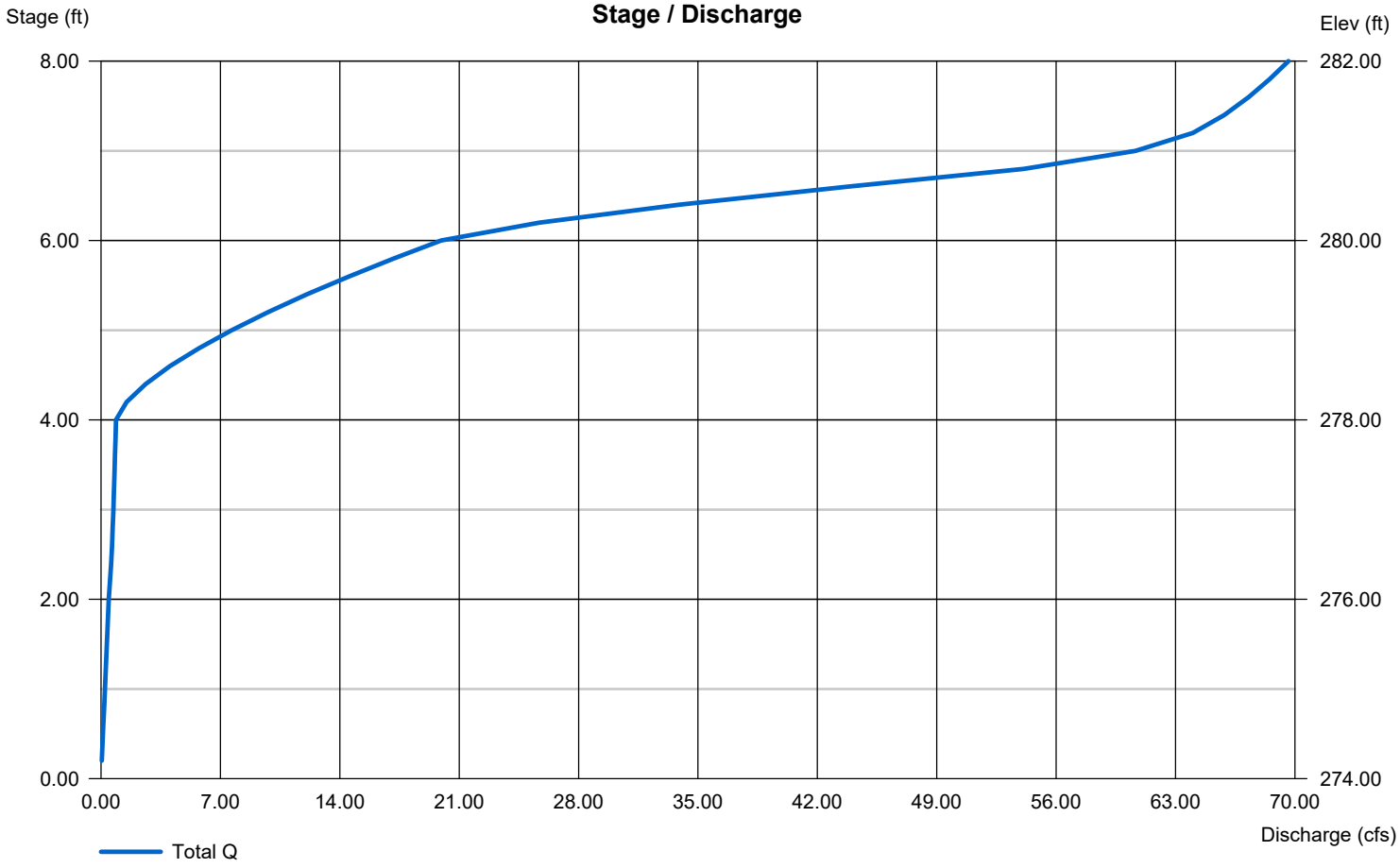
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 9.50	2.00	0.00	0.00
Crest El. (ft)	= 280.00	278.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Pond No. 9 - Basin A9

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 295.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	295.00	10,027	0	0
1.00	296.00	14,199	11,449	11,449
3.00	298.00	21,249	33,448	44,897
5.00	300.00	28,105	46,730	91,627
7.00	302.00	35,555	60,332	151,959

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	10.00	0.00	0.00
Span (in)	= 24.00	10.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 295.00	297.20	0.00	0.00
Length (ft)	= 85.00	0.00	0.00	0.00
Slope (%)	= 3.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

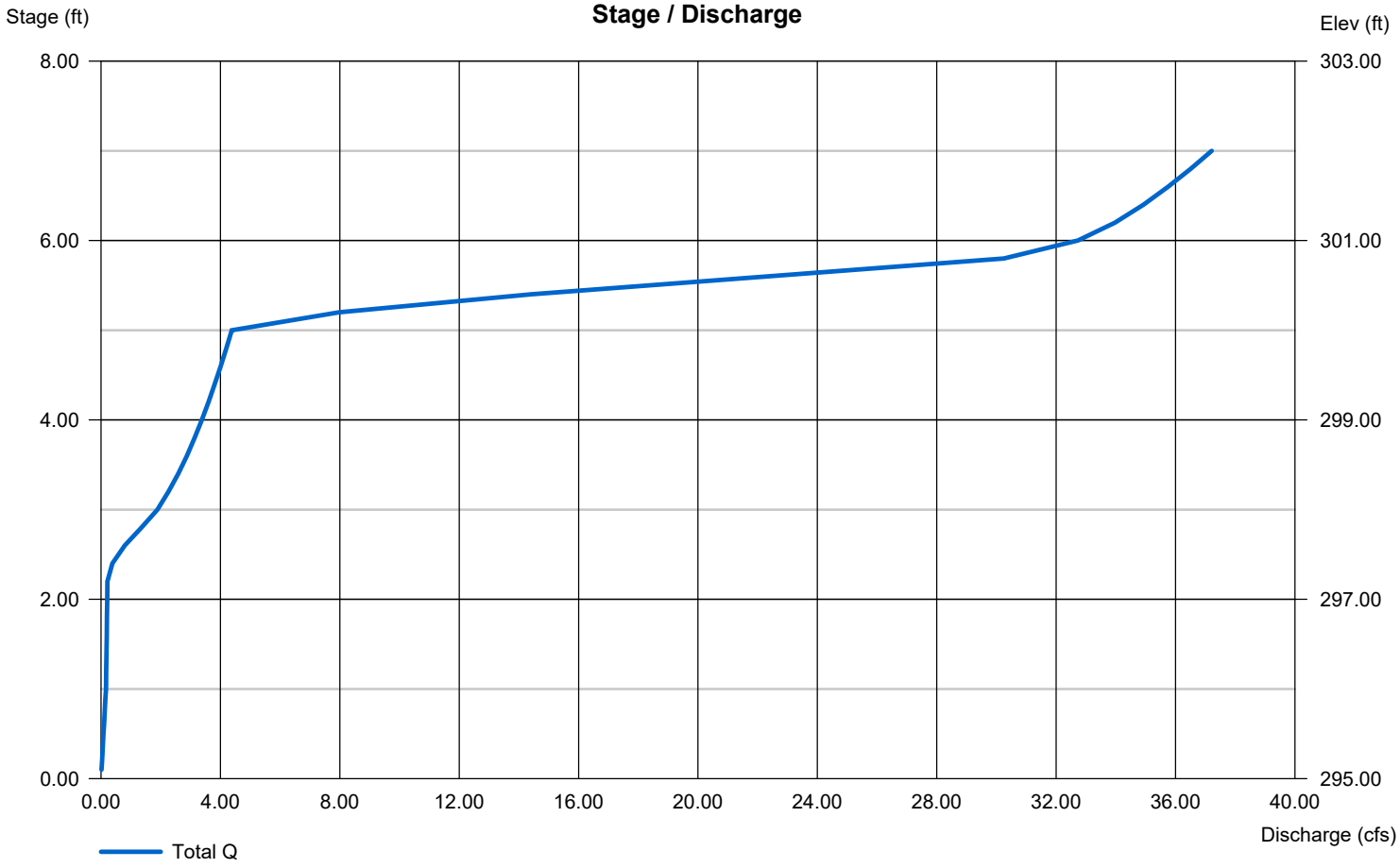
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.50	0.00	0.00	0.00
Crest El. (ft)	= 300.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Pond No. 10 - Basin A10

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 307.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	307.00	4,860	0	0
1.00	308.00	10,340	7,057	7,057
3.00	310.00	16,335	25,123	32,180
5.00	312.00	22,730	36,941	69,121

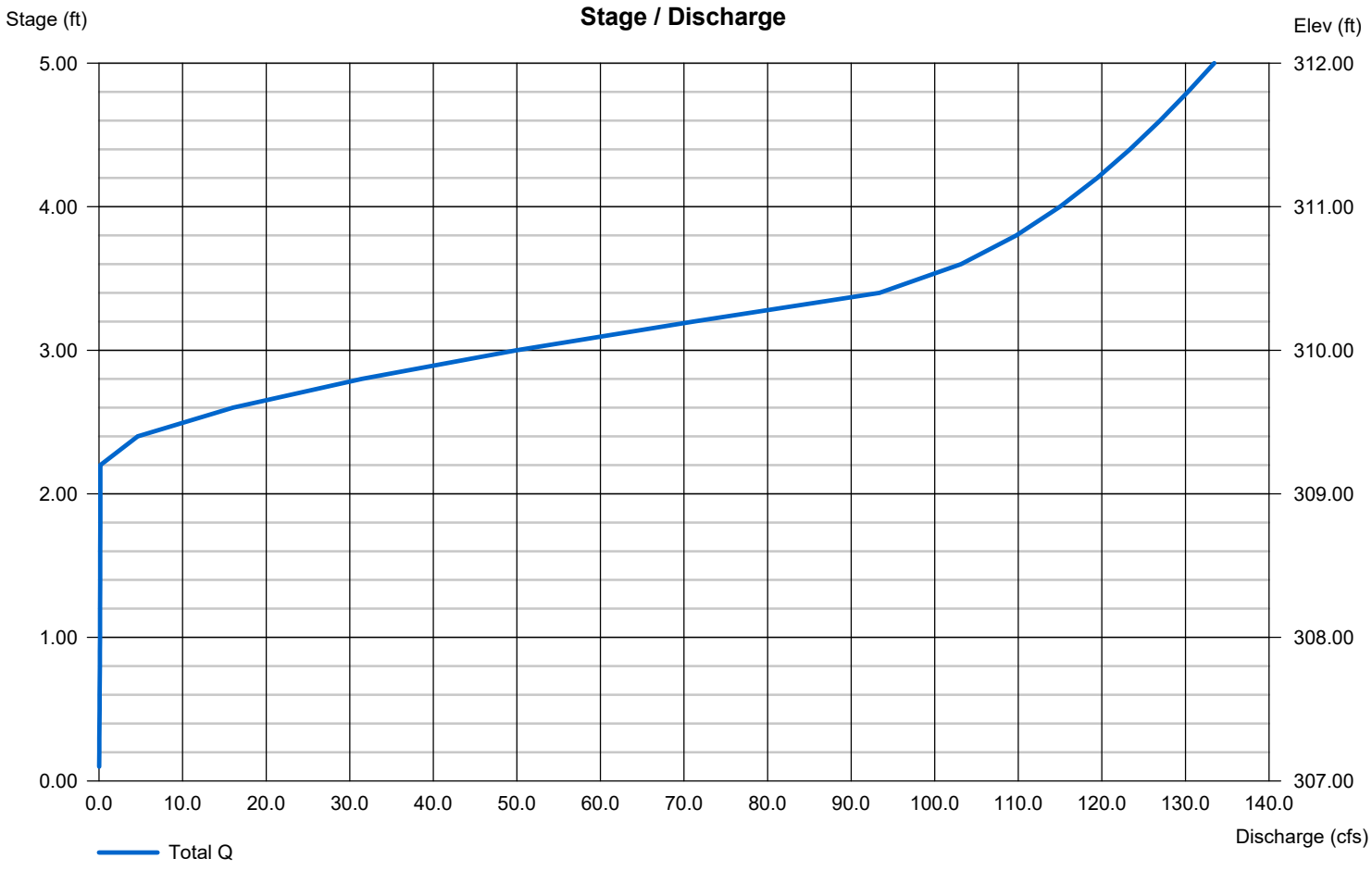
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 48.00	0.00	0.00	0.00
Span (in)	= 48.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 305.00	0.00	0.00	0.00
Length (ft)	= 70.00	0.00	0.00	0.00
Slope (%)	= 2.70	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 23.00	0.00	0.00	0.00
Crest El. (ft)	= 309.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.500 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Pond No. 11 - Basin C1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 348.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	348.00	15,563	0	0
2.00	350.00	28,099	40,893	40,893
4.00	352.00	34,335	59,208	100,100
6.00	354.00	40,974	71,444	171,544
8.00	356.00	48,016	84,444	255,987

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	3.00	0.00	0.00
Span (in)	= 24.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 348.00	350.00	0.00	0.00
Length (ft)	= 70.00	0.00	0.00	0.00
Slope (%)	= 2.70	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

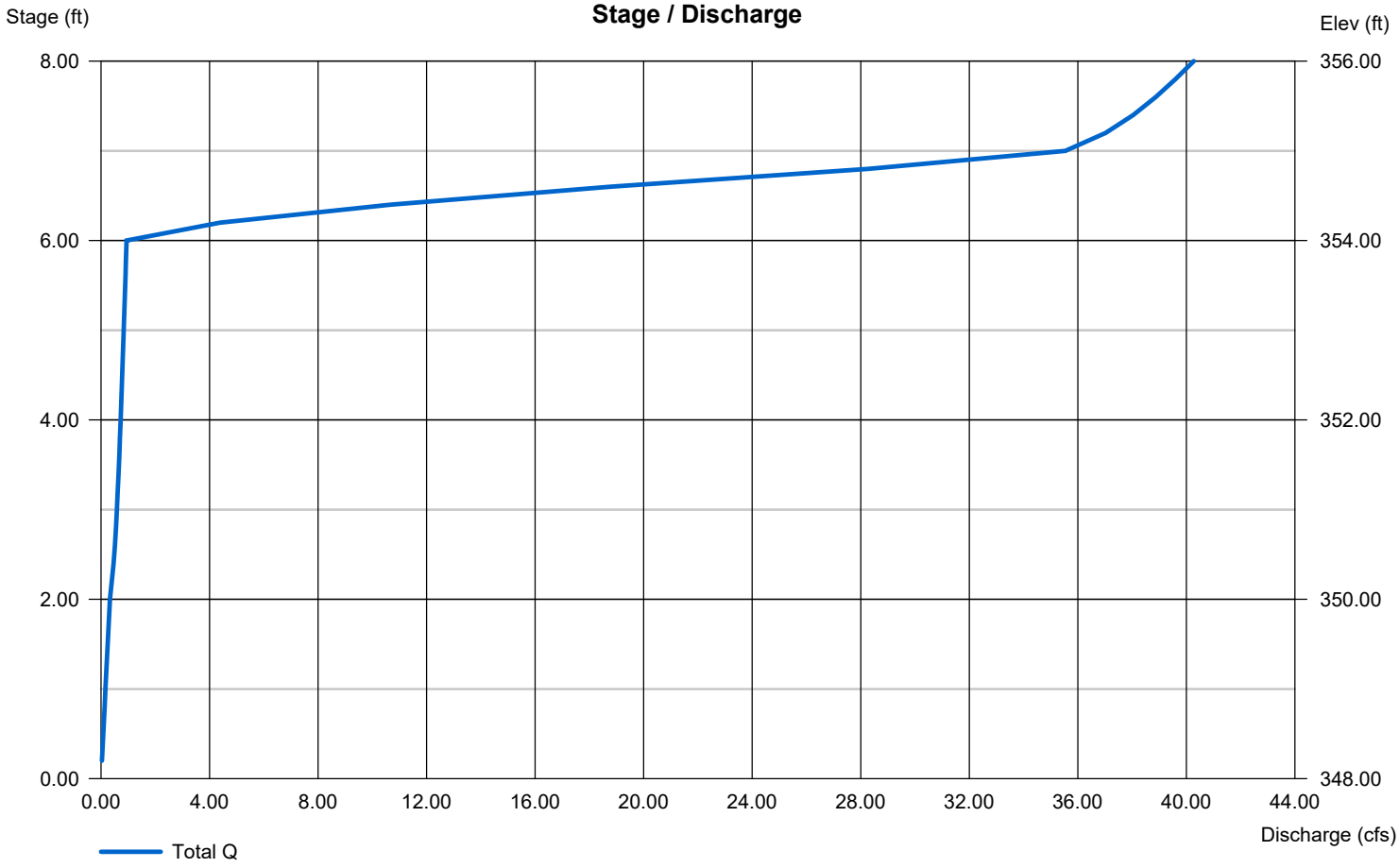
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.50	0.00	0.00	0.00
Crest El. (ft)	= 354.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Preliminary Infiltration Report

7

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm

Toll Brothers, Inc.
516 North Newtown Street Road
Newtown Square, Pennsylvania 19073

Attn: Mr. Michael A. Downs, P.E.

Re: Summary of Infiltration Testing
Crebilly Farm
Westtown Township, Chester County, Pennsylvania

Mr. Downs:

In accordance with our Agreement, Geo-Technology Associates, Inc. (GTA) has evaluated potential stormwater management (SWM) facility locations at the site for infiltration potential of underlying soils. A *Site Location Map* is attached to this Report in *Appendix A.*

GTA performed SWM soil evaluations at the site in 2016, 2019 and 2020. The results of our 2016 and 2019 evaluations are summarized in the following documents: *Report of Preliminary Geotechnical Exploration dated August 11, 2016 (GTA, 2016); our August 19, 2019 Crebilly Farm- Robinson Tract Memo (GTA, 2019a); and our November 18, 2019 Crebilly Farm- The Robinson Tract Additional testing Memo (GTA, 2019b).* The results of the 2020 evaluations, as well as the infiltration results for the previous 2016 and 2019 evaluations, are summarized herein.

GTA performed infiltration testing in 2020 at locations requested by ESE Consultants (ESE). The test pit locations were staked by ESE prior to our work and the approximate locations are depicted on the attached *Exploration Location Plan.* The subsurface exploration and infiltration testing was performed on January 23 and 24, 2020 (at Locations TP4-01 and –01A, and TP4-02 through -06), and on July 28, 2020 (at Locations TP5-01 through -05). Deep test pits were initially excavated at each location to evaluate the subsurface conditions and limiting zones. Where two test pits were adjacent to each other, one deep test pit was excavated in the approximate middle. Shallower offset test pits were then excavated to perform field infiltration testing. Infiltration testing was performed using a double-ring infiltrometer and the stabilized values recorded over the last four time-intervals were recorded. Soil samples retrieved from select test pits were delivered GTA's laboratory for visual classification by engineering personnel. Samples obtained from select test pits were tested for grain-size analysis to determine the United States Department of Agriculture (USDA) classification for the soil.

Based on our observations made during the subsurface exploration, it is our opinion that managing stormwater quality through the use of infiltration will be feasible with some limitations in portions of the site. However, the surficial fine-grained soils, depth to groundwater, and depth to weathered rock could impact the design and construction of the proposed facilities. Where infiltration is desired, it is recommended that the proposed subgrades be extended through the fine-grained soils in to the sandy residual soils. If the subgrades need to be undercut below the design grade, the proposed subgrade elevations can be re-established with ASTM C33 sand (concrete sand) or AASHTO #57 stone.

The guidelines established in the Pennsylvania Stormwater Best Management Practices Manual, Appendix C Site Evaluation and Soil Testing indicates that the minimum infiltration rate for all runoff reduction and infiltration practices is 0.1-inch per hour. Also, a vertical separation of two (2) feet from the seasonal high groundwater elevation is required.

The approximate locations of infiltration tests with rates that appear to be suitable for infiltration are indicated on *Test Plan A,* attached to this Report in *Appendix A. Table 1* summarizes the field-testing results and indicates the soil types at tested depths, for test locations with rates that appear to be suitable for infiltration.

Table 1: FIELD INFILTRATION TEST SUMMARY for TEST LOCATIONS WITH APPARENTLY SUITABLE RATES*

Location	Test Depth (feet)	Unfactored Field Infiltration Rate	USCS Soil Classification
TP-1	4	2	Silty SAND (SM)
TP-2	2 ½	2	Silty GRAVEL with sand (GM)
TP-3	4 ½	1	Silty SAND (SM)
TP-5	3 ½	0.5	Silty Clayey SAND with gravel (SM-SC)
TP-6	4 ½	2	Silty SAND (SM)
TP-7	3	2	Silty SAND (SM)
TP-8	3	1	Silty SAND (SM)
TP-9	5	0.2	Silty SAND with gravel (SM)
TP-11	4	1	(SC-SM)
TP-12	4 ½	2	Sandy SILT (ML)
TP-13	3 ½	4	Silty SAND (SM)
TP2-01	4 ½	1	Silty SAND with gravel (SM)
TP2-02	7	6	Well-graded GRAVEL with silt and sand
TP2-03	5 ½	4.5	Silty SAND (SM)
TP2-05	7	6	Silty SAND (SM)
TP3-04	9	3.5	Silty SAND (SM)
TP3-05	10	0.5	Silty SAND (SM)
TP3-05A	6	1	Sandy SILT (ML)
TP3-06	6	0.5	Sandy SILT (ML)

Location	Test Depth (feet)	Unfactored Field Infiltration Rate	USCS Soil Classification
TP3-11	6	1	Sandy SILT (ML)
TP3-12	6	4	Silty SAND (SM)
TP4-02	2	0.25	Sandy SILT (ML)
TP4-03	3	0.25	Silty SAND (SM)
TP4-04	6	0.25	Silty SAND (SM)
TP4-05	3	0.75	Silty SAND (SM)
TP4-06	6	0.75	Silty SAND (SM)
TP5-01	4	1.3	Silty SAND (SM)
TP5-03	5	1.3	Sandy SILT (SM)
TP5-04	4	0.8	Silty SAND (SM)
TP5-05	5	0.4	Sandy SILT (ML)

***Note:** See *Appendix B* of this Report for results for all explored locations

Unfactored field measured infiltration rates ranged up to 6 inches per hour at the tested locations and depths, for the locations with apparently suitable rates for infiltration. However, we recommend that a design infiltration rate of no more than 25 to 50 percent of the field measured rate be used for the final design of the facilities. We do not recommend averaging rates at various locations and applying the averaged rate to the site or per facility. This recommendation is based on the inherent problems associated with these systems as they become less permeable due to densification during construction and partial clogging or siltation occurring over time. Additionally, design phase infiltration testing should be performed to confirm the preliminary rates in this report and for refinement/confirmation of suitable SWM areas.

It is noted that all explored/tested locations from our 2016, 2019 and 2020 evaluations, including suitable and unsuitable locations, are indicated on *Test Plan B* in *Appendix B* of this Report. Field testing results for all of our 2016, 2019 and 2020 test locations are indicated on the Table inset to *Test Plan B* in *Appendix B,* along with notes (also included on *Test Plan B)* on results, recommendations and limitations.

Observed soil conditions at SWM exploration locations from our 2016, 2019 and 2020 evaluations are summarized on the *Test Pit Exploration Logs*, attached to this Report in *Appendix C.* The soil descriptions indicated on the logs are based on visual observations using the Unified Soil Classification System (USCS) of the individual soil samples as summarized on the *Notes for Exploration Logs,* also attached to this report in Appendix C. Samples obtained from select test pits were tested for grain-size analysis to evaluate the United States Department of Agriculture (USDA) classification for the soil. The classifications provide information regarding soils permeability. The results of the lab testing are summarized on the *Summary of Laboratory Testing Table* in *Appendix D* and in the *Particle Size Distribution Reports,* also in *Appendix D*. The USDA correlated infiltration rates based on the texture classification generally agree with the field measured rates.

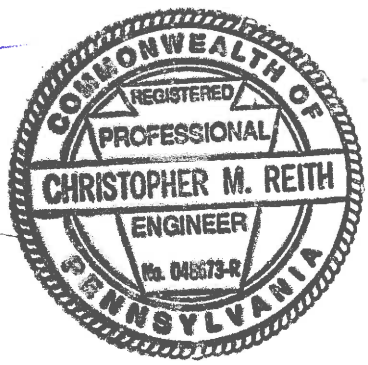
Once the design of the proposed facilities has been completed, GTA should be provided the opportunity to review the plans to evaluate if the geotechnical issues have been addressed. Also, GTA should be provided the opportunity to review the facility subgrade during construction and perform additional field testing, if warranted. This is to observe compliance with the design concepts, specifications or recommendations, and to allow for field changes in the event that the soils conditions differ from that anticipated prior to that start of construction. This data should be used with the other information and recommendations contained in our initial report for the project dated August 11, 2016 (GTA, 2016), as well as in GTA 2019a and 2019b.

This report, including all supporting logs, field data, field notes, laboratory test data, calculations, estimates and other documents prepared by GTA in connection with this Project have been prepared in accordance with generally accepted engineering practice. Use and reproduction of this report by any other person without the expressed written permission of GTA and Toll Brothers is unauthorized and such use is at the sole risk of the user.

Thank you for the opportunity to assist you with this project. Should you have any questions or require any additional information, please contact our office at (410) 515-9446.

Sincerely,
GEO-TECHNOLOGY ASSOCIATES, INC.

Christopher M. Reith, P.E.
Vice President



Paul S. Scott, P.G.
Vice President

PSS/CR/gmm
31161348x1
\\PSMC-DATA\gta\Shared\Aquifer\Reports\2016 Projects\31161348 Crebilly Farm\2020 Work\Summary Reports\31161348.Crebilly. SWM Summary_PS_8_20.doc

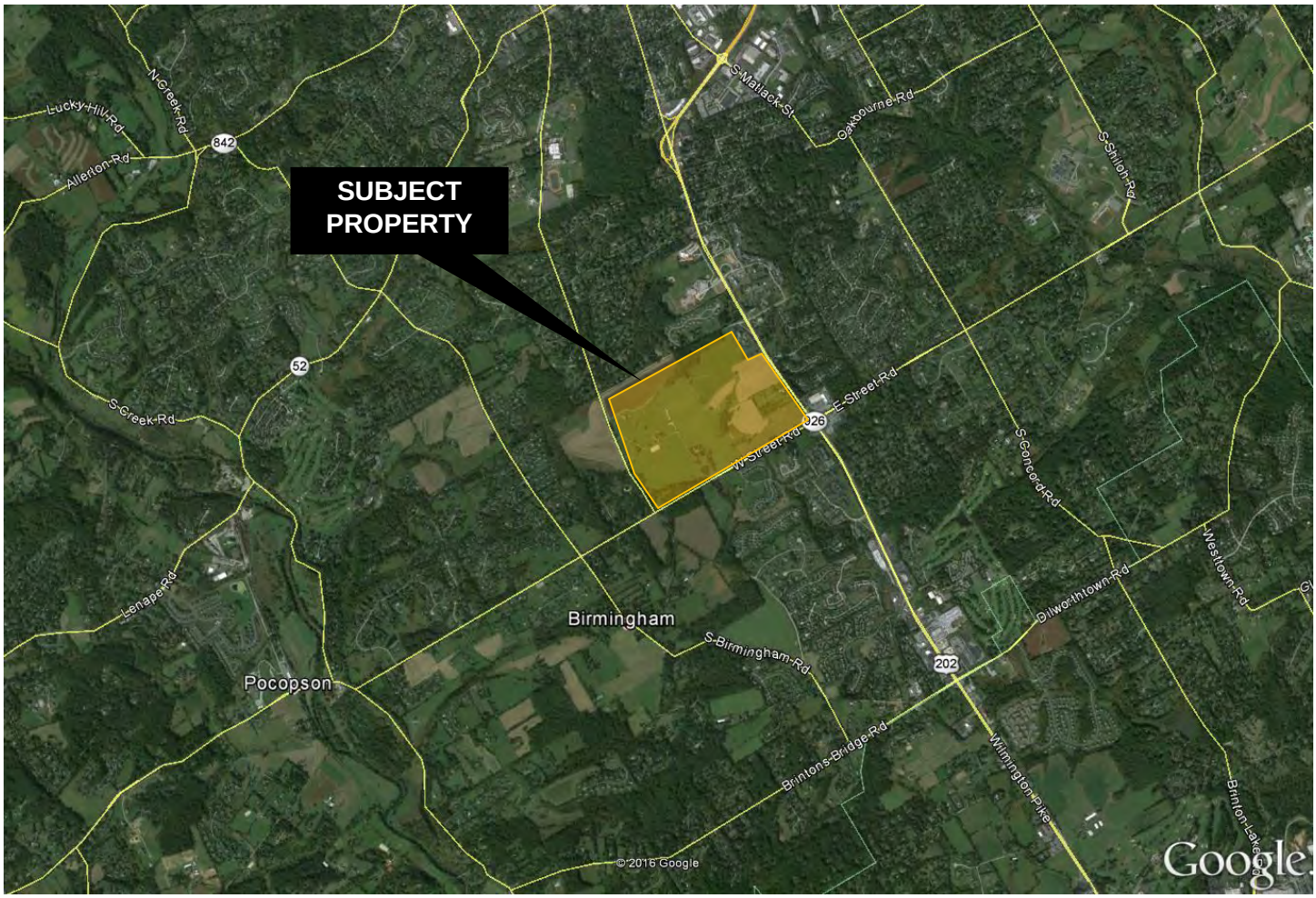
LIST OF APPENDICES

Appendix A	Site Location Plan Test Plan A
Appendix B	Test Plan B
Appendix C	Notes for Exploration Logs Test Pit Exploration Logs (36 Logs)
Appendix D	Summary of Laboratory Testing Table Particle Size Distribution Reports (24 Sheets)

APPENDIX A

Site Location Plan

Test Plan A



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Notes: (1) Layout was obtained from a Google Earth Imagery, dated October 7, 2011.

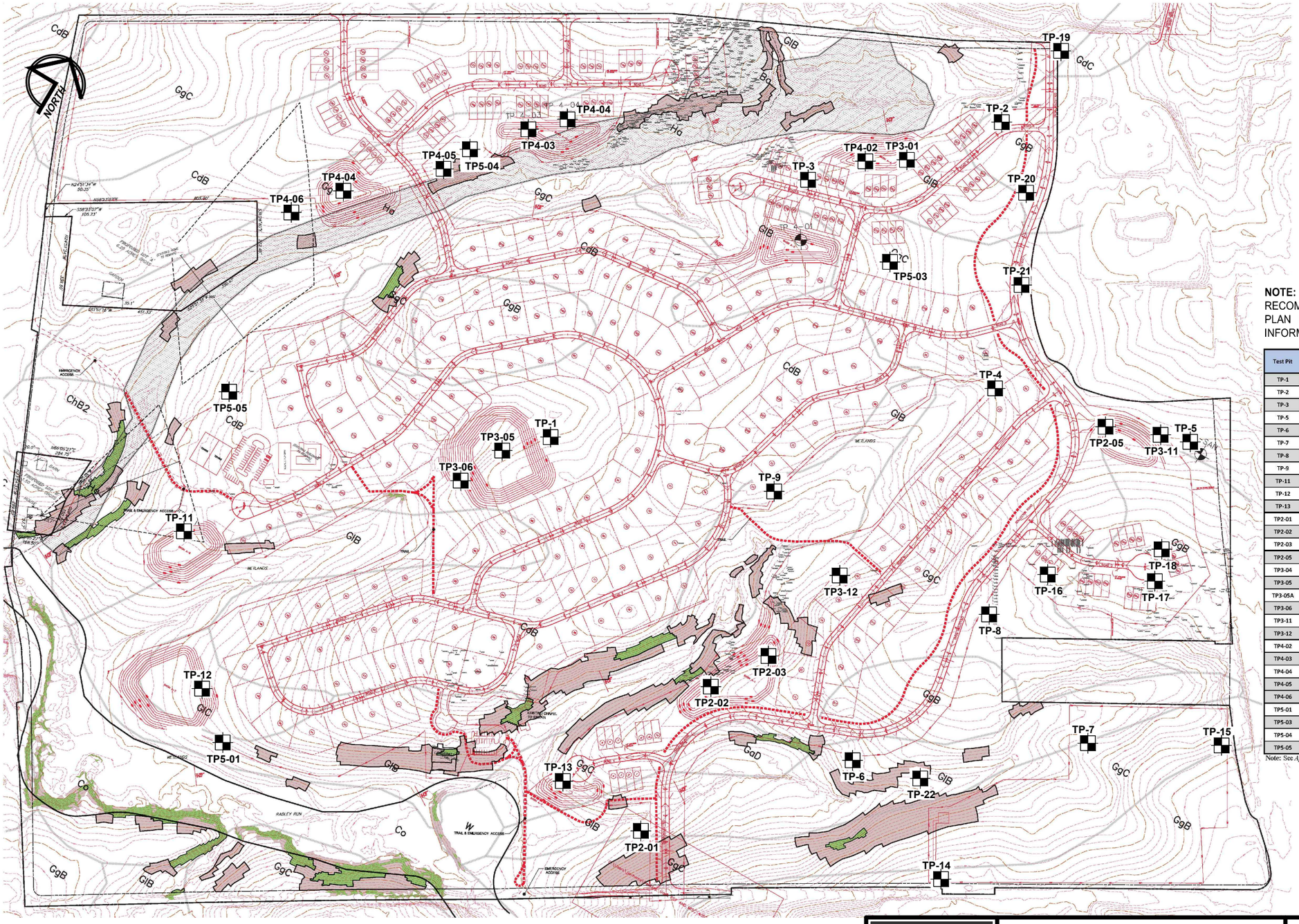
GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
18 Boulden Circle, Suite 36
New Castle, Delaware 19720
(302) 326-2100
Fax (302) 326-2399

SITE LOCATION MAP

CREBILLY FARM

WESTTOWN TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA

SCALE	DATE	DRAWN BY	REVIEW BY	JOB NO.	FIGURE:
NTS	AUG 2016	GOOGLE	CMR	161348	1



NOTE: SEE GTA (2016, 2019A AND 2019B) FOR ADDITIONAL INFORMATION, RECOMMENDATIONS AND LIMITATIONS; SEE ALSO EXPLORATION LOCATION PLAN B IN APPENDIX B OF THIS REPORT FOR ADDITIONAL TESTING INFORMATION AND NOTES

Test Pit	Total Depth (ft)	Test Depth (ft)	Unfactored Field Infiltration Rate (in/hr)	Soil Description (USCS)	Depth to Refusal (ft)	Depth to Water (ft)
TP-1	10	4	2	Silty SAND (SM)	N/A	N/A
TP-2	7.5	2 ½	2	Silty GRAVEL with sand (GM)	7.5	N/A
TP-3	11	4 ½	1	Silty SAND (SM)	N/A	N/A
TP-5	11	3 ½	0.5	Silty Clayey SAND with gravel (SM-SC)	N/A	N/A
TP-6	10.5	4 ½	2	Silty SAND (SM)	N/A	N/A
TP-7	9	3	2	Silty SAND (SM)	N/A	N/A
TP-8	7.5	3	1	Silty SAND (SM)	7.5	N/A
TP-9	11	5	0.2	Silty SAND with gravel (SM)	N/A	10.7
TP-11	11	4	1	(SC-SM)	N/A	N/A
TP-12	9	4 ½	2	Sandy SILT (ML)	9	N/A
TP-13	9	3 ½	4	Silty SAND (SM)	N/A	N/A
TP2-01	9.5	4 ½	1	Silty SAND with gravel (SM)	N/A	7.6
TP2-02	11.2	7	6	Well-graded GRAVEL with silt and sand	11.2	N/A
TP2-03	8.1	5 ½	4.5	Silty SAND (SM)	8.1	N/A
TP2-05	11.3	7	6	Silty SAND (SM)	11.3	N/A
TP3-04	12.5	9	3.5	Silty SAND (SM)	N/A	N/A
TP3-05	13	10	0.5	Silty SAND (SM)	N/A	N/A
TP3-05A	13	6	1	Sandy SILT (ML)	N/A	N/A
TP3-06	13	6	0.5	Sandy SILT (ML)	N/A	N/A
TP3-11	7	6	1	Sandy SILT (ML)	N/A	N/A
TP3-12	9.7	6	4	Silty SAND (SM)	N/A	N/A
TP4-02	10	2	0.25	Sandy SILT (ML)	N/A	10
TP4-03	9	3	0.25	Silty SAND (SM)	N/A	7
TP4-04	9	6	0.25	Silty SAND (SM)	N/A	7
TP4-05	10	3	0.75	Silty SAND (SM)	N/A	10
TP4-06	10	6	0.75	Silty SAND (SM)	N/A	10
TP5-01	9	4	1.25	Silty SAND (SM)	N/A	N/A
TP5-03	8	5	1.25	Sandy SILT (ML)	N/A	7.5
TP5-04	8.5	4	0.8125	Silty SAND (SM)	N/A	N/A
TP5-05	10	5	0.4375	Sandy SILT (ML)	N/A	N/A

Note: See *Appendix B* of this Report for results for all explored locations

LEGEND

APPROXIMATE SUITABLE TEST PIT LOCATION

0' 100' 200' 400' 800'

SCALE: 1"=400'

GEO-TECHNOLOGY ASSOCIATES, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
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WWW.GTAENG.COM

TEST PLAN A

CREBILLY FARM

CHESTER COUNTY, PENNSYLVANIA

JOB NO.	31161348	SCALE:	1"=400'	DATE:	JULY 2020	DRAWN BY:	GMM	REVIEW BY:	PSS	FIGURE:	1 OF 1

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APPENDIX B

Test Plan B

NOTES:

1. SEE GTA (2016, 2019A AND 2019B) FOR ADDITIONAL INFORMATION, RECOMMENDATIONS AND LIMITATIONS IN REGARDS TO EXPLORATION AND TESTING PERFORMED BY GTA IN 2016 AND 2019
2. THE GUIDELINES ESTABLISHED IN THE PENNSYLVANIA STORMWATER BEST MANAGEMENT PRACTICES MANUAL, APPENDIX C SITE EVALUATION AND SOIL TESTING INDICATES THAT THE MINIMUM INFILTRATION RATE FOR ALL RUNOFF REDUCTION AND INFILTRATION PRACTICES IS 0.1-INCH PER HOUR. ALSO, A VERTICAL SEPARATION OF TWO (2) FEET FROM THE SEASONAL HIGH GROUNDWATER ELEVATION IS REQUIRED. INFILTRATION TESTS PERFORMED IN JULY 2020 WERE PERFORMED AT DEPTHS NEAR THE BOTTOM ELEVATION OF THEIR RESPECTIVE PROPOSED STORMWATER MANAGEMENT FACILITY, I.E. APPROXIMATELY 4 TO 6 FT BGS AS REQUESTED BY ESE CONSULTANTS, INC. ON JULY 20, 2020, WITH THE EXCEPTION OF TP5-02. IN THAT INSTANCE, MEASURED GROUNDWATER APPEARED TO BE LESS THAN TWO FEET FROM THE PROPOSED TEST DEPTH OF 4 TO 6 FT BGS. A TEST WAS PERFORMED AT 3 ½ FEET BELOW GROUND SURFACE (FT BGS) TO EVALUATE SHALLOWER SOIL STRATA IN THE IMMEDIATE VICINITY OF TEST PIT TP5-02. INFILTRATION DOES NOT APPEAR TO BE PRACTICAL AT THIS LOCATION DUE TO SHALLOW LIMITING ZONES AND/OR UNSATISFACTORY INFILTRATION RATES
3. INFILTRATION TESTS PERFORMED IN JANUARY 2020 WERE PERFORMED AT DEPTHS NEAR THE BOTTOM ELEVATION OF THEIR RESPECTIVE PROPOSED STORMWATER MANAGEMENT FACILITY, PROVIDED BY ESE CONSULTANTS, INC. ON JANUARY 17, 2019, WITH THE EXCEPTION OF TP4-1 AND -1A. IN THAT INSTANCE, MEASURED GROUNDWATER APPEARED TO BE LESS THAN TWO FEET FROM THE FACILITY BOTTOM ELEVATION OF 316 FEET ABOVE MEAN SEA LEVEL (FT MSL). TESTS WERE PERFORMED AT 2 AND 4 ½ FEET BELOW GROUND SURFACE (FT BGS) TO EVALUATE SHALLOWER SOIL STRATA IN THE IMMEDIATE VICINITY OF TEST PITS TP4-1 AND -1A. INFILTRATION DOES NOT APPEAR TO BE PRACTICAL AT THIS LOCATION, I.E., TP4-01, AND TP4-1A, DUE TO SHALLOW LIMITING ZONES AND/OR UNSATISFACTORY INFILTRATION RATES
4. FOR SWM DESIGN AND AREA SELECTION TEST PIT LOCATIONS IN TABLE INSET TO THIS PLAN WITH INFILTRATION RATES OF <0.1 INCH PER HOUR SHOULD BE AVOIDED
5. DESIGN PHASE EXPLORATION AND TESTING SHOULD BE PERFORMED TO CONFIRM PRELIMINARY RATES INDICATED ON THIS PLAN, AND TO REFINE/CONFIRM PROPOSED SWM AREAS

Test Pit	Total Depth (ft)	Test Depth (ft)	Unfactored Field Infiltration Rate (in/hr)	Soil Description (USCS)	Depth to Refusal (ft)	Depth to Water (ft)
TP-1	10	4	2	Silty SAND (SM)	N/A	N/A
TP-2	7.5	2 ½	2	Silty GRAVEL with sand (GM)	7.5	N/A
TP-3	11	4 ½	1	Silty SAND (SM)	N/A	N/A
TP-4	10.5	5 ½	<0.1	SILT (ML)	N/A	8.5
TP-5	11	3 ½	0.5	Silty Clayey SAND with gravel (SM-SC)	N/A	N/A
TP-6	10.5	4 ½	2	Silty SAND (SM)	N/A	N/A
TP-7	9	3	2	Silty SAND (SM)	N/A	N/A
TP-8	7.5	3	1	Silty SAND (SM)	7.5	N/A
TP-9	11	5	0.2	Silty SAND with gravel (SM)	N/A	10.7
TP-10	10	4	<0.1	Silty Clayey SAND	N/A	N/A
TP-11	11	4	1	(SC-SM)	N/A	N/A
TP-12	9	4 ½	2	Sandy SILT (ML)	9	N/A
TP-13	9	3 ½	4	Silty SAND (SM)	N/A	N/A
TP2-01	9.5	4 ½	1	Silty SAND with gravel (SM)	N/A	7.6
TP2-02	11.2	7	6	Well-graded GRAVEL with silt and sand	11.2	N/A
TP2-03	8.1	5 ½	4.5	Silty SAND (SM)	8.1	N/A
TP2-05	11.3	7	6	Silty SAND (SM)	11.3	N/A
TP3-01	10	7	<0.1	Silty SAND (SM)	N/A	N/A
TP3-02	12.5	2	<0.1	Sandy Lean CLAY (CL)	N/A	8.4
TP3-03	12.5	7	<0.1	Silty SAND (SM)	N/A	8.4
TP3-04	12.5	9	3.5	Silty SAND (SM)	N/A	N/A
TP3-05	13	10	0.5	Silty SAND (SM)	N/A	N/A
TP3-05A	13	6	1	Sandy SILT (ML)	N/A	N/A
TP3-06	13	6	0.5	Sandy SILT (ML)	N/A	N/A
TP3-07	6	2	<0.1	Sandy SILT (ML)	N/A	5
TP3-08	6	3	<0.1	Sandy SILT (ML)	N/A	5
TP3-09	9.5	6	<0.1	Silty SAND (SM)	N/A	9
TP3-10	9.5	3	<0.1	Lean CLAY (CL)	N/A	9
TP3-11	7	6	1	Sandy SILT (ML)	N/A	N/A
TP3-12	9.7	6	4	Silty SAND (SM)	N/A	N/A
TP4-01	9	2	<0.1	Sandy Lean CLAY (CL)	N/A	7
TP4-01A	9	4 ½	<0.1	Sandy Lean CLAY (CL)	N/A	7
TP4-02	10	2	0.25	Sandy SILT (ML)	N/A	10
TP4-03	9	3	0.25	Silty SAND (SM)	N/A	7
TP4-04	9	6	0.25	Silty SAND (SM)	N/A	7
TP4-05	10	3	0.75	Silty SAND (SM)	N/A	10
TP4-06	10	6	0.75	Silty SAND (SM)	N/A	10
TP5-01	9	4	1.25	Silty SAND (SM)	N/A	N/A
TP5-02	6.5	3 ½	<0.1	Silty CLAY (CL-ML)	N/A	5.5
TP5-03	8	5	1.25	Sandy SILT (ML)	N/A	7.5
TP5-04	8.5	4	0.8125	Silty SAND (SM)	N/A	N/A
TP5-05	10	5	0.4375	Sandy SILT (ML)	N/A	N/A

SOURCE: PLAN ADAPTED FROM A PLAN PROVIDED TO GTA ON JANUARY 17, 2020 BY ESE CONSULTANTS, INC.

LEGEND

APPROXIMATE TEST PIT LOCATION

0' 100' 200' 400' 800'

SCALE: 1"=400'

GEO-TECHNOLOGY ASSOCIATES, INC.
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FAX: 410-515-4895
WWW.GTAENG.COM

TEST PLAN B

CREBILLY FARM

CHESTER COUNTY, PENNSYLVANIA

JOB NO.	31161348	SCALE:	1"=400'	DATE:	JULY 2020	DRAWN BY:	GMM	REVIEW BY:	PSS	FIGURE:	1 OF 1

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APPENDIX C

Notes for Exploration Logs

Test Pit Exploration Logs

NOTES FOR EXPLORATION LOGS

KEY TO USCS TERMINOLOGY AND GRAPHIC SYMBOLS

MAJOR DIVISIONS (BASED UPON ASTM D 2488)			SYMBOLS GRAPHIC	SYMBOLS LETTER
COARSE - GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% PASSING THE NO. 200 SIEVE)		GW
				GP
		GRAVELS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		GM
				GC
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% PASSING THE NO. 200 SIEVE)		SW
				SP
		SANDS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		SM
				SC
FINE - GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	SILT OR CLAY (<15% RETAINED THE NO. 200 SIEVE)		ML
		SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED THE NO. 200 SIEVE)		CL
		SANDY OR GRAVELY SILT OR CLAY (>30% RETAINED THE NO. 200 SIEVE)		OL
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50	SILT OR CLAY (<15% RETAINED THE NO. 200 SIEVE)		MH
		SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED THE NO. 200 SIEVE)		CH
		SANDY OR GRAVELY SILT OR CLAY (>30% RETAINED THE NO. 200 SIEVE)		OH
HIGHLY ORGANIC SOILS				PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS CONTAINING AN ESTIMATED 10% FINES BY VISUAL CLASSIFICATION OR WHEN THE SOIL HAS BETWEEN 5 AND 12 PERCENT FINES FROM LABORATORY TESTS; AND FOR FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSSHATCHED AREA. RESULTS OF LABORATORY TESTING ARE USED TO SUPPLEMENT THE CLASSIFICATION OF THE SOILS BASED ON THE VISUAL-MANUAL PROCEDURES OF ASTM D2488.

ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

	DESCRIPTION		GRAPHIC SYMBOLS
ADDITIONAL DESIGNATION	TOPSOIL		
	MAN-MADE FILL		
	GLACIAL TILL		
	COBBLES AND BOULDERS		
RESIDUAL SOIL DESIGNATION	DESCRIPTION	"N" VALUE	
	HIGHLY WEATHERED ROCK	50 TO 50/1"	
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR 1" PENETRATION, AUGER PENETRABLE	

COARSE-GRAINED SOILS
(GRAVEL AND SAND)

DESIGNATION	BLOWS PER FOOT (BPF) "N"
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	>50

NOTE: "N" VALUE DETERMINED AS PER ASTM D1586

FINE-GRAINED SOILS
(SILT AND CLAY)

CONSISTENCY	BPF "N"
VERY SOFT	<2
SOFT	2 - 4
MEDIUM STIFF	5 - 8
STIFF	9 - 15
VERY STIFF	16 - 30
HARD	>30

NOTE: ADDITIONAL DESIGNATIONS TO ADVANCE SAMPLER INDICATED IN BLOW COUNT COLUMN:
WOH = WEIGHT OF HAMMER
WOR = WEIGHT OF ROD(S)

SAMPLE TYPE

DESIGNATION	SYMBOL
SPLIT-SPOON	S-
SHELBY TUBE	U-
ROCK CORE	R-

WATER DESIGNATION

DESCRIPTION	SYMBOL
ENCOUNTERED DURING DRILLING	▽
UPON COMPLETION OF DRILLING	▼
24 HOURS AFTER COMPLETION	⧩

NOTE: WATER OBSERVATIONS WERE MADE AT THE TIME INDICATED. POROSITY OF SOIL STRATA, WEATHER CONDITIONS, SITE TOPOGRAPHY, ETC. MAY CAUSE WATER LEVEL CHANGES.

LOG OF TEST PIT NO. TP-1

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **310.6**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 14 inches	
309.5		ML		Brown, moist, Sandy SILT	
	3				
306.6		SM		Brown, moist, Silty SAND, contains rock fragments	
	6			Orange and brown, moist, Silty SAND, contains rock fragments	
				Same, gray	
	9				
300.6				Test pit terminated at 10 feet. Dry upon completion and at end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-1

LOG OF TEST PIT NO. TP-2

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

PROJECT NO.: **161348**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **337.3**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 11 inches	
336.4		ML		Brown, moist, Sandy SILT	
335.8		SM		Brown, moist, Silty SAND, contains rock fragments	
	3			Brown, moist, Silty GRAVEL with sand Same, gray	
332.3		HW		Gray, moist, Highly Weathered ROCK	
	6				
329.8				Bucket refusal at 7.5 feet. Dry upon completion and at end of day.	
	9				
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-2

LOG OF TEST PIT NO. TP-3

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **325.2**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 15 inches	
324.0		ML		Brown, moist, SILT with sand, contains rock fragments	
	3				
320.7		SM		Brown, moist, Silty SAND, contains rock fragments	
	6			Brown, orange, and gray, moist, Silty SAND, contains rock fragments	
	9				
314.2				Test pit terminated at 11 feet. Dry upon completion and at end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-3

LOG OF TEST PIT NO. TP-4

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **8.5 feet**
GROUND SURFACE ELEVATION: **340.6**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 12 inches	
339.6		ML		Brown, moist, SILT	
	3			Same, contains rock fragments	
	6				
334.1		SM		Brown and orange, moist, Silty SAND, contains rock fragments	
	9			Same, wet	
330.1				Test pit terminated at 10.5 feet. Water at 10.3 feet upon completion. Water at 8.5 feet end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-4

LOG OF TEST PIT NO. TP-5

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **351.4**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 12 inches	
350.4		ML		Brown, moist, SILT with sand	
	3				
347.9		SC-SM		Orange and brown, moist, Silty, Clayey SAND with gravel	
	6				
344.4		SM		Brown, orange, and gray, moist, Silty SAND with rock fragments	
	9				
340.4				Test pit terminated at 11 feet. Dry upon completion and at end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-5

LOG OF TEST PIT NO. TP-6

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **325.6**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 11 inches	
324.5		ML		Orange and brown, moist, SILT with sand	
	3				
321.1		SM		Orange and brown, moist, Silty SAND, contains rock fragments	
	6				
				Brown, orange, and gray, moist, Silty SAND, contains rock fragments	
	9				
315.1				Test pit terminated at 10.5 feet. Dry upon completion and at end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-6

LOG OF TEST PIT NO. TP-7

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

PROJECT NO.: **161348**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **344.9**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 10 inches	
344.1		ML		Brown, moist, Sandy SILT	
341.9	3	SM		Brown, moist, Silty SAND	
	6			Brown, orange, and gray, moist, Silty SAND, contains rock fragments	
335.9	9			Test pit terminated at 9 feet. Dry upon completion and at end of day,	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-7

LOG OF TEST PIT NO. TP-8

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **356.4**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 12 inches	
355.4		ML		Brown, moist, Sandy SILT	
353.4	3	SM		Brown, moist, Silty SAND, contains rock fragments	
	6			Brown and gray, moist, Silty SAND, contains rock fragments	
349.4		HW		Brown and gray, moist, Highly Weathered ROCK	
348.9				Bucket refusal at 7.5 feet. Dry upon completion and at end of day.	
	9				
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-8

LOG OF TEST PIT NO. TP-9

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

PROJECT NO.: **161348**

GROUNDWATER ENCOUNTERED: **10.7**
GROUND SURFACE ELEVATION: **325.4**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 10 inches	
324.6		ML		Brown, moist, Sandy SILT	
323.4		SM		Brown, moist, Silty SAND, contains rock fragments	
	3				
320.4		SC-SM		Brown, moist, Silty, Clayey SAND	
	6				
316.4	9	SM		Brown, gray, and white, moist, Silty SAND, contains rock fragments	
314.4				Test pit terminated at 11 feet. Dry upon completion. Water at 10.7 feet at end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-9

LOG OF TEST PIT NO. TP-10

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **7/25/2016**
DATE COMPLETED: **7/25/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **321.7**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 12 inches	
320.7		ML		Orange and brown, moist, SILT with sand	
	3			Orange and brown, moist, Sandy SILT	
	6				
313.7		SM		Brown, orange, gray, and white, Silty SAND, contains rock fragments	
	9				
311.7				Test pit terminated at 10 feet. Dry upon completion and at end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-10

LOG OF TEST PIT NO. TP-11

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **7/26/2016**
DATE COMPLETED: **7/26/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **299.9**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
299.9	0			Topsoil +/- 7 inches	
299.3		ML		Orange and brown, SILT with sand	
	3				
295.9		SM		Orange and brown, moist, Silty SAND, contains rock fragments	
				Same, brown and gray	
	6				
				Brown, gray, and white, moist, Silty SAND, contains rock fragments	
	9				
288.9				Test pit terminated at 11 feet. Dry upon completion and at end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-11

LOG OF TEST PIT NO. TP-12

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

DATE STARTED: **7/26/2016**
DATE COMPLETED: **7/26/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

PROJECT NO.: **161348**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **276.2**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 9 inches	
275.4		ML		Orange and brown, moist, Sandy SILT	
273.2	3	SM		Orange and brown, moist, Silty SAND, contains rock fragments	
		SM		Same, brown	
	6			Same, brown and gray	
268.7		HW		Brown, gray, and white, moist, Highly Weathered ROCK	
267.2	9			Bucket refusal at 9.0 feet. Dry upon completion and at end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-12

LOG OF TEST PIT NO. TP-13

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

DATE STARTED: **7/26/2016**
DATE COMPLETED: **7/26/2016**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

PROJECT NO.: **161348**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **290.6**
DATUM: **Survey**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 8 inches	
289.9		ML		Brown, moist, Sandy SILT	
289.1		SM		Brown, moist, Silty SAND, contains rock fragments	
	3			Same, brown and gray	
287.1		GW-GM		Brown and gray, moist, Rock fragments with silt and sand	
	6				
283.6		HW		Brown and gray, moist, Highly Weathered ROCK	
281.6	9			Bucket refusal at 9 feet. Dry upon completion and at end of day.	
	12				
	15				
	18				

NOTES: **Surveyed locations provided by Northeast Surveyors, LLC.**

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LOG OF TEST PIT NO. TP-13

LOG OF TEST PIT NO. TP 2-01

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **8/8/19**
DATE COMPLETED: **8/8/19**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **7.6 feet**
GROUND SURFACE ELEVATION: **295.4**
DATUM: **Survey**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 8 inches	
294.7		ML		Brown, moist, SILT with sand	
	2				
291.7		SM		Brown, moist, Silty SAND contains rock fragments	
	4				
	6				
	8				
285.9				Test pit terminated at 9.5 feet. Water at 8.1 feet upon completion Water at 7.6 feet at end of day	
	10				
	12				

NOTES:

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LOG OF TEST PIT NO. TP 2-01

LOG OF TEST PIT NO. TP 2-02

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **8/8/19**
DATE COMPLETED: **8/8/19**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **316.6**
DATUM: **Survey**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 8 inches	
315.9		SM		Brown, moist, Silty SAND	
	2				
	4				
	6				
	8				
306.6	10	HW		Brown, moist, Highly Weathered ROCK	
305.4				Test pit refusal at 11.2 feet.	
	12				

NOTES:

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LOG OF TEST PIT NO. TP 2-02

Sheet 1 of 1

LOG OF TEST PIT NO. TP 2-03

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **8/8/19**
DATE COMPLETED: **8/8/19**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **318.4**
DATUM: **Survey**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 10 inches	
317.6		SM		Light Brown, moist, Silty SAND	
	2				
	4				
	6				
310.9		HW		Brown, moist, Highly Weathered ROCK	
310.3	8			Test pit refusal at 8.1 feet.	
	10				
	12				

NOTES:

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LOG OF TEST PIT NO. TP 2-03

LOG OF TEST PIT NO. TP 2-05

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **8/8/19**
DATE COMPLETED: **8/8/19**
CONTRACTOR: **R. Keating and Sons, Inc.**
EQUIPMENT: **Case 580 Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **351.6**
DATUM: **Survey**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 10 inches	
350.8		SM		Brown, moist, Silty SAND contains rock fragments	
	2				
	4				
	6				
	8				
341.6	10	HW		Brown, moist, Highly Weathered ROCK	
340.3				Test pit refusal at 11.3 feet.	
	12				

NOTES:

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LOG OF TEST PIT NO. TP 2-05

LOG OF TEST PIT NO. TP 3-01

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **11/11/19**
DATE COMPLETED: **11/11/19**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **333.0**
DATUM: **Topo**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 11 inches	
332.1		ML		Light brown, moist, Sandy SILT	
	3				
328.1		SM		Tan, moist, Silty SAND, contains rock fragments	
	6			Dark Brown, moist, Silty SAND	
	9				
323.0				Test pit terminated at 10.0 feet.	
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**

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LOG OF TEST PIT NO. TP 3-01

LOG OF TEST PIT NO. TP 3-02/03

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **11/11/19**
DATE COMPLETED: **11/11/19**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **8.4**
GROUND SURFACE ELEVATION: **303.0**
DATUM: **Topo**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 10 inches	
302.2		CL		Brown, moist, Sandy Lean CLAY	
				Brown, moist, Lean CLAY	
	3				
297.1	6	SM		Tan, moist, Silty SAND, contains rock fragments	
	9				
	12				
290.5				Test pit terminated at 12.5 feet.	Groundwater encountered at 12.0 feet. Stabilized at 8.4 feet.
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**

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New Castle, DE 19720

LOG OF TEST PIT NO. TP 3-02/03

LOG OF TEST PIT NO. TP 3-04

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **11/11/19**
DATE COMPLETED: **11/11/19**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **302.9**
DATUM: **Topo**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 10 inches	
302.1		ML		Brown, moist, Sandy SILT	
	3				
298.1		SM		Tan, moist, Silty SAND, contains gravel and highly weathered rock	
	6				
	9			Brown, moist, Silty SAND, contains gravel rock fragments	
	12				
290.4				Test pit terminated at 12.5 feet.	
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**

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LOG OF TEST PIT NO. TP 3-04

LOG OF TEST PIT NO. TP 05/06

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **11/11/19**
DATE COMPLETED: **11/11/19**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **304.0**
DATUM: **Topo**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 9 inches	
303.2		ML		Tan, moist, Sandy SILT, contains rock fragments	
	3				
298.0	6	SM		Tan, moist, Silty SAND, contains rock fragments	
	9				
	12				
291.0				Test pit terminated at 13.0 feet.	
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**

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LOG OF TEST PIT NO. TP 05/06

LOG OF TEST PIT NO. TP 3-07/08

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **11/11/19**
DATE COMPLETED: **11/11/19**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **5.0**
GROUND SURFACE ELEVATION: **318.0**
DATUM: **Topo**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 12 inches	
317.0		ML		Brown, moist, Sandy SILT	
	3				
					Groundwater encountered at 5.0 feet.
312.0	6			Brown, moist, Sandy SILT, contains rock fragments	
	9				
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**

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LOG OF TEST PIT NO. TP 3-07/08

LOG OF TEST PIT NO. TP 3-09/10

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **11/11/19**
DATE COMPLETED: **11/11/19**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **9.0**
GROUND SURFACE ELEVATION: **269.0**
DATUM: **Topo**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 10 inches	
268.2		CL		Light brown, moist, Lean CLAY	
	3				
264.0		SM		Dark brown, moist, Silty SAND, contains rock fragments	
	6				
	9				▼
259.5				Test pit terminated at 9.5 feet.	Groundwater encountered at 9.0 feet.
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**

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LOG OF TEST PIT NO. TP 3-09/10

LOG OF TEST PIT NO. TP 3-11

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **11/12/19**
DATE COMPLETED: **11/12/19**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **350.0**
DATUM: **Topo**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 9 inches	
349.3		ML		Tan, moist, Sandy SILT	
	3				
	6				
343.0				Test pit terminated at 7.0 feet.	
	9				
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**

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LOG OF TEST PIT NO. TP 3-11

LOG OF TEST PIT NO. TP 3-12

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers, Inc.**

PROJECT NO.: **161348**

DATE STARTED: **11/12/19**
DATE COMPLETED: **11/12/19**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **326.4**
DATUM: **Topo**
LOGGED BY: **A. Carta**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 10 inches	
325.6		ML		Light brown, moist, Sandy SILT	
323.7	3	SM		Tan, moist, Silty SAND, contains rock fragments	
	6				
	9				
316.7				Test pit terminated at 9.7	
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**

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LOG OF TEST PIT NO. TP 3-12

LOG OF TEST PIT NO. TP4-01

PROJECT: **Crebilly Farms**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **161348**

GROUNDWATER ENCOUNTERED: **7 ft**
DATE STARTED: **1/24/2020**
GROUND SURFACE ELEVATION: **322**
DATE COMPLETED: **1/24/2020**
DATUM: **Survey**
CONTRACTOR: **Cavan Construction**
LOGGED BY: **G. McKee**
EQUIPMENT: **John Deere Backhoe**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
321.0		CL		Brown, moist, Sandy Lean CLAY	
				Brown, moist, Sandy Lean CLAY, mottled	
	3				
				Brown, moist, Sandy Lean CLAY, containing highly weathered rock fragments	
317.0		ML		Brown and gray, Sandy SILT, containing weathered rock fragments	
	6				
315.0		CL		Brown and gray, moist Sandy Lean CLAY, containing weathered rock fragments	▼
313.0	9			Test pit terminated at 9 feet	
	12				
	15				
	18				

NOTES:

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LOG OF TEST PIT NO. TP4-01

LOG OF TEST PIT NO. TP4-02

PROJECT: **Crebilly Farms**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **161348**

DATE STARTED: **1/24/2020**
DATE COMPLETED: **1/24/2020**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **10 ft**
GROUND SURFACE ELEVATION: **322**
DATUM: **Survey**
LOGGED BY: **G. McKee**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
321.0		ML		Brown, moist, Sandy SILT,	
	3			Red brown, moist, Sandy SILT	
317.0		SM		Red brown, moist, Silty SAND, containing weathered rock fragments	
	6				
	9				
312.0				Test pit terminated at 10 feet	
	12				
	15				
	18				

NOTES:

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LOG OF TEST PIT NO. TP4-02

LOG OF TEST PIT NO. TP4-03

PROJECT: **Crebilly Farms**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **161348**

DATE STARTED: **1/23/2020**
DATE COMPLETED: **1/23/2020**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **7 ft**
GROUND SURFACE ELEVATION: **303**
DATUM: **Survey**
LOGGED BY: **G. McKee**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
302.0		CL		Brown, moist, Lean CLAY	
300.0	3	SM		Brown, moist, Silty SAND	
	6			Red brown, moist, Silty SAND, containing weathered rock fragments	▼
294.0	9			Test pit terminated at 9 feet	
	12				
	15				
	18				

NOTES:

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LOG OF TEST PIT NO. TP4-03

LOG OF TEST PIT NO. TP4-04

PROJECT: **Crebilly Farms**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **161348**

DATE STARTED: **1/23/2020**
DATE COMPLETED: **1/23/2020**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **7 ft**
GROUND SURFACE ELEVATION: **310**
DATUM: **Survey**
LOGGED BY: **G. McKee**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
309.0		ml		Brown, moist, sandy SILT	
307.0	3	sm		Gray, moist, Silty SAND, containing weathered rock fragments	
	6				▼
301.0	9			Test pit terminated at 9 feet	
	12				
	15				
	18				

NOTES:

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LOG OF TEST PIT NO. TP4-04

LOG OF TEST PIT NO. TP4-05

PROJECT: **Crebilly Farms**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **161348**

GROUNDWATER ENCOUNTERED: **Dry**
DATE STARTED: **1/23/2020**
GROUND SURFACE ELEVATION: **302**
DATE COMPLETED: **1/23/2020**
DATUM: **Survey**
CONTRACTOR: **Cavan Construction**
LOGGED BY: **G. McKee**
EQUIPMENT: **John Deere Backhoe**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
301.0		ML		Brown, moist, Sandy SILT	
299.0	3	SM		Gray, moist, Silty SAND, containing weathered rock fragments	
	6				
	9				
292.0				Test pit terminated at 10 feet	
	12				
	15				
	18				

NOTES:

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LOG OF TEST PIT NO. TP4-05

LOG OF TEST PIT NO. TP4-06

PROJECT: **Crebilly Farms**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **161348**

DATE STARTED: **1/23/2020**
DATE COMPLETED: **1/23/2020**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **John Deere Backhoe**

GROUNDWATER ENCOUNTERED: **Dry**
GROUND SURFACE ELEVATION: **303**
DATUM: **Survey**
LOGGED BY: **G. McKee**
CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
302.0		ML		Brown, moist, Sandy SILT	
	3				
299.0		SM		Gray, moist, Silty SAND, containing weathered rock fragments	
	6			Brown, moist, Silty SAND, containing weathered rock fragments	
	9				
293.0				Test pit terminated at 10 feet	
	12				
	15				
	18				

NOTES:

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LOG OF TEST PIT NO. TP4-06

LOG OF TEST PIT NO. TP5-01

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **31161348**

GROUNDWATER ENCOUNTERED: **N/A**
DATE STARTED: **7/28/2020**
GROUND SURFACE ELEVATION: **274**
DATE COMPLETED: **7/28/2020**
DATUM: **Survey**
CONTRACTOR: **Cavan Construction**
LOGGED BY: **Greg McKee**
EQUIPMENT: **Rubber Tire Backhoe**
CHECKED BY: **Paul Scott**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
273.0		ML		Red, Sandy SILT, containing Clay	
	2				
271.5		SM		Red and Brown, Silty SAND, containing Gravel	
	4				
269.5		SM		Black and Red, SAND, with Silt and Highly Weathered Rock	
	6				
	8				
265.0				Test Pit Terminated at 9 feet	
	10				
	12				

NOTES:

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LOG OF TEST PIT NO. TP5-01

LOG OF TEST PIT NO. TP5-02

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **31161348**

DATE STARTED: **7/28/2020**
DATE COMPLETED: **7/28/2020**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **Rubber Tire Backhoe**

GROUNDWATER ENCOUNTERED: **5.5**
GROUND SURFACE ELEVATION: **330**
DATUM: **Survey**
LOGGED BY: **Greg McKee**
CHECKED BY: **Paul Scott**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
329.0		CL		Grey, Silty CLAY, mottled	
	2				
	4				
325.0		ML		Brown, Sandy SILT, containing Gravel	▼
	6				
323.5				Test Pit Terminated at 6.5 ft	
	8				
	10				
	12				

NOTES:

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LOG OF TEST PIT NO. TP5-02

LOG OF TEST PIT NO. TP5-03

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **31161348**

DATE STARTED: **7/28/2020**
DATE COMPLETED: **7/28/2020**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **Rubber Tire Backhoe**

GROUNDWATER ENCOUNTERED: **7.5**
GROUND SURFACE ELEVATION: **334**
DATUM: **Survey**
LOGGED BY: **Greg McKee**
CHECKED BY: **Paul Scott**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
333.0		ML		Grey, SILT, containing Clay, mottled	
	2				
	4				
329.0		SM		Brown, Micaceous, Silty SAND, containing Gravel	
	6				
326.0	8			Test Pit Terminated at 8 ft	
	10				
	12				

NOTES:

GEO-TECHNOLOGY ASSOCIATES, INC.
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LOG OF TEST PIT NO. TP5-03

LOG OF TEST PIT NO. TP5-04

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **31161348**

DATE STARTED: **7/28/2020**
DATE COMPLETED: **7/28/2020**
CONTRACTOR: **Cavan Construction**
EQUIPMENT: **Rubber Tire Backhoe**

GROUNDWATER ENCOUNTERED: **N/A**
GROUND SURFACE ELEVATION: **311**
DATUM: **Survey**
LOGGED BY: **Greg McKee**
CHECKED BY: **Paul Scott**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 12 inches	
310.0		ML		Red SILT, containing Gravel	
	2				
308.0		SM		Grey, Silty SAND, containing Gravel	
	4				
	6			Grey, Silty SAND, containing Weathered Rock	
	8				
302.5				Test Pit Terminated at 8.5	
	10				
	12				

NOTES:

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Abingdon, MD 21009

LOG OF TEST PIT NO. TP5-04

LOG OF TEST PIT NO. TP5-05

PROJECT: **Crebilly Farm**
PROJECT LOCATION: **Chester County, Pennsylvania**
CLIENT: **Toll Brothers**

PROJECT NO.: **31161348**

GROUNDWATER ENCOUNTERED: **N/A**
DATE STARTED: **7/28/2020**
GROUND SURFACE ELEVATION: **284**
DATE COMPLETED: **7/28/2020**
DATUM: **Survey**
CONTRACTOR: **Cavan Construction**
LOGGED BY: **Greg McKee**
EQUIPMENT: **Rubber Tire Backhoe**
CHECKED BY: **Paul Scott**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0	TS		Topsoil +/- 6 inches	
283.5		SC		Brown, Clayey SAND	
282.5		ML		Orange, Micaceous, SILT, containing Sand and Clay	
	2				
	4				
279.5		ML		Brown, Micaceous, Sandy SILT containing Gravel	
	6				
276.0	8	ML		Grey, Micaceous, SILT, containing Weathered Rock	
275.0				Test Pit Terminated at 9 ft	
	10				
	12				

NOTES:

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LOG OF TEST PIT NO. TP5-05

APPENDIX D

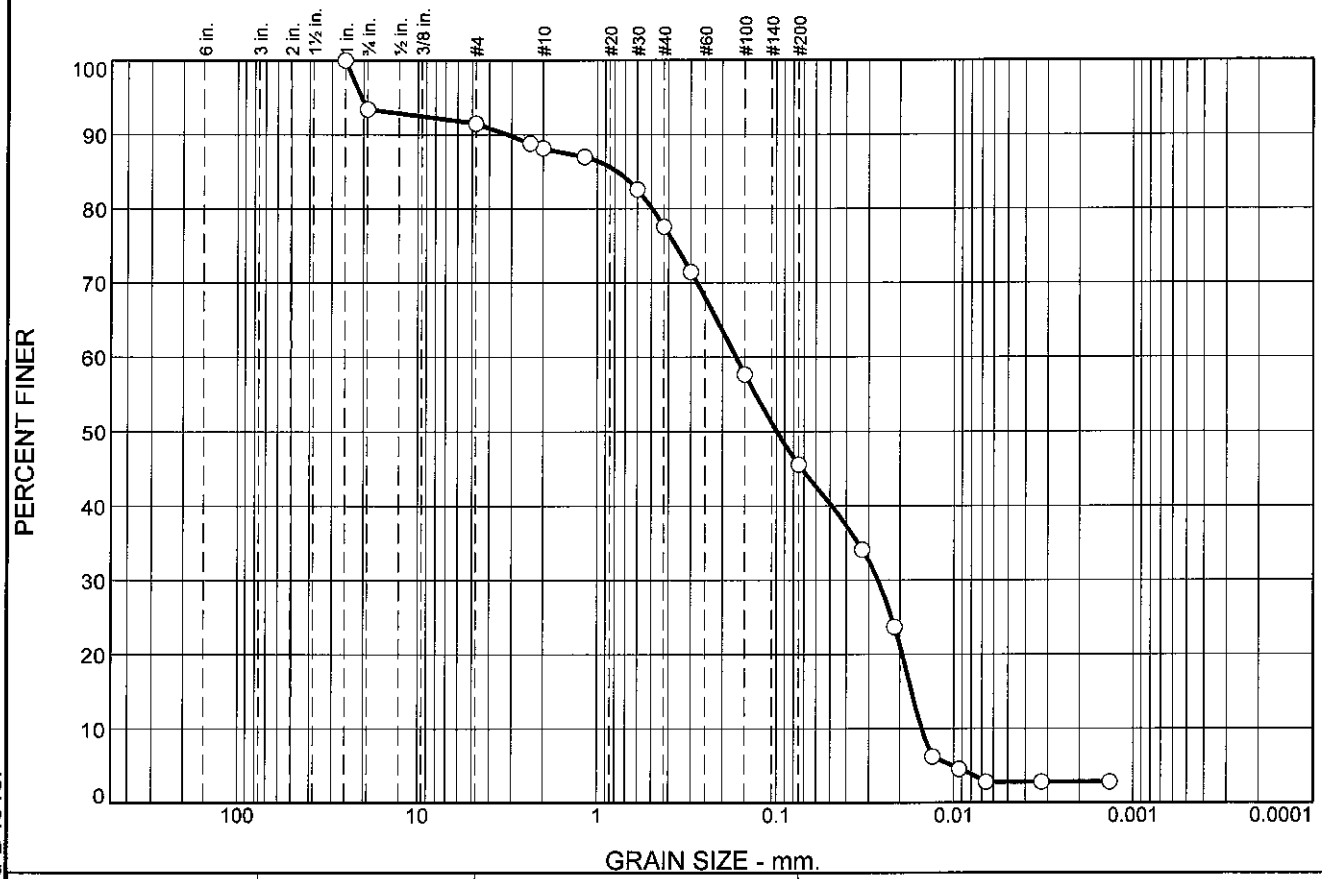
Summary of Laboratory Testing Table

Particle Size Distribution Reports

SUMMARY OF LABORATORY TESTING TABLE

TEST PIT	DEPTH (ft)	USDA CLASSIFICATION
TP-1	4	Sandy Loam (1.02)
TP-2	2 ½	Sandy Loam (1.02)
TP-3	4 ½	Sandy Loam (1.02)
TP-5	3 ½	Sandy Loam (1.02)
TP-6	4 ½	Sandy Loam (1.02)
TP-7	3	Sandy Loam (1.02)
TP-8	3	Loam (0.52)
TP-9	5	Sandy Loam (1.02)
TP-10	4	Loam (0.52)
TP-11	4	Loam (0.52)
TP-12	4 ½	Sandy Loam (1.02)
TP-13	3 ½	Sandy Loam (1.02)
TP3-01	7	Sandy Loam (1.02)
TP3-02/03	2	Silt Loam (0.27)
TP3-04	9	Loam (0.52)
TP3-05/06	10	Sandy Loam (1.02)
TP3-09/10	3	Silty Clay Loam (0.06)
TP3-11	6	Loam (0.52)
TP4-01	2	Loam (0.52)
TP5-03	5	Sandy Loam (1.02)
TP5-05	5	Loam (0.52)

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.6	1.9	3.3	10.6	32.0	42.8	2.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	93.4		
#4	91.5		
#8	88.8		
#10	88.2		
#16	87.0		
#30	82.6		
#40	77.6		
#50	71.5		
#100	57.7		
#200	45.6		
0.0326 mm.	34.1		
0.0215 mm.	23.7		
0.0131 mm.	6.2		
0.0093 mm.	4.6		
0.0066 mm.	2.8		
0.0032 mm.	2.8		
0.0014 mm.	2.8		

* (no specification provided)

Soil Description

Brown, moist, Silty SAND

Atterberg Limits

PL= 25 LL= 33 PI= 8 NM= 15.6

Coefficients

D_{90}= 3.1722 D_{85}= 0.7710 D_{60}= 0.1685
D_{50}= 0.0994 D_{30}= 0.0266 D_{15}= 0.0173
D_{10}= 0.0151 C_u= 11.14 C_c= 0.28

Classification

USCS= SM AASHTO= A-4(1)

Remarks

USDA: Sandy Loam

Source of Sample: TP-1 **Depth:** 4.0

Date: 8/2/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

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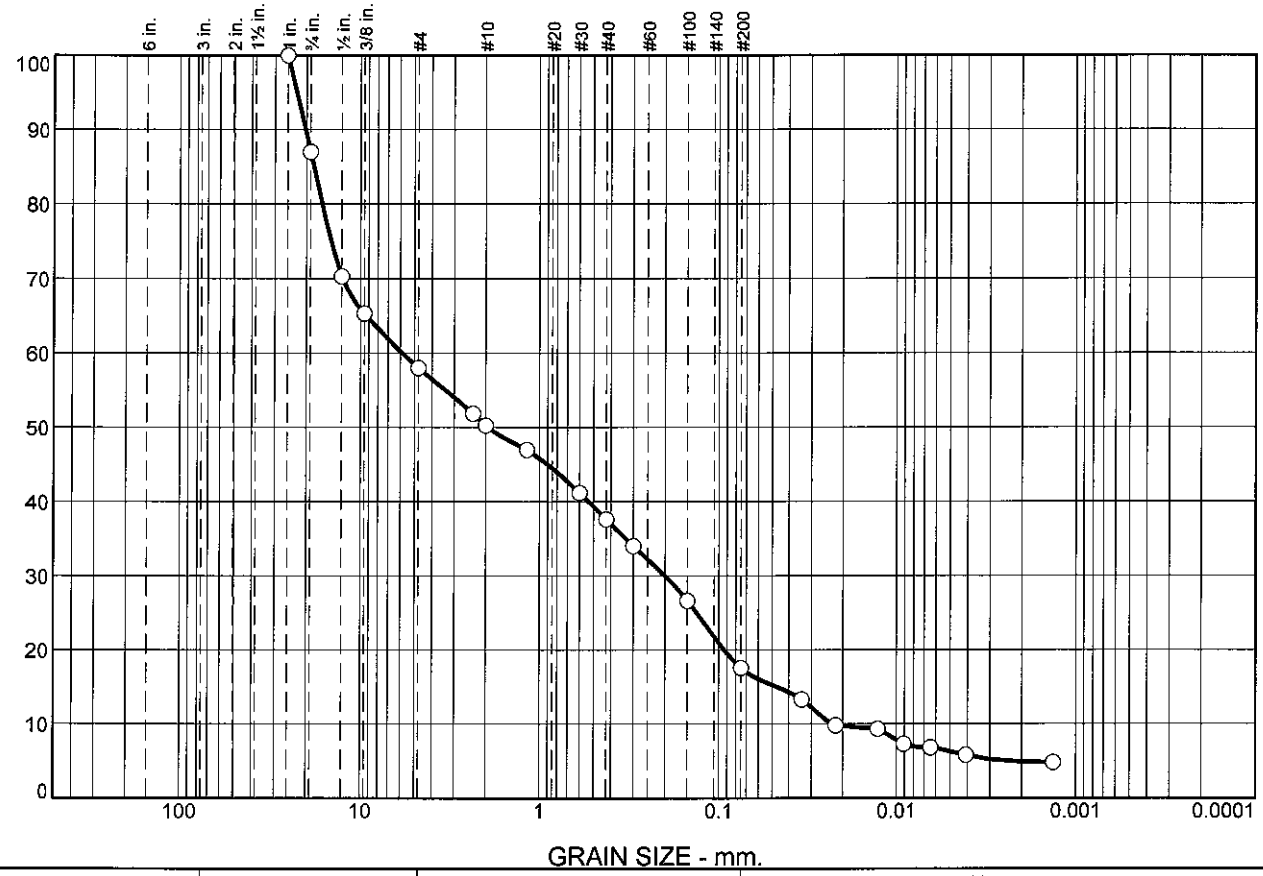
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 3

Tested By: M. Kerezsi **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.0	29.0	7.8	12.6	20.0	11.3	6.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100.0		
.75	87.0		
.5	70.3		
.375	65.3		
#4	58.0		
#8	51.8		
#10	50.2		
#16	47.0		
#30	41.2		
#40	37.6		
#50	34.0		
#100	26.6		
#200	17.6		
0.0340 mm.	13.3		
0.0219 mm.	9.8		
0.0127 mm.	9.3		
0.0091 mm.	7.3		
0.0064 mm.	6.8		
0.0041 mm.	5.8		
0.0013 mm.	4.8		

* (no specification provided)

Soil Description

Brown, moist, Silty GRAVEL with sand

Atterberg Limits

PL= 26 LL= 32 PI= 6 NM= 12.4

Coefficients

D_{90}= 20.3379 D_{85}= 18.2596 D_{60}= 5.8616
D_{50}= 1.9456 D_{30}= 0.2004 D_{15}= 0.0468
D_{10}= 0.0229 C_u= 255.70 C_c= 0.30

Classification

USCS= AASHTO= A-1-b

Remarks

USDA: Sandy Loam

Source of Sample: TP-2 **Depth:** 2.5

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

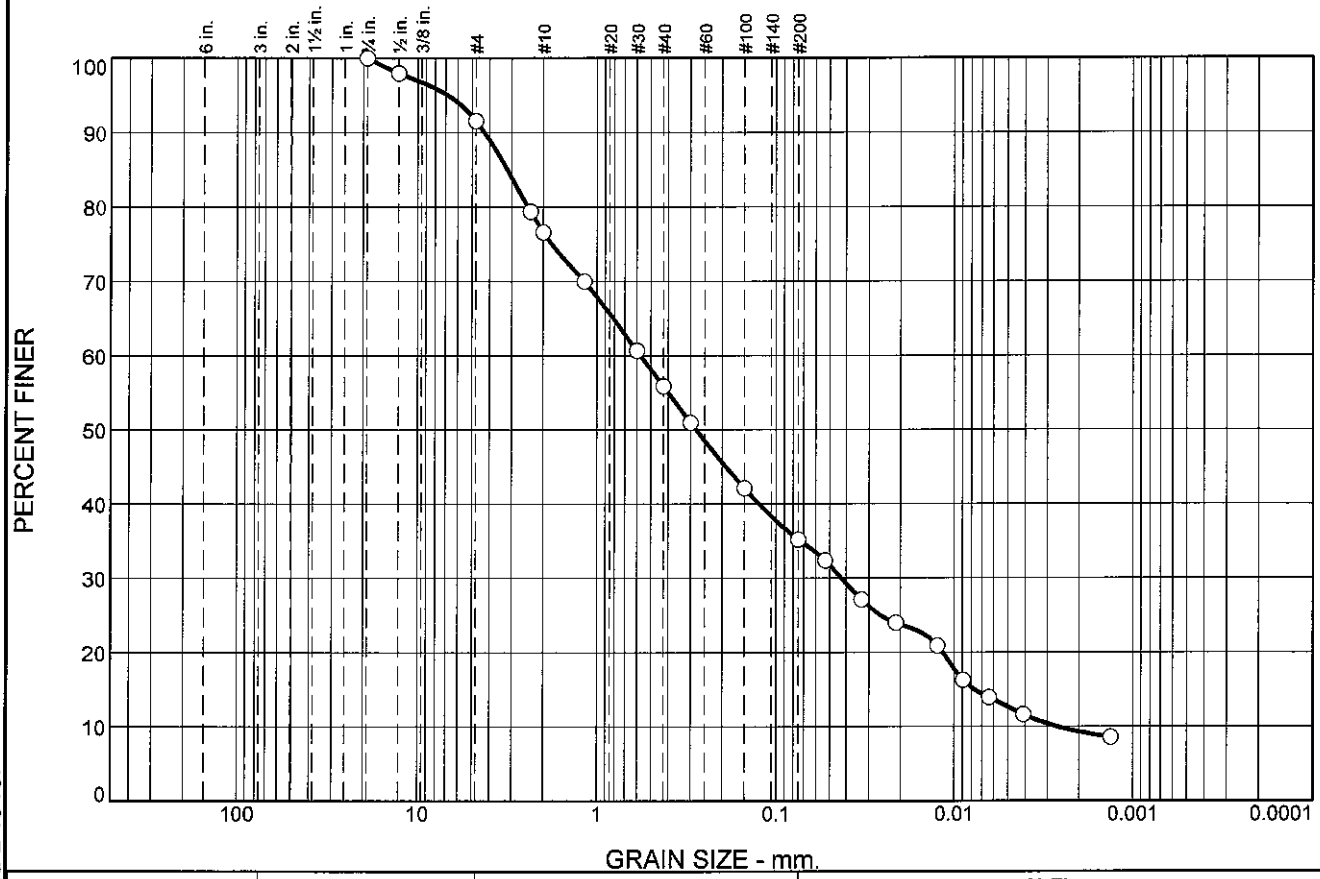
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 4

Tested By: C. Jackson **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.5	14.9	20.7	20.7	22.5	12.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	97.9		
#4	91.5		
#8	79.4		
#10	76.6		
#16	70.0		
#30	60.7		
#40	55.9		
#50	51.0		
#100	42.1		
#200	35.2		
#270	32.4		
0.0331 mm.	27.1		
0.0212 mm.	24.0		
0.0124 mm.	20.9		
0.0089 mm.	16.3		
0.0064 mm.	14.0		
0.0041 mm.	11.6		
0.0013 mm.	8.5		

* (no specification provided)

Soil Description

Brown, moist, Silty SAND

Atterberg Limits

PL= 24 LL= 26 PI= 2 NM= 15.2

Coefficients

D_{90}= 4.2608 D_{85}= 3.1874 D_{60}= 0.5716
D_{50}= 0.2799 D_{30}= 0.0428 D_{15}= 0.0077
D_{10}= 0.0026 C_u= 215.98 C_c= 1.21

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

USDA: Sandy Loam

Source of Sample: TP-3 **Depth:** 4.5

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

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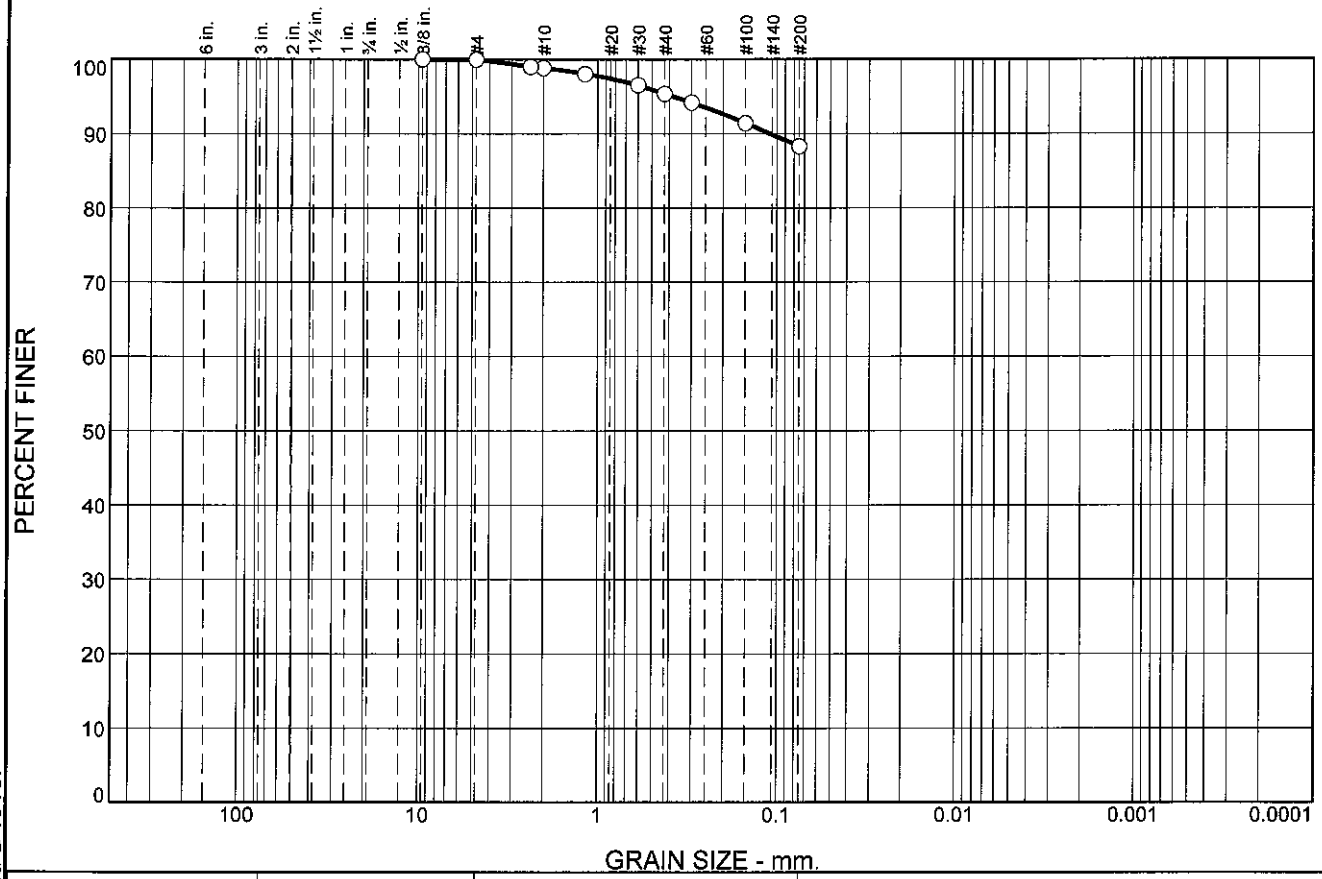
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 5

Tested By: D. Jeffery **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	1.1	3.4	7.1	88.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.9		
#8	99.0		
#10	98.8		
#16	98.0		
#30	96.5		
#40	95.4		
#50	94.2		
#100	91.4		
#200	88.3		

* (no specification provided)

Soil Description

Brown, moist, SILT

Atterberg Limits

PL= 25 LL= 33 PI= 8 NM= 24.8

Coefficients

D_{90}= 0.1086 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-4(7)

Remarks

Source of Sample: TP-4 **Depth:** 2-5ft
Sample Number: S-072616

Date: 7/25/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

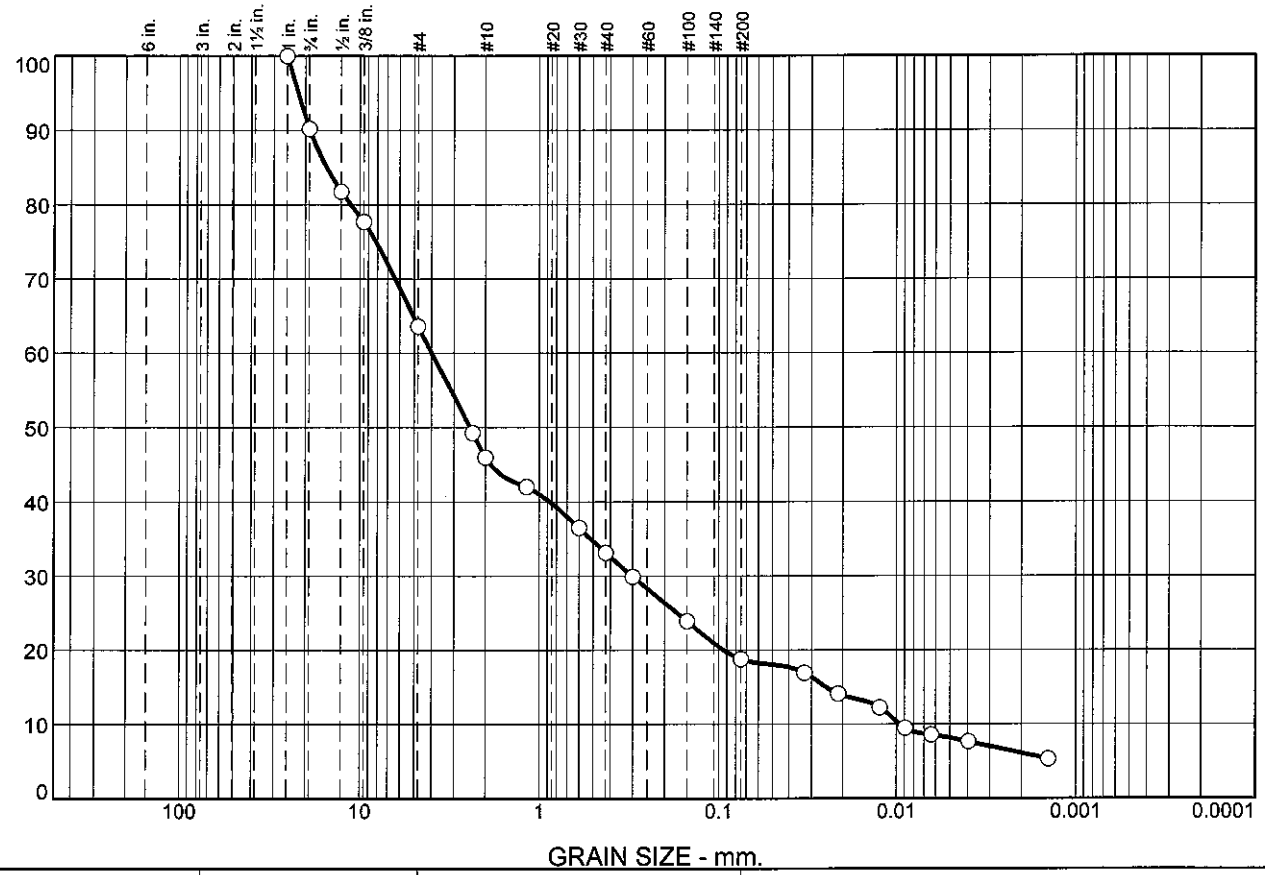
Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 6

Tested By: D. Jeffery **Checked By:** E. Williams

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.8	26.6	17.6	12.8	14.4	10.6	8.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	90.2		
.5	81.8		
.375	77.7		
#4	63.6		
#8	49.3		
#10	46.0		
#16	42.0		
#30	36.5		
#40	33.2		
#50	29.9		
#100	23.9		
#200	18.8		
0.0328 mm.	16.9		
0.0212 mm.	14.1		
0.0124 mm.	12.3		
0.0089 mm.	9.5		
0.0064 mm.	8.6		
0.0040 mm.	7.6		
0.0014 mm.	5.3		

* (no specification provided)

Soil Description

Orange and brown, moist, Silty, Clayey SAND with gravel

Atterberg Limits

PL= 22 LL= 28 PI= 6 NM= 13.1

Coefficients

D_{90}= 18.9121 D_{85}= 15.3366 D_{60}= 3.9996
D_{50}= 2.4428 D_{30}= 0.3029 D_{15}= 0.0247
D_{10}= 0.0096 C_u= 417.58 C_c= 2.39

Classification

USCS= SC-SM AASHTO= A-1-b

Remarks

USDA: Sandy Loam

Source of Sample: TP-5 **Depth:** 3.5

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

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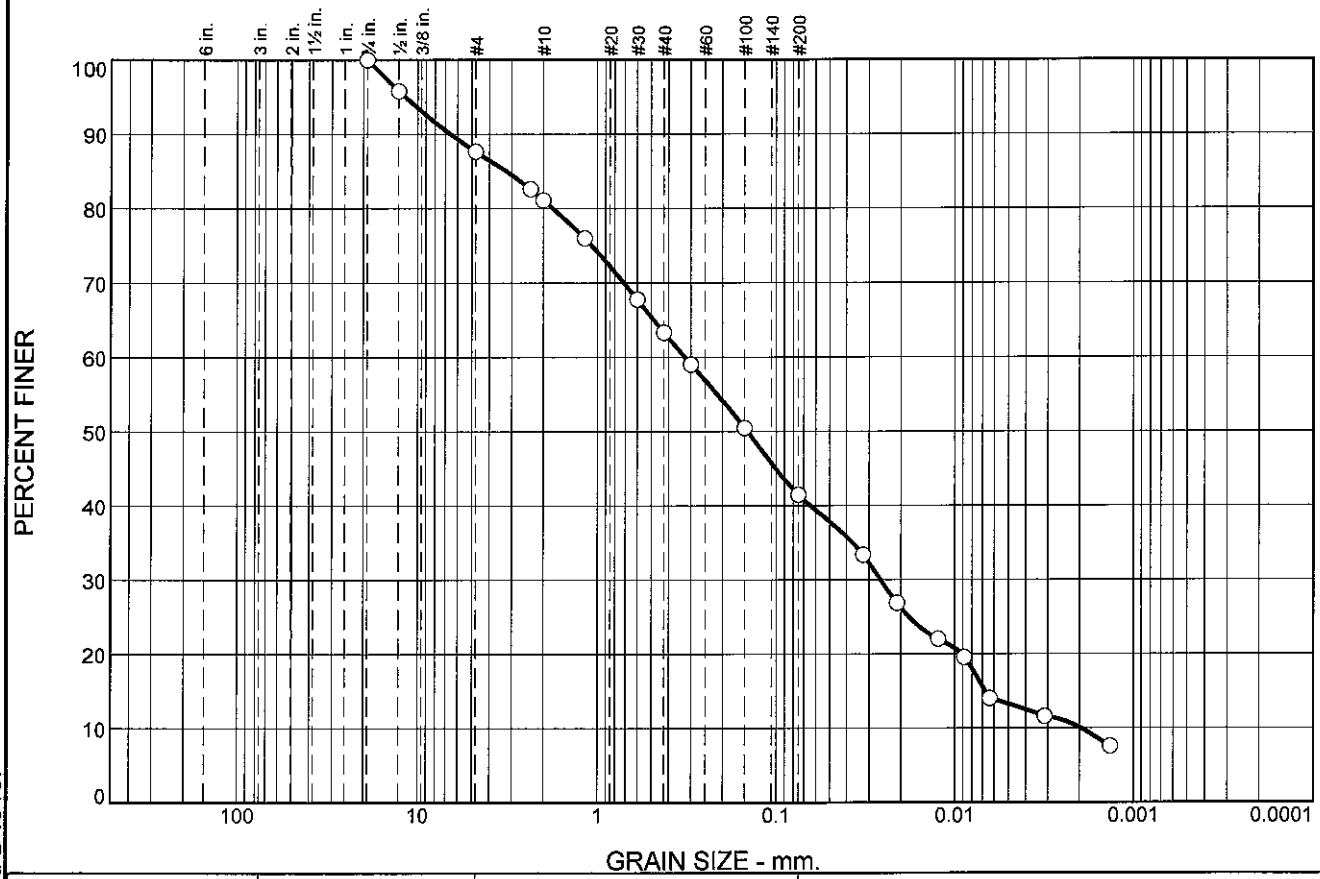
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm
Project No: 161348 **Figure** No. 7

Tested By: C. Jackson **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.4	6.5	17.8	21.8	28.2	13.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	95.8		
#4	87.6		
#8	82.6		
#10	81.1		
#16	76.0		
#30	67.8		
#40	63.3		
#50	59.1		
#100	50.5		
#200	41.5		
0.0324 mm.	33.4		
0.0211 mm.	26.9		
0.0124 mm.	22.0		
0.0088 mm.	19.6		
0.0064 mm.	14.0		
0.0031 mm.	11.6		
0.0013 mm.	7.6		

* (no specification provided)

Soil Description

Orange and brown, moist, Silty SAND

Atterberg Limits

PL= 30 LL= 38 PI= 8 NM= 19.8

Coefficients

D_{90}= 6.5593 D_{85}= 3.2233 D_{60}= 0.3246
D_{50}= 0.1449 D_{30}= 0.0259 D_{15}= 0.0068
D_{10}= 0.0020 C_u= 165.28 C_c= 1.05

Classification

USCS= SM AASHTO= A-4(1)

Remarks

USDA: Sandy Loam

Source of Sample: TP-6 **Depth:** 4.5

Date: 8/2/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

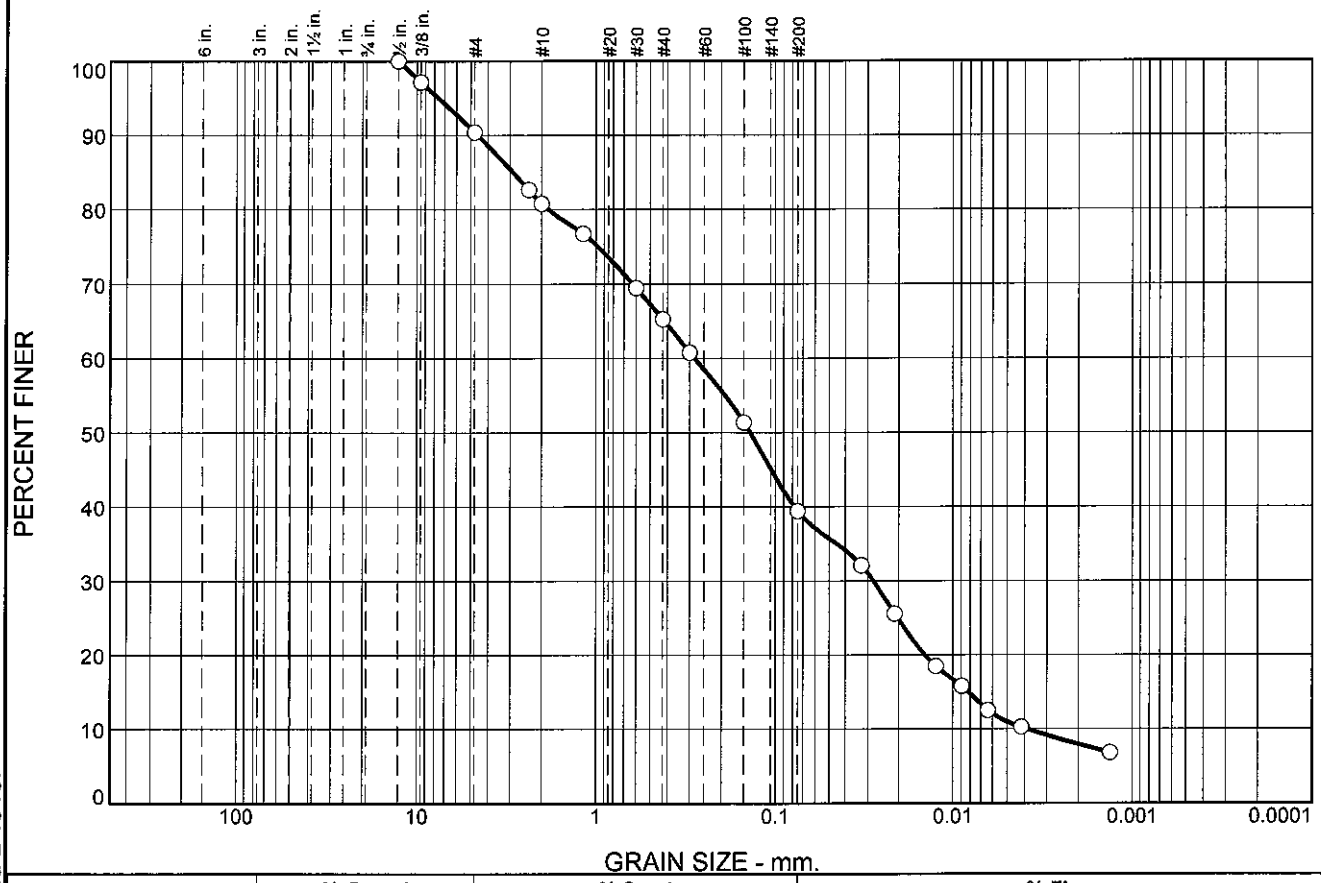
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 8

Tested By: J. Friant **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.6	9.6	15.5	25.9	28.4	11.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	97.2		
#4	90.4		
#8	82.6		
#10	80.8		
#16	76.7		
#30	69.5		
#40	65.3		
#50	60.8		
#100	51.4		
#200	39.4		
0.0325 mm.	32.1		
0.0211 mm.	25.6		
0.0124 mm.	18.5		
0.0089 mm.	15.8		
0.0064 mm.	12.5		
0.0042 mm.	10.2		
0.0013 mm.	6.8		

* (no specification provided)

Source of Sample: TP-7 **Depth:** 3.0

Soil Description

Brown, moist, Silty SAND

Atterberg Limits

PL= 29 LL= 36 PI= 7 NM= 20.2

Coefficients

D_{90}= 4.5766 D_{85}= 2.9009 D_{60}= 0.2825
D_{50}= 0.1384 D_{30}= 0.0278 D_{15}= 0.0082
D_{10}= 0.0039 C_u= 72.67 C_c= 0.70

Classification

USCS= SM AASHTO= A-4(0)

Remarks

USDA: Sandy Loam

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

GEO-TECHNOLOGY ASSOCIATES, INC.
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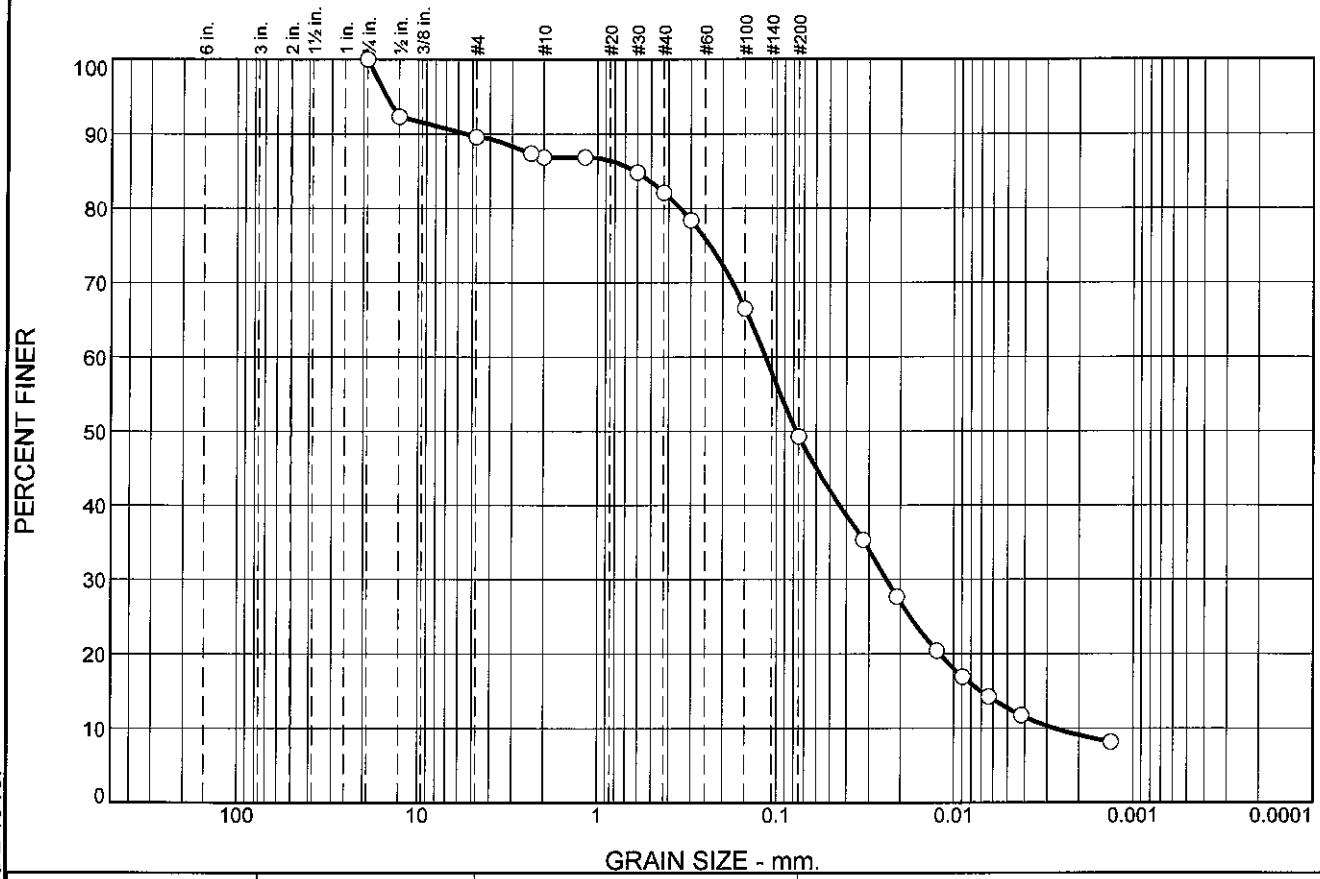
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm
Project No: 161348 **Figure** No. 9

Tested By: M. Kerezsi **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.4	2.7	4.8	32.8	36.6	12.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	92.3		
#4	89.6		
#8	87.4		
#10	86.9		
#16	86.9		
#30	84.8		
#40	82.1		
#50	78.4		
#100	66.5		
#200	49.3		
0.0324 mm.	35.3		
0.0210 mm.	27.7		
0.0125 mm.	20.4		
0.0089 mm.	16.9		
0.0064 mm.	14.3		
0.0042 mm.	11.8		
0.0013 mm.	8.2		

* (no specification provided)

Soil Description

Brown, moist, Silty SAND

Atterberg Limits

PL= 28 LL= 28 PI= NP NM= 10.2

Coefficients

D_{90}= 5.3945 D_{85}= 0.6159 D_{60}= 0.1155
D_{50}= 0.0774 D_{30}= 0.0240 D_{15}= 0.0070
D_{10}= 0.0027 C_u= 42.39 C_c= 1.83

Classification

USCS= SM AASHTO= A-4(0)

Remarks

USDA: Loam

Source of Sample: TP-8 **Depth:** 3.0

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

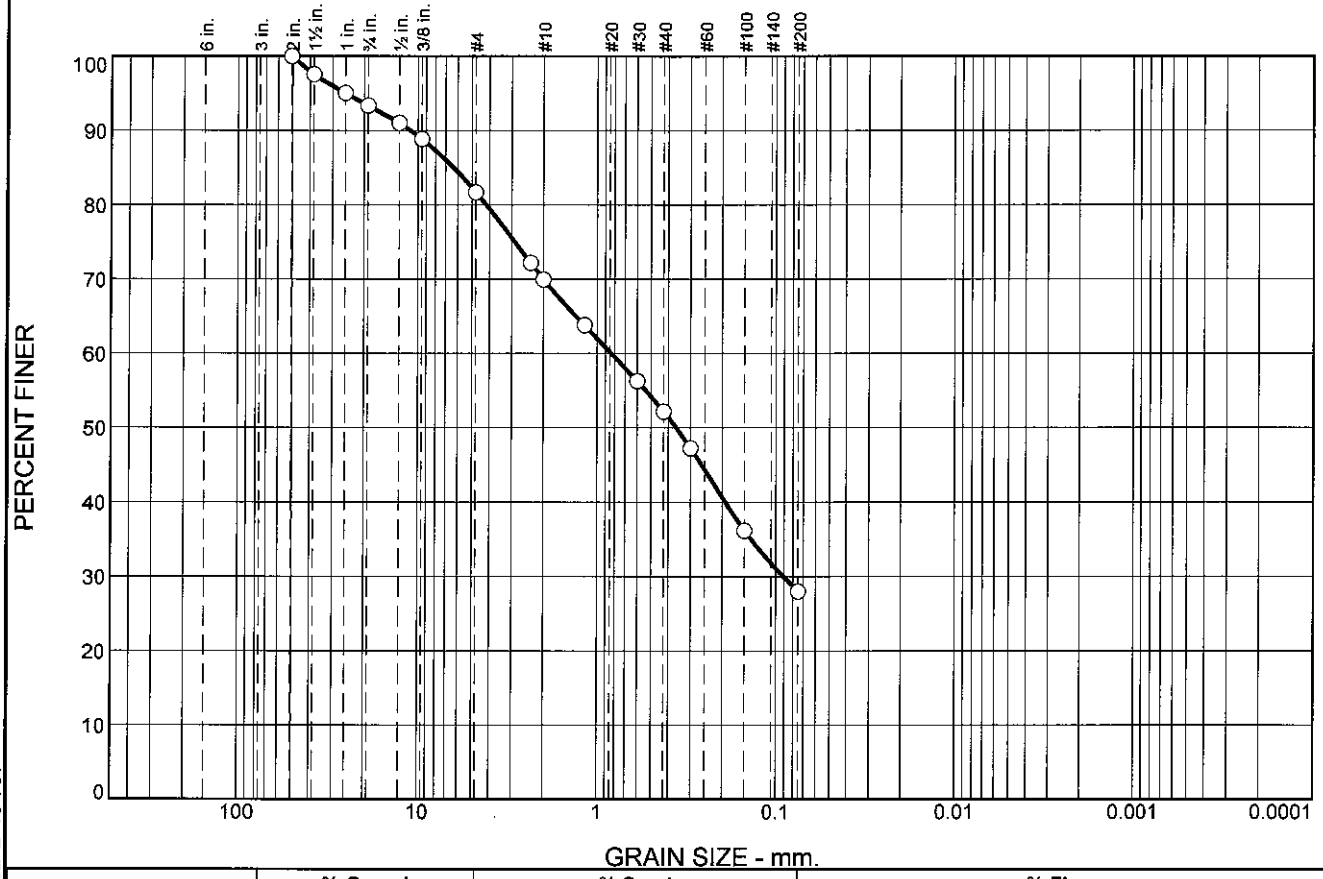
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 10

Tested By: M. Kerezsi **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.6	11.7	11.7	17.8	24.2	28.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	97.6		
1	95.1		
.75	93.4		
.5	91.0		
.375	88.9		
#4	81.7		
#8	72.2		
#10	70.0		
#16	63.8		
#30	56.3		
#40	52.2		
#50	47.2		
#100	36.2		
#200	28.0		

* (no specification provided)

Soil Description

Brown, moist, Silty SAND with gravel

Atterberg Limits

PL= 28 LL= 33 PI= 5 NM= 14.0

Coefficients

D_{90}= 10.9987 D_{85}= 6.3352 D_{60}= 0.8377
D_{50}= 0.3620 D_{30}= 0.0906 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Source of Sample: TP-9 **Depth:** 2.0
Sample Number: S-072616

Date: 7/26/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
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New Castle, DE 19720

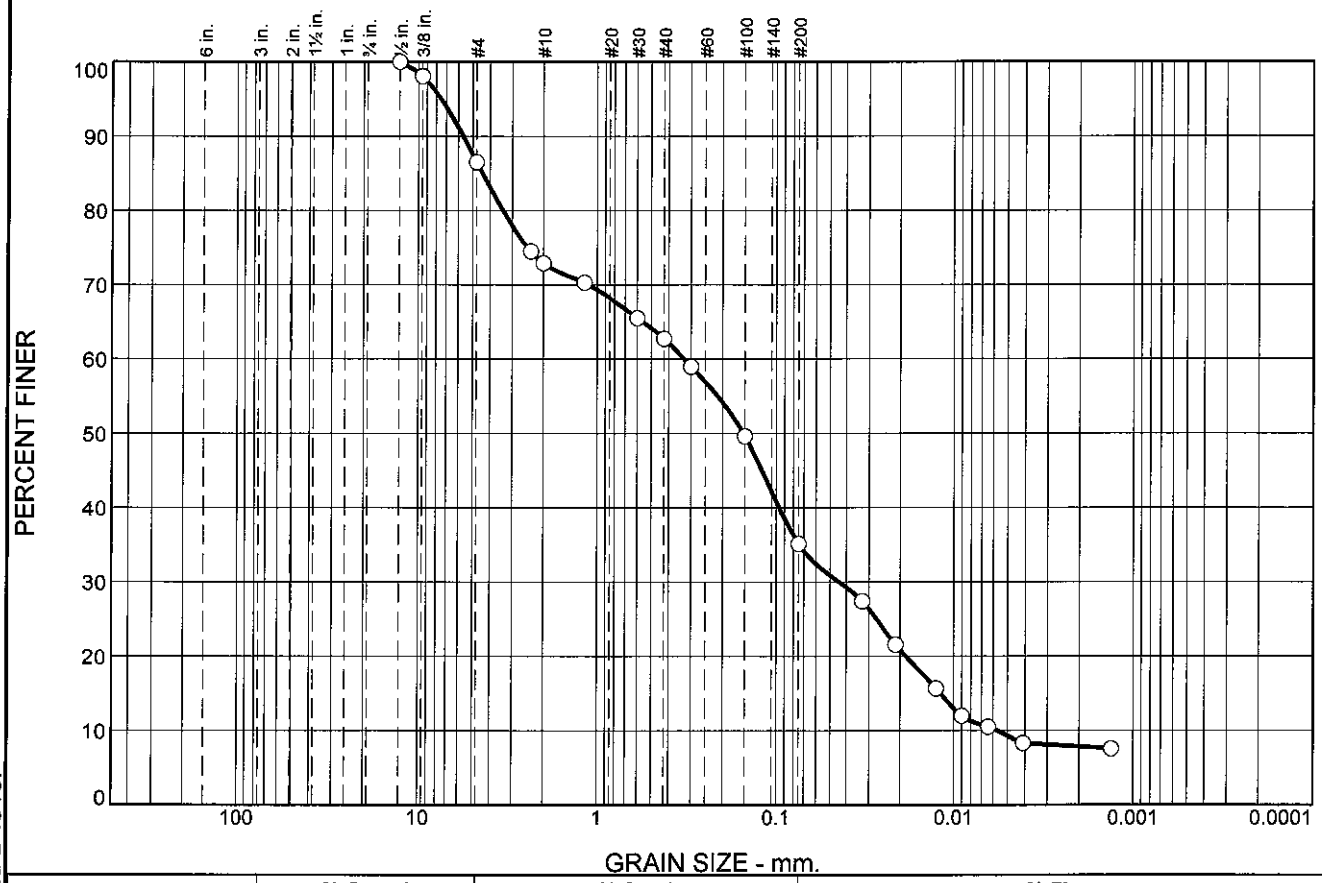
Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 11

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Tested By: D. Jeffery **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.5	13.6	10.2	27.5	25.9	9.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	98.0		
#4	86.5		
#8	74.5		
#10	72.9		
#16	70.3		
#30	65.5		
#40	62.7		
#50	58.9		
#100	49.6		
#200	35.2		
0.0327 mm.	27.4		
0.0212 mm.	21.5		
0.0126 mm.	15.7		
0.0090 mm.	12.0		
0.0064 mm.	10.5		
0.0041 mm.	8.3		
0.0013 mm.	7.6		

* (no specification provided)

Soil Description

Brown, moist, Silty, Clayey SAND

Atterberg Limits

PL= 22 LL= 29 PI= 7 NM= 13.8

Coefficients

D_{90}= 5.6657 D_{85}= 4.4017 D_{60}= 0.3293
D_{50}= 0.1532 D_{30}= 0.0441 D_{15}= 0.0119
D_{10}= 0.0057 C_u= 57.88 C_c= 1.04

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

USDA: Sandy Loam

Source of Sample: TP-9 **Depth:** 5

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

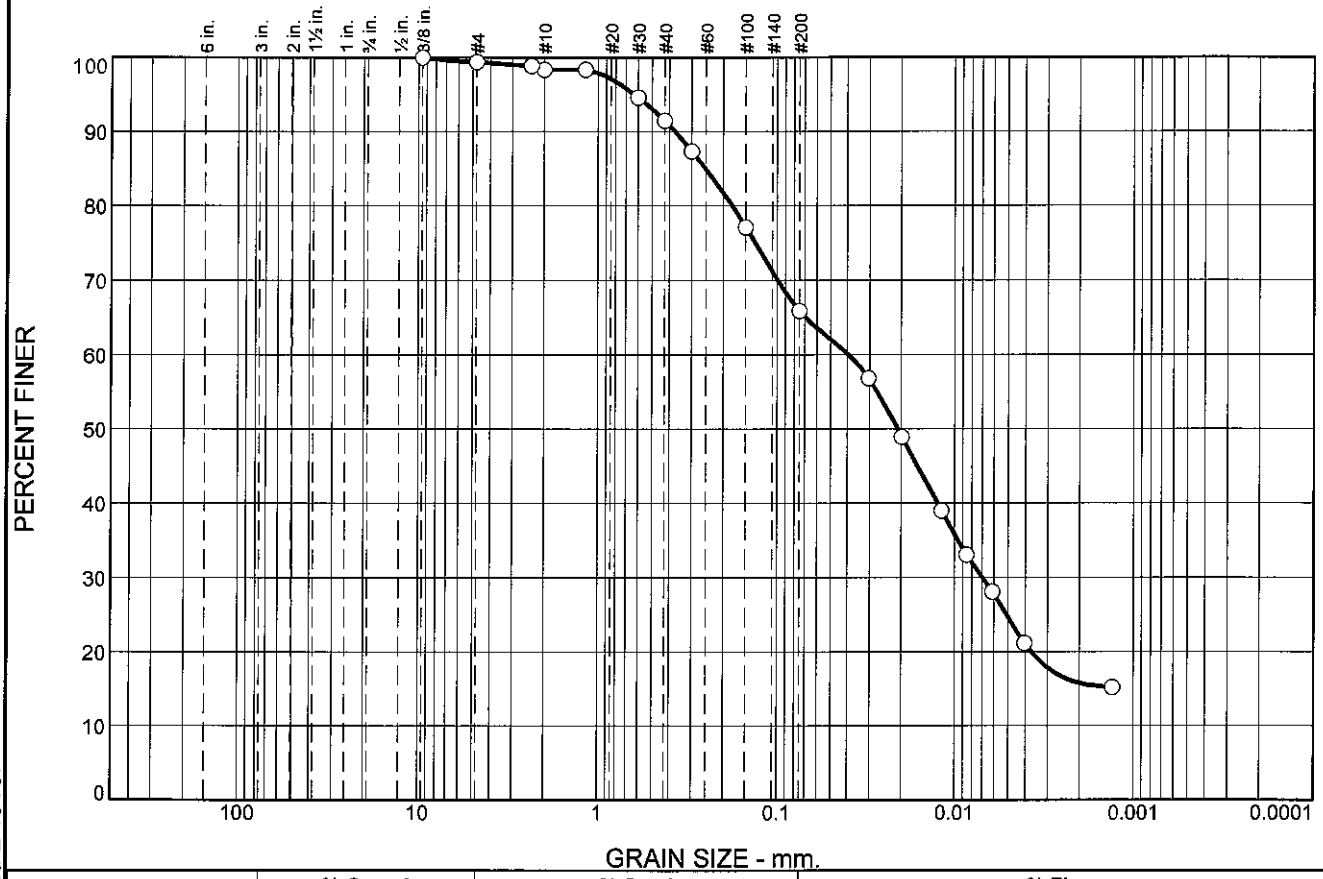
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 12

Tested By: C. Jackson **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	1.1	6.8	25.6	41.3	24.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.4		
#8	98.9		
#10	98.3		
#16	98.3		
#30	94.6		
#40	91.5		
#50	87.3		
#100	77.1		
#200	65.9		
0.0305 mm.	56.8		
0.0198 mm.	48.9		
0.0119 mm.	39.0		
0.0086 mm.	33.0		
0.0061 mm.	28.1		
0.0040 mm.	21.1		
0.0013 mm.	15.2		

* (no specification provided)

Source of Sample: TP-10 **Depth:** 4.0

Soil Description

Orange and brown, moist, Sandy SILT

Atterberg Limits

PL= 24 LL= 31 PI= 7 NM= 15.1

Coefficients

D_{90}= 0.3727 D_{85}= 0.2520 D_{60}= 0.0395
D_{50}= 0.0209 D_{30}= 0.0070 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-4(3)

Remarks

USDA: Loam

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

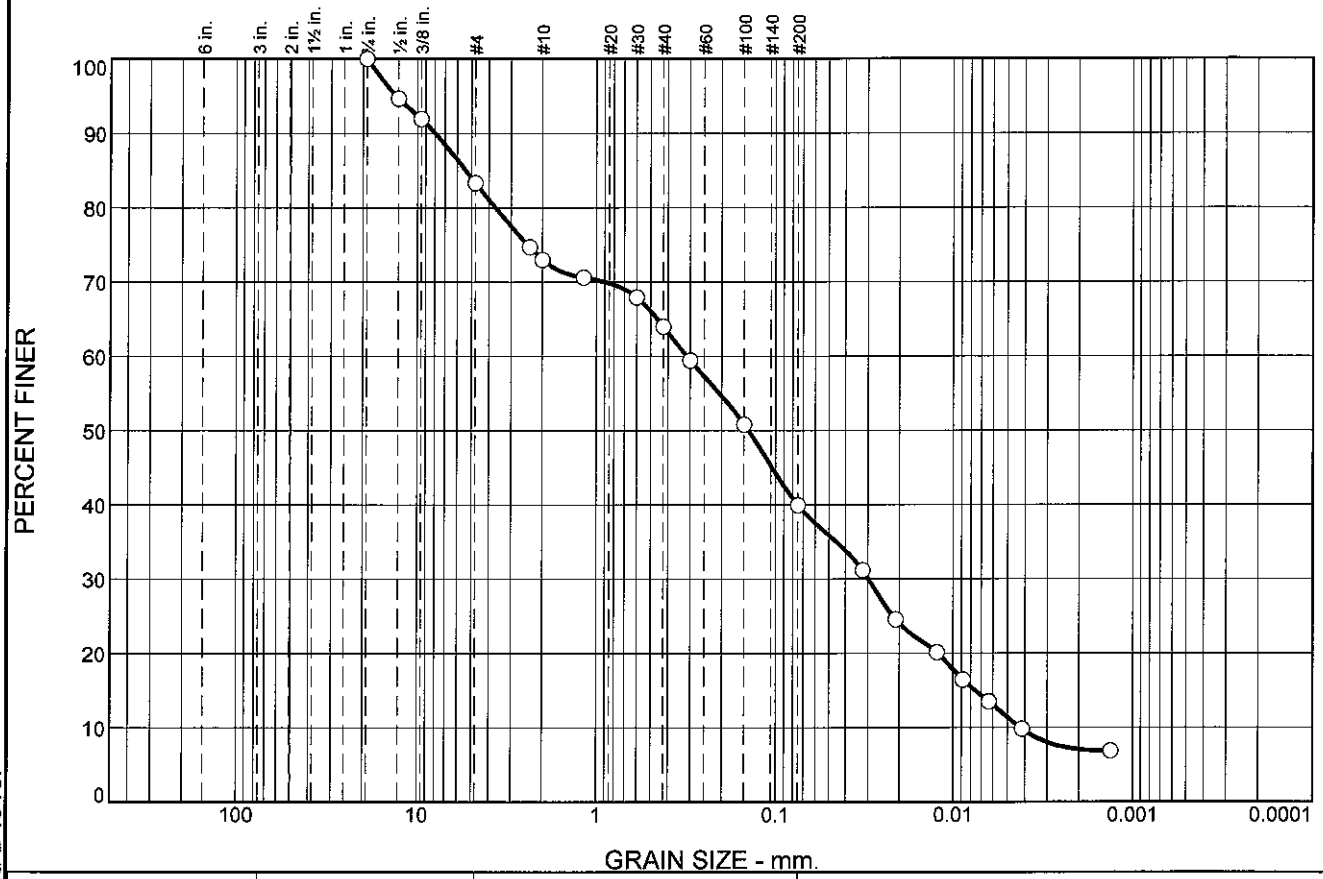
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 13

Tested By: C. Jackson **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	16.7	10.3	9.0	24.0	28.6	11.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	94.7		
.375	92.0		
#4	83.3		
#8	74.7		
#10	73.0		
#16	70.6		
#30	67.9		
#40	64.0		
#50	59.4		
#100	50.8		
#200	40.0		
0.0322 mm.	31.2		
0.0210 mm.	24.5		
0.0123 mm.	20.1		
0.0089 mm.	16.4		
0.0063 mm.	13.5		
0.0041 mm.	9.8		
0.0013 mm.	6.9		

* (no specification provided)

Soil Description

Orange and brown, moist, Silty SAND with gravel

Atterberg Limits

PL= 36 LL= 43 PI= 7 NM= 33.2

Coefficients

D_{90}= 7.9413 D_{85}= 5.3853 D_{60}= 0.3137
D_{50}= 0.1420 D_{30}= 0.0298 D_{15}= 0.0076
D_{10}= 0.0043 C_u= 73.73 C_c= 0.67

Classification

USCS= SM AASHTO= A-5(0)

Remarks

USDA: Loam

Source of Sample: TP-11 **Depth:** 4.0

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

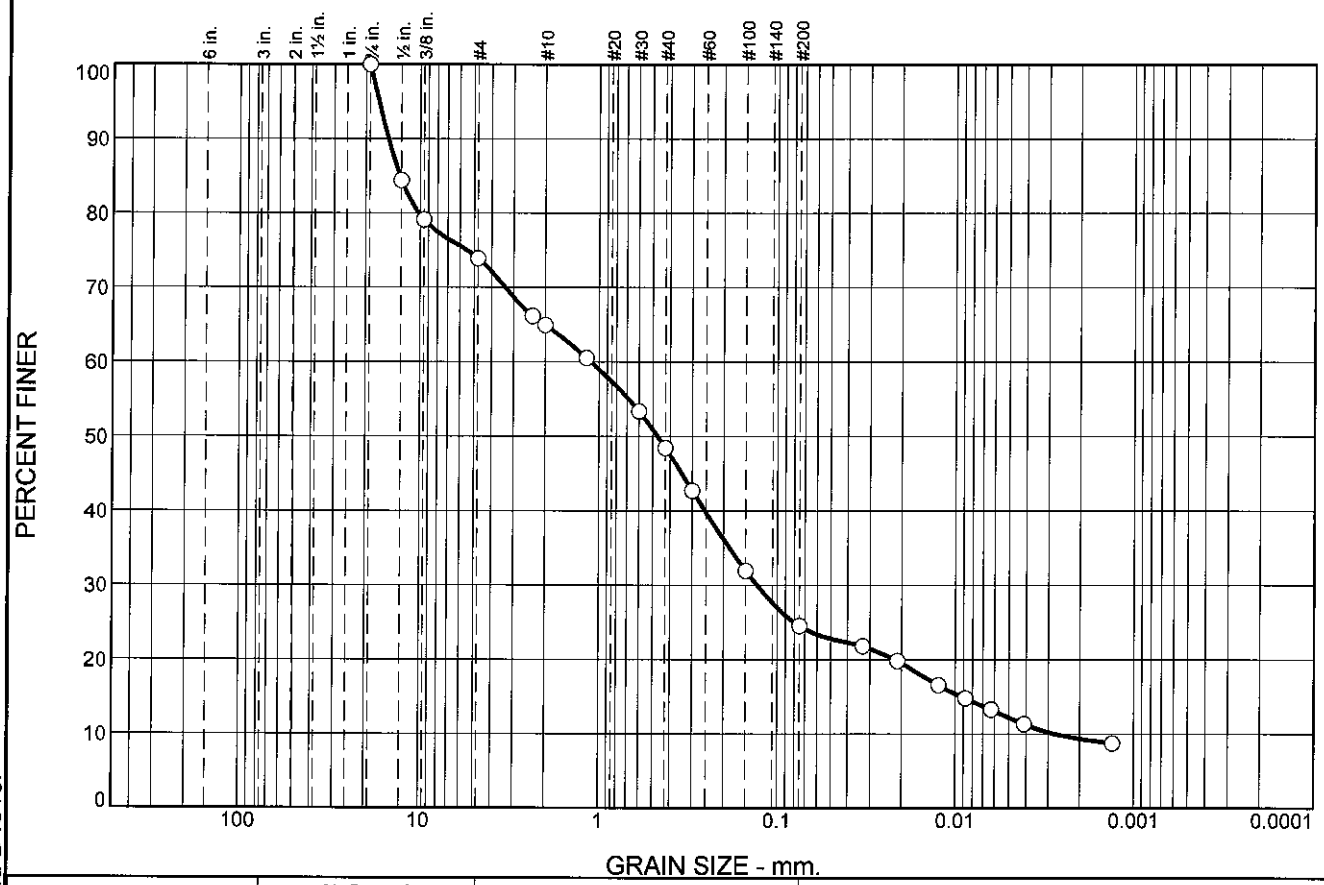
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 14

Tested By: C. Jackson **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	26.1	9.0	16.5	23.9	12.3	12.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	84.4		
.375	79.1		
#4	73.9		
#8	66.1		
#10	64.9		
#16	60.5		
#30	53.4		
#40	48.4		
#50	42.7		
#100	31.9		
#200	24.5		
0.0331 mm.	21.8		
0.0212 mm.	19.8		
0.0124 mm.	16.6		
0.0088 mm.	14.8		
0.0063 mm.	13.3		
0.0041 mm.	11.3		
0.0013 mm.	8.7		

* (no specification provided)

Soil Description

Brown, moist, Silty SAND with gravel

Atterberg Limits

PL= 25 LL= 29 PI= 4 NM= 16.0

Coefficients

D_{90}= 15.0229 D_{85}= 12.9745 D_{60}= 1.1169
D_{50}= 0.4709 D_{30}= 0.1297 D_{15}= 0.0092
D_{10}= 0.0027 C_u= 409.09 C_c= 5.52

Classification

USCS= SM AASHTO= A-1-b

Remarks

USDA: Sandy Loam

Source of Sample: TP-12 **Depth:** 4.5

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

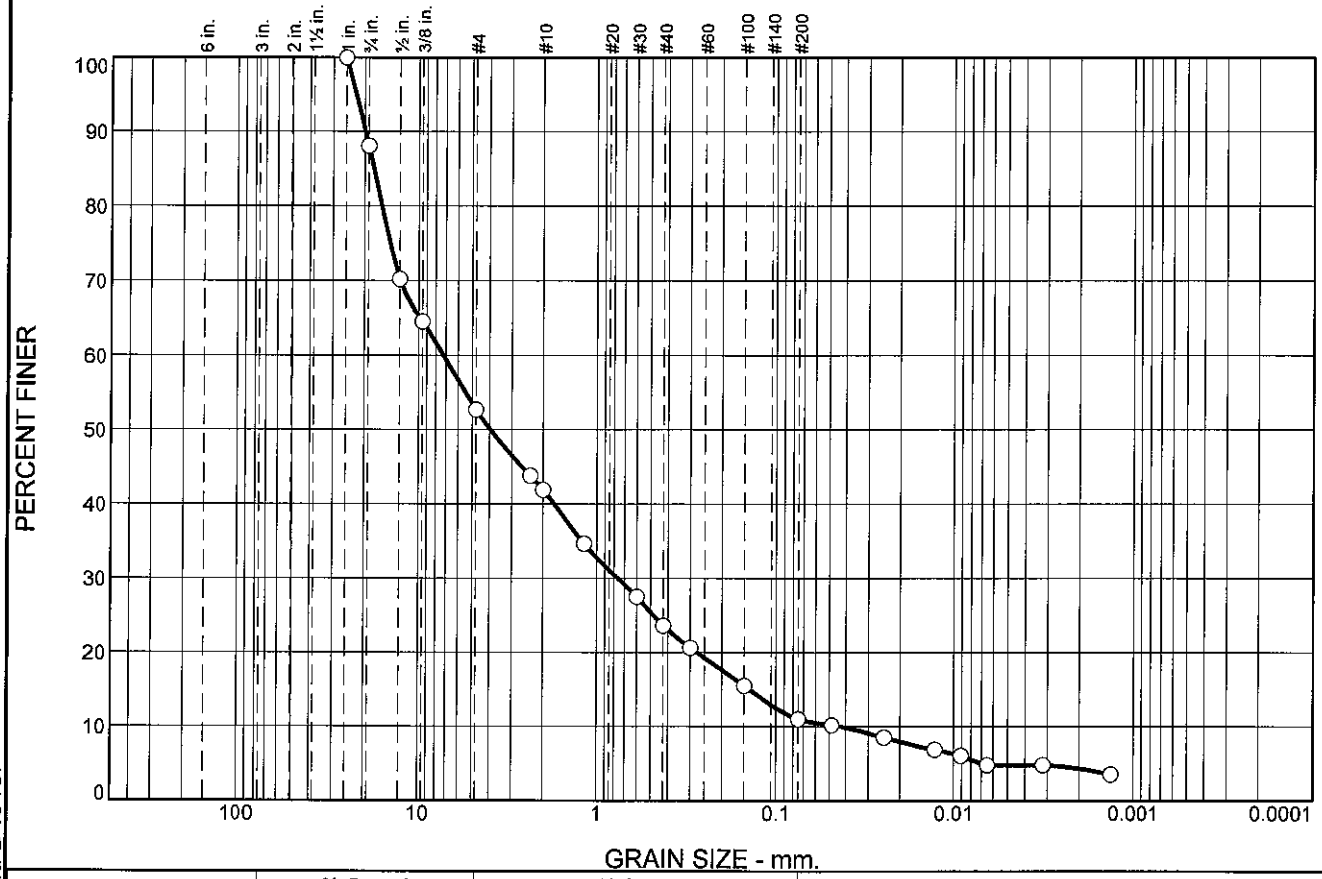
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 15

Tested By: M. Kerezsi **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.9	35.4	10.8	18.3	12.6	6.2	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	88.1		
.5	70.2		
.375	64.5		
#4	52.7		
#8	43.8		
#10	41.9		
#16	34.7		
#30	27.5		
#40	23.6		
#50	20.6		
#100	15.5		
#200	11.0		
0.0483 mm.	10.2		
0.0245 mm.	8.5		
0.0128 mm.	6.9		
0.0091 mm.	6.0		
0.0065 mm.	4.8		
0.0032 mm.	4.8		
0.0013 mm.	3.6		

* (no specification provided)

Soil Description

Brown and gray, moist, Well-graded GRAVEL with silt and sand

Atterberg Limits

PL= 25 LL= 32 PI= 7 NM= 9.2

Coefficients

D_{90}= 19.8909 D_{85}= 17.8561 D_{60}= 7.2522
D_{50}= 3.9575 D_{30}= 0.7624 D_{15}= 0.1406
D_{10}= 0.0434 C_u= 167.04 C_c= 1.85

Classification

USCS= GW-GM AASHTO= A-2-4(0)

Remarks

USDA: Sandy Loam

Source of Sample: TP-13 **Depth:** 3.5

Date: 7/27/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

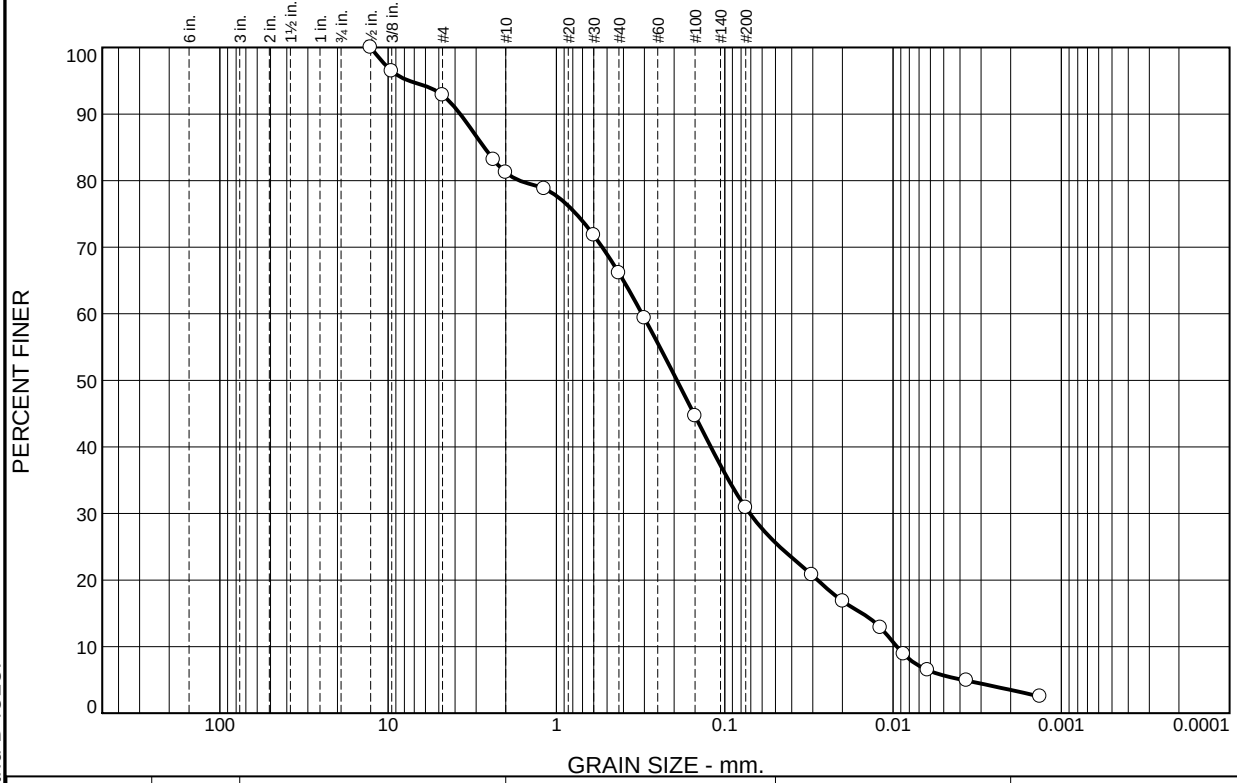
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure** No. 16

Tested By: D. Jeffery **Checked By:** E. Williams

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.0	7.2	11.6	3.5	8.8	13.3	19.5	10.5	8.7	13.4	3.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	96.5		
#4	92.8		
#8	83.1		
#10	81.2		
#16	78.8		
#30	71.8		
#40	66.1		
#50	59.3		
#100	44.6		
#200	30.9		
0.0303 mm.	20.8		
0.0199 mm.	16.8		
0.0119 mm.	12.8		
0.0086 mm.	8.9		
0.0062 mm.	6.5		
0.0037 mm.	4.9		
0.0013 mm.	2.5		

* (no specification provided)

Soil Description

Sandy LOAM (1.02)

Atterberg Limits

PL= LL= PI= NM=

Coefficients

D_{90}= 3.7267 D_{85}= 2.6861 D_{60}= 0.3100
D_{50}= 0.1922 D_{30}= 0.0709 D_{15}= 0.0153
D_{10}= 0.0095 C_u= 32.63 C_c= 1.71

Classification

USCS= Silty SAND (SM) AASHTO=

Remarks

Source of Sample: TP 3-01 **Depth:** 7.0

Date: 11/18/2019

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

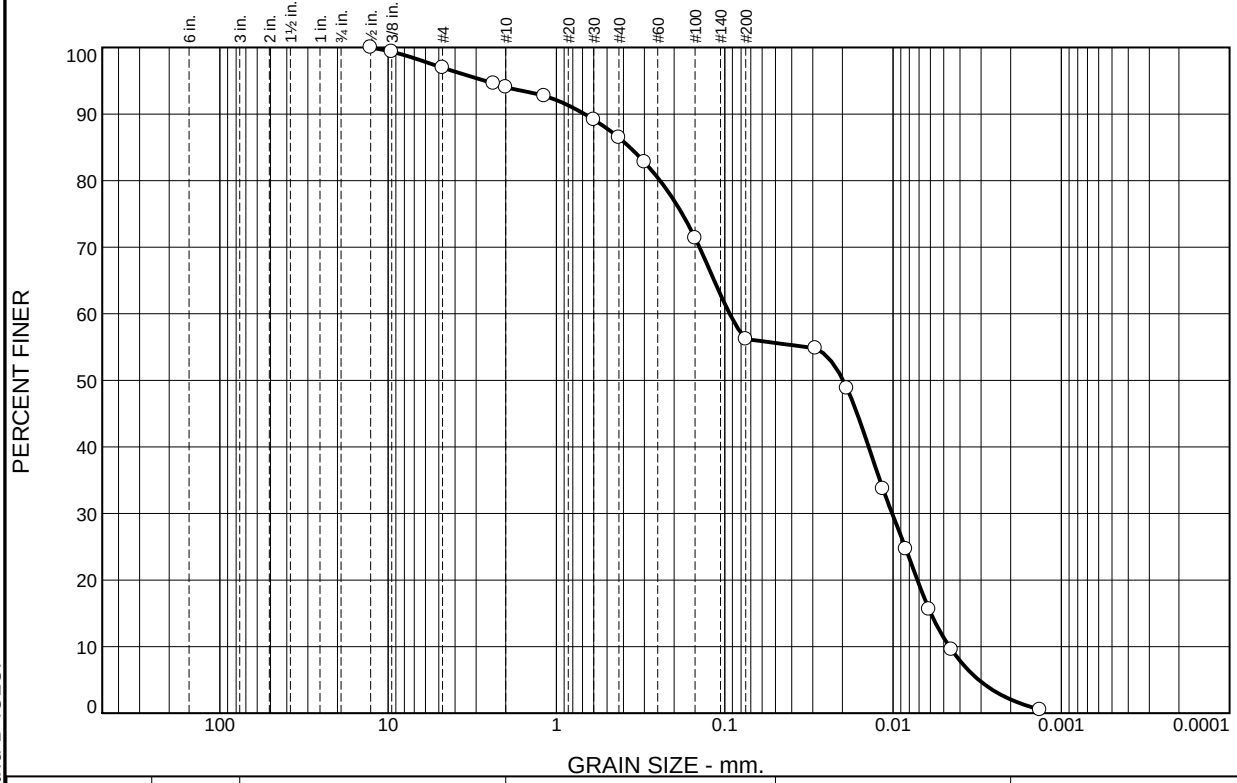
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure**

Tested By: A. Veith **Checked By:** C. Reith

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.0	3.0	3.0	1.9	4.3	7.4	18.9	5.9	5.4	48.1	2.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	99.4		
#4	97.0		
#8	94.6		
#10	94.0		
#16	92.7		
#30	89.2		
#40	86.5		
#50	82.8		
#100	71.4		
#200	56.2		
0.0289 mm.	54.8		
0.0188 mm.	48.8		
0.0115 mm.	33.7		
0.0084 mm.	24.7		
0.0061 mm.	15.6		
0.0045 mm.	9.6		
0.0013 mm.	0.5		

* (no specification provided)

Soil Description

SILT LOAM (0.27)

Atterberg Limits

PL= LL= PI= NM=

Coefficients

D_{90}= 0.6803 D_{85}= 0.3660 D_{60}= 0.0934
D_{50}= 0.0198 D_{30}= 0.0101 D_{15}= 0.0060
D_{10}= 0.0046 C_u= 20.21 C_c= 0.24

Classification

USCS= CL Sandy Lean CLAY AASHTO=

Remarks

Source of Sample: TP 3-02/03 **Depth:** 2.0

Date: 11/18/2019

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

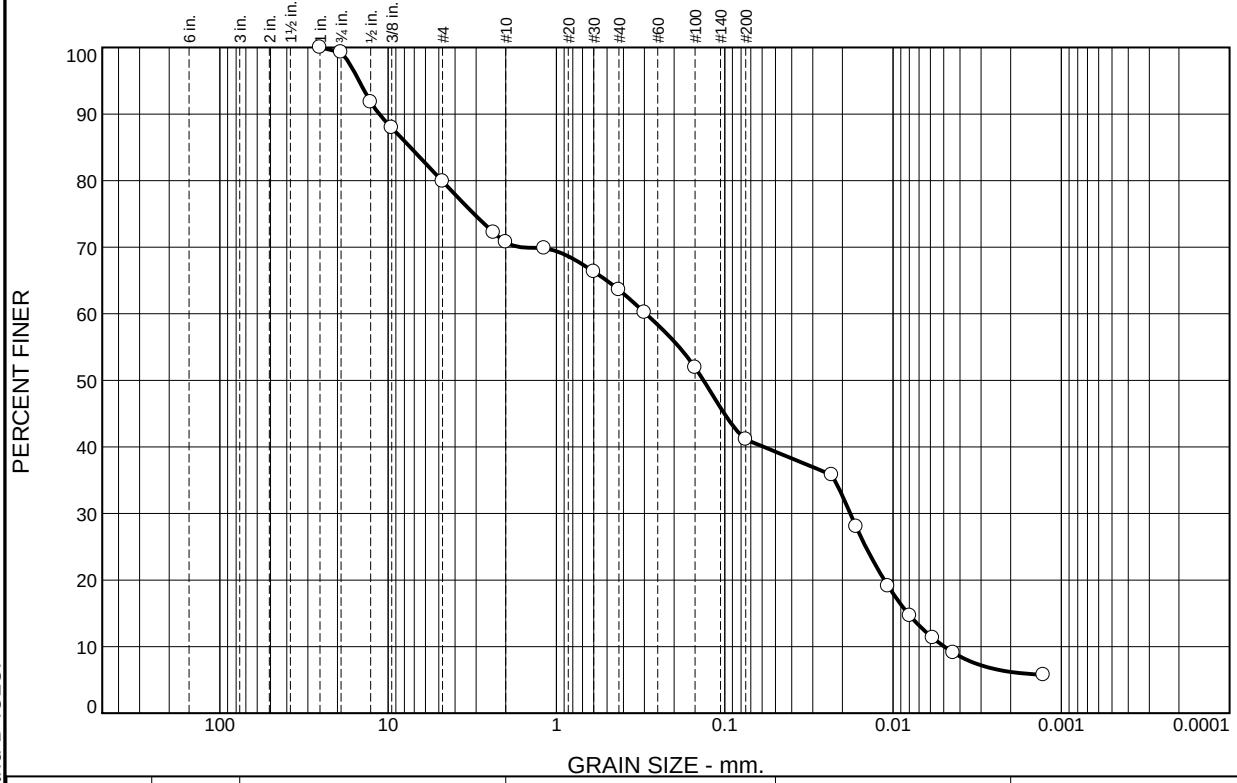
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure**

Tested By: A. Veith **Checked By:** C. Reith

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.7	19.4	9.1	1.4	4.4	6.7	13.4	5.6	6.6	26.5	6.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	99.3		
.5	91.8		
.375	87.9		
#4	79.9		
#8	72.2		
#10	70.8		
#16	69.8		
#30	66.3		
#40	63.6		
#50	60.2		
#100	51.9		
#200	41.1		
0.0231 mm.	35.8		
0.0166 mm.	28.0		
0.0107 mm.	19.1		
0.0079 mm.	14.7		
0.0058 mm.	11.3		
0.0044 mm.	9.1		
0.0013 mm.	5.7		

* (no specification provided)

Soil Description

LOAM (0.521)

Atterberg Limits

PL= LL= PI= NM=

Coefficients

D_{90}= 11.3006 D_{85}= 7.3768 D_{60}= 0.2944
D_{50}= 0.1337 D_{30}= 0.0179 D_{15}= 0.0082
D_{10}= 0.0050 C_u= 59.27 C_c= 0.22

Classification

USCS= Silty SAND (SM) AASHTO=

Remarks

Source of Sample: TP 3-04 **Depth:** 9.0

Date: 11/18/2019

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

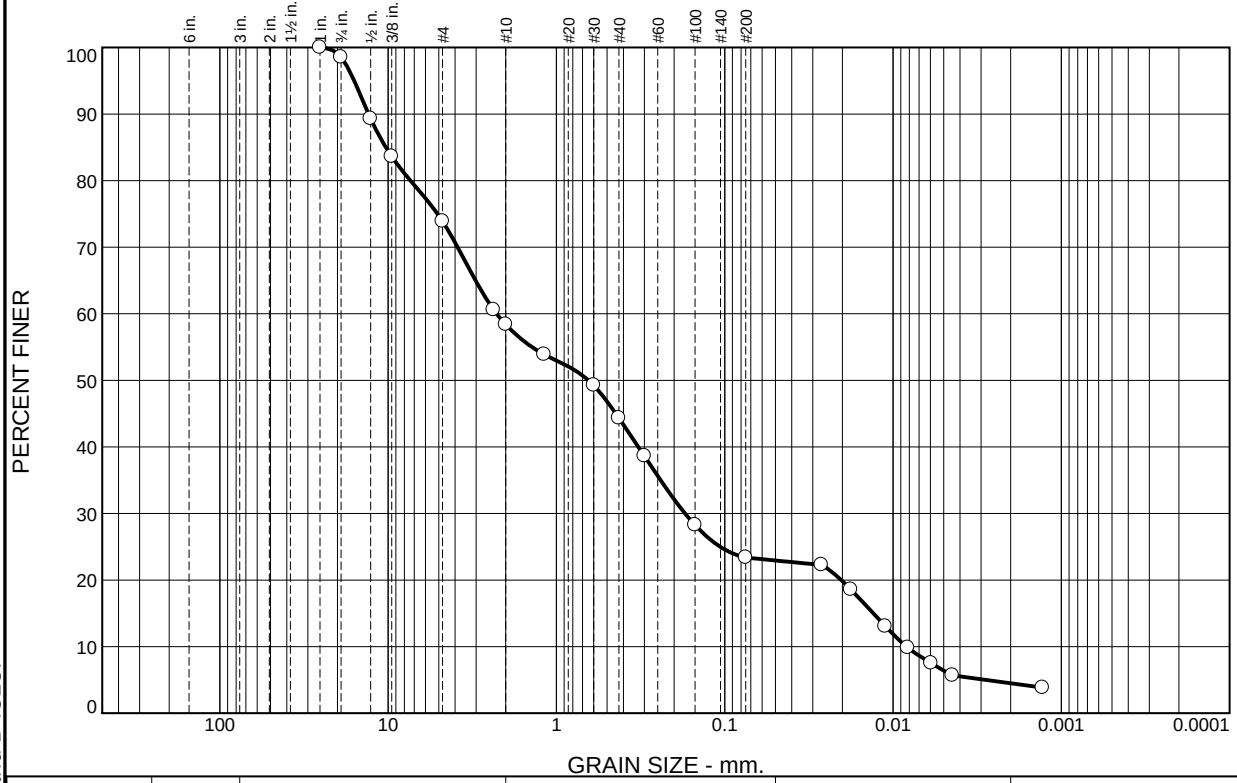
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure**

Tested By: A. Veith **Checked By:** C. Reith

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	1.5	24.6	15.5	5.4	6.2	11.2	11.0	1.7	3.1	15.3	4.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	98.5		
.5	89.3		
.375	83.6		
#4	73.9		
#8	60.6		
#10	58.4		
#16	53.9		
#30	49.2		
#40	44.3		
#50	38.6		
#100	28.2		
#200	23.4		
0.0266 mm.	22.3		
0.0178 mm.	18.6		
0.0111 mm.	13.1		
0.0082 mm.	9.8		
0.0059 mm.	7.5		
0.0044 mm.	5.7		
0.0013 mm.	3.8		

* (no specification provided)

Soil Description

Sandy LOAM (1.02)

Atterberg Limits

PL= LL= PI= NM=

Coefficients

D_{90}= 13.0714 D_{85}= 10.3306 D_{60}= 2.2692
D_{50}= 0.6450 D_{30}= 0.1722 D_{15}= 0.0131
D_{10}= 0.0083 C_u= 272.74 C_c= 1.57

Classification

USCS= Silty SAND (SM) AASHTO=

Remarks

Source of Sample: TP 3-05/06 **Depth:** 10.0

Date: 11/18/2019

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

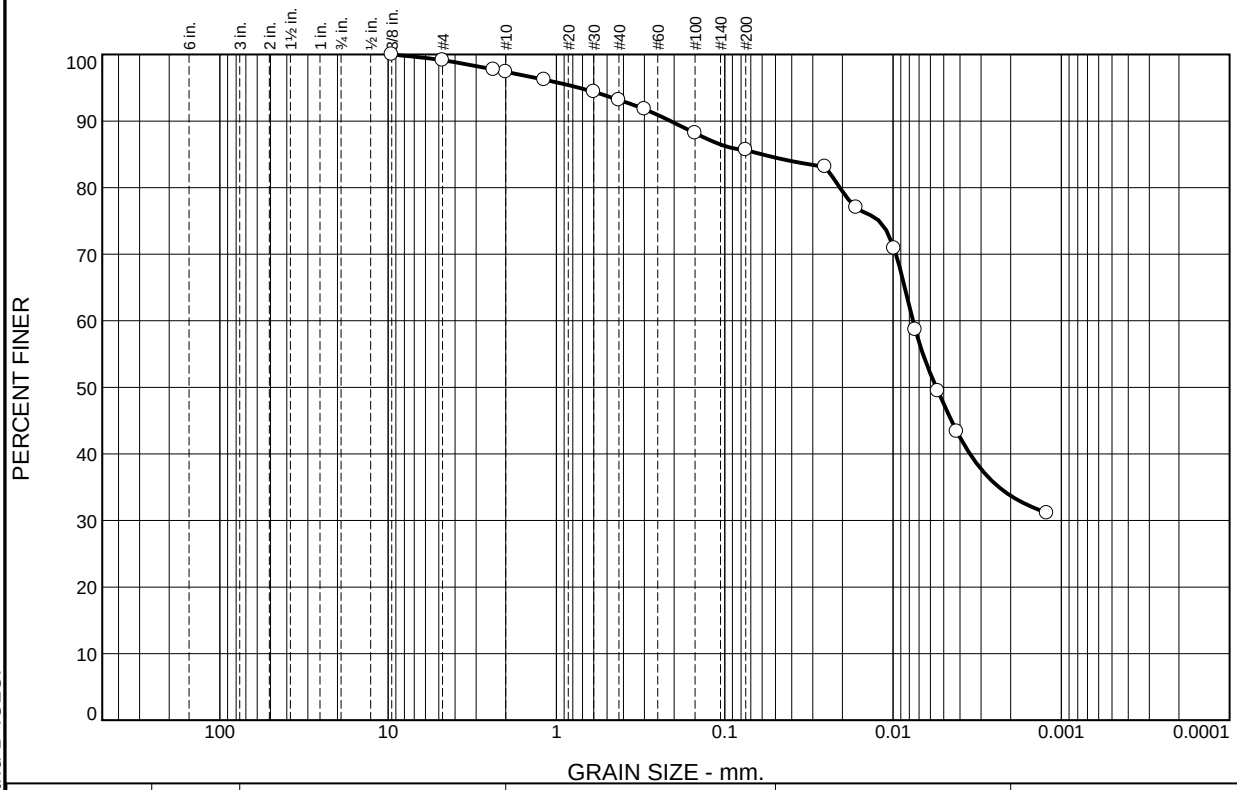
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure**

Tested By: A. Veith **Checked By:** C. Reith

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.0	0.9	1.7	1.6	2.0	2.9	4.6	1.8	5.0	45.8	33.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.1		
#8	97.7		
#10	97.4		
#16	96.2		
#30	94.4		
#40	93.2		
#50	91.8		
#100	88.2		
#200	85.7		
0.0253 mm.	83.1		
0.0166 mm.	77.0		
0.0099 mm.	70.9		
0.0074 mm.	58.7		
0.0054 mm.	49.5		
0.0042 mm.	43.4		
0.0012 mm.	31.1		

* (no specification provided)

Soil Description

Silty CLAY LOAM (0.06)

Atterberg Limits

PL= LL= PI= NM=

Coefficients

D_{90}= 0.2096 D_{85}= 0.0601 D_{60}= 0.0076
D_{50}= 0.0055 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= Lean CLAY (CL) AASHTO=

Remarks

Source of Sample: TP 3-09/10 **Depth:** 3.0

Date: 11/18/2019

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

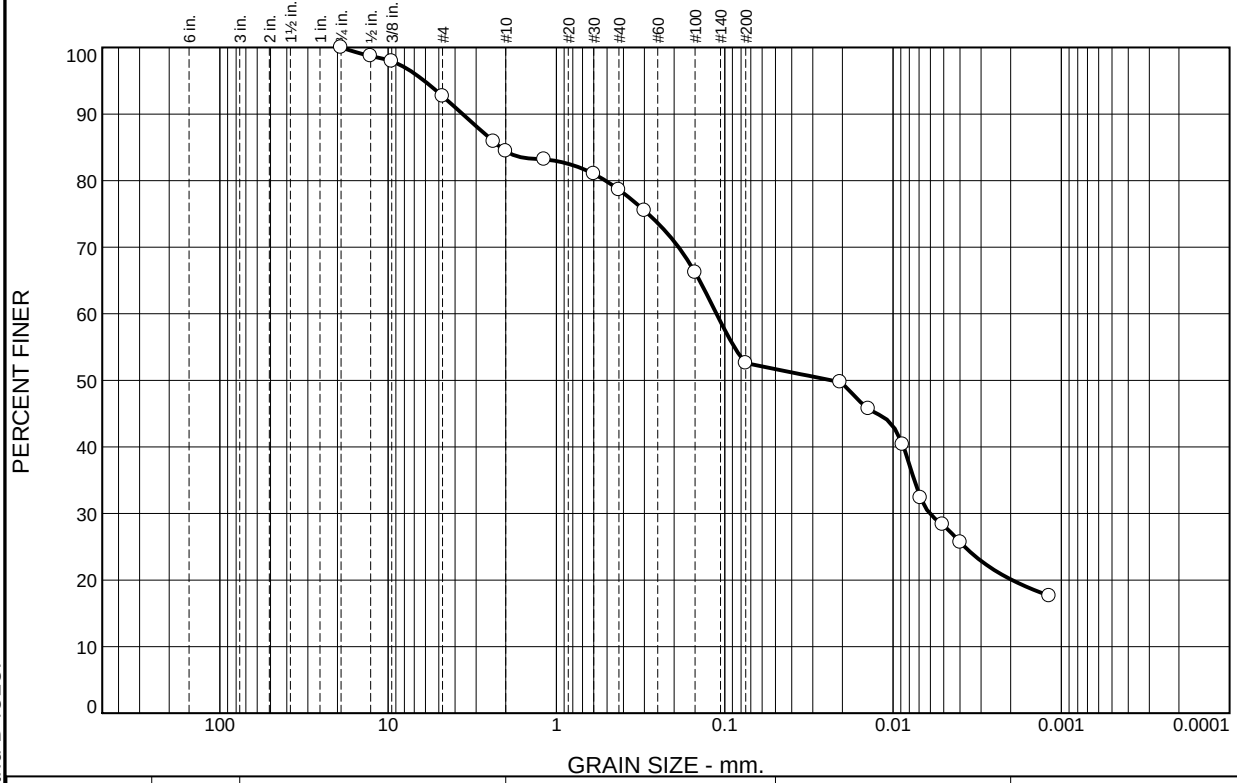
Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure**

Tested By: A. Veith **Checked By:** C. Reith

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.0	7.3	8.3	1.5	3.0	6.3	16.0	5.9	2.2	29.4	20.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.50	98.7		
.375	97.9		
#4	92.7		
#8	85.9		
#10	84.4		
#16	83.2		
#30	81.0		
#40	78.6		
#50	75.5		
#100	66.2		
#200	52.6		
0.0206 mm.	49.7		
0.0140 mm.	45.7		
0.0088 mm.	40.4		
0.0069 mm.	32.3		
0.0051 mm.	28.3		
0.0040 mm.	25.7		
0.0012 mm.	17.6		

* (no specification provided)

Soil Description

LOAM (0.52)

Atterberg Limits

PL= LL= PI= NM=

Coefficients

D_{90}= 3.6041 D_{85}= 2.1485 D_{60}= 0.1120
D_{50}= 0.0232 D_{30}= 0.0061 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= Sandy SILT (ML) AASHTO=

Remarks

Source of Sample: TP 3-11 **Depth:** 6.0

Date: 11/18/2019

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

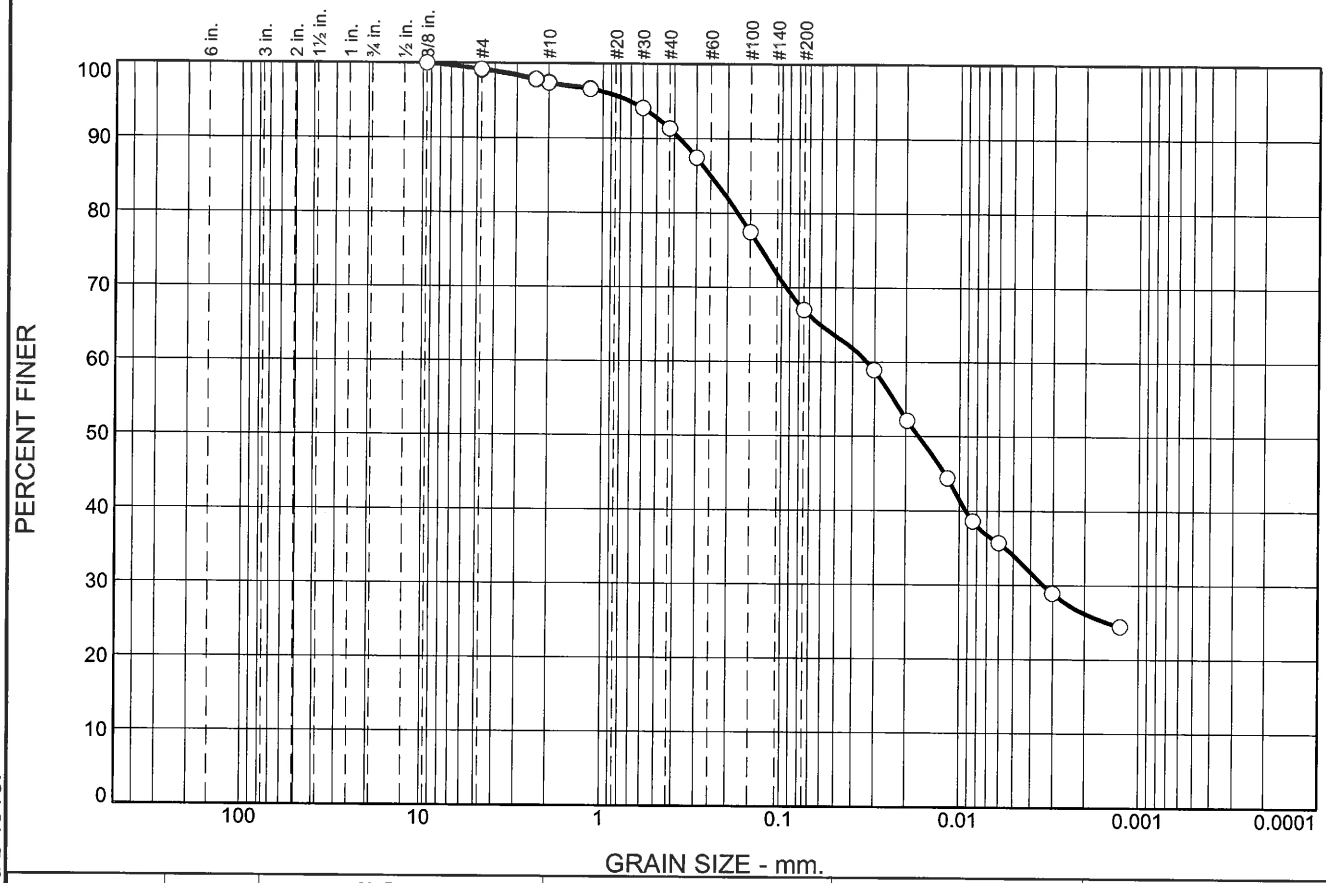
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure**

Tested By: A. Veith **Checked By:** C. Reith

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.0	0.8	1.8	1.1	3.5	7.7	14.2	7.3	11.2	26.2	26.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.2		
#8	97.9		
#10	97.4		
#16	96.6		
#30	94.1		
#40	91.4		
#50	87.5		
#100	77.5		
#200	67.0		
0.0303 mm.	58.9		
0.0197 mm.	52.1		
0.0117 mm.	44.4		
0.0084 mm.	38.6		
0.0060 mm.	35.7		
0.0030 mm.	28.9		
0.0013 mm.	24.4		

* (no specification provided)

Soil Description

USDA Classification: Loam

Atterberg Limits

PL= LL= PI= NM= 27.4

Coefficients

D_{90}= 0.3719 D_{85}= 0.2487 D_{60}= 0.0331
D_{50}= 0.0170 D_{30}= 0.0034 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: TP4-01 **Depth:** 2.0

Date: 1/23/2020

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

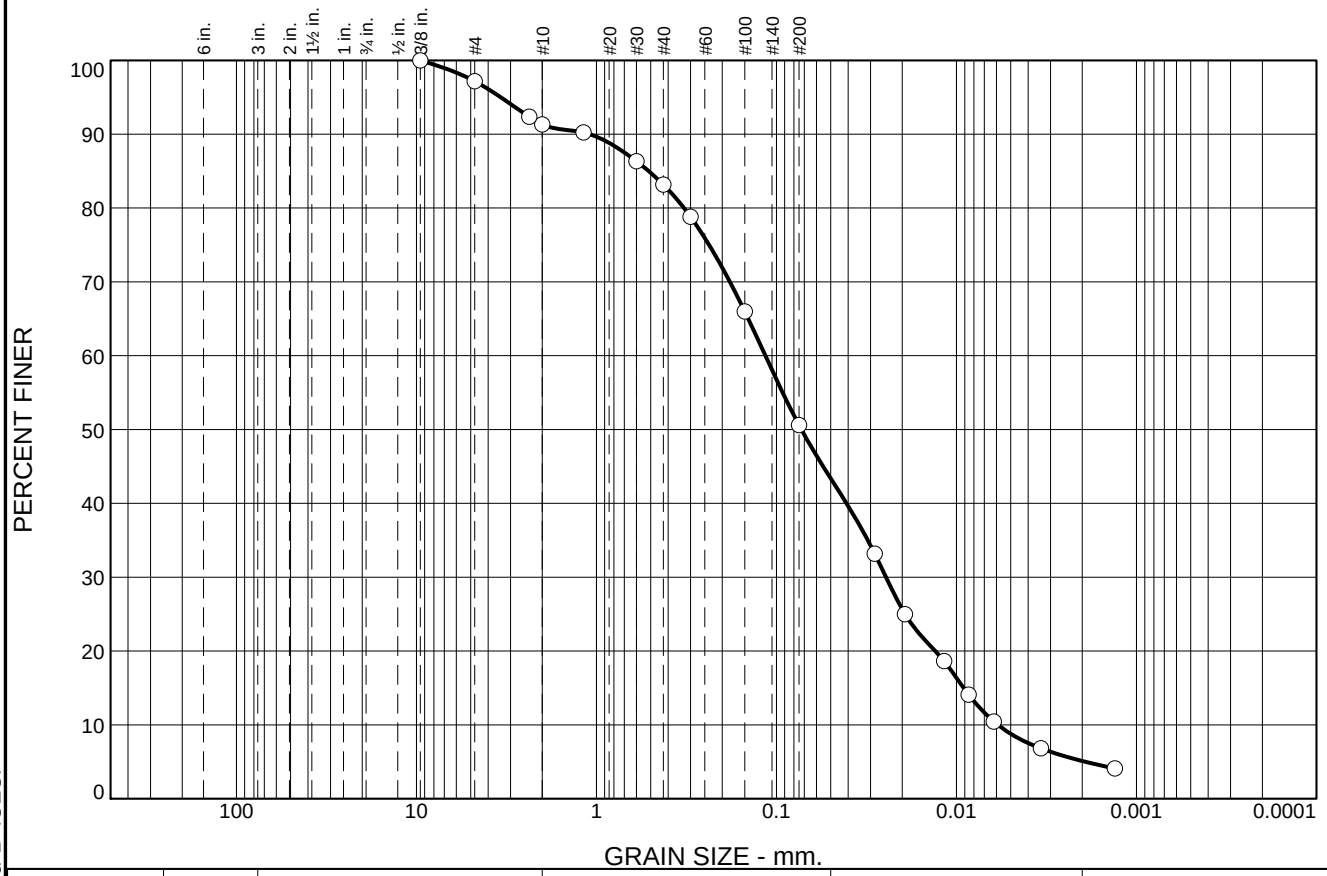
Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure**

Tested By: A. Veith **Checked By:** C. Reith

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.0	2.8	5.9	1.6	4.9	8.9	19.1	13.4	17.8	20.5	5.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	97.2		
#8	92.4		
#10	91.3		
#16	90.2		
#30	86.3		
#40	83.2		
#50	78.8		
#100	66.0		
#200	50.6		
0.0284 mm.	33.2		
0.0193 mm.	25.0		
0.0117 mm.	18.6		
0.0086 mm.	14.1		
0.0062 mm.	10.5		
0.0034 mm.	6.8		
0.0013 mm.	4.1		

* (no specification provided)

Source of Sample: TP4-05

Soil Description

USDA Classification: Sandy Loam

Atterberg Limits

PL= LL= PI= NM= 20.3

Coefficients

D_{90}= 1.0865 D_{85}= 0.5127 D_{60}= 0.1152
D_{50}= 0.0728 D_{30}= 0.0246 D_{15}= 0.0091
D_{10}= 0.0059 C_u= 19.56 C_c= 0.89

Classification

USCS= AASHTO=

Remarks

Date: 1/24/2020

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Toll Brothers, Inc.
Project: Crebilly Farm

Project No: 161348 **Figure**

Tested By: A. Veith **Checked By:** C. Reith

Particle Size Distribution Report

% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.0	2.6	4.8	9.1	11.2	12.5	12.6	19.8	15.5	6.8	5.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	99.4		
#4	97.4		
#8	93.6		
#10	92.6		
#16	86.1		
#30	75.2		
#40	69.7		
#50	63.4		
#100	51.1		
#200	42.1		
0.0335 mm.	14.7		
0.0217 mm.	12.1		
0.0129 mm.	9.4		
0.0092 mm.	7.5		
0.0065 mm.	7.5		
0.0032 mm.	5.6		
0.0014 mm.	4.8		

* (no specification provided)

Soil Description

USDA Classifiaction - Sandy LOAM
T88 Textural Analysis -
% Sand: 55.3 % Silt: 35.1 % Clay: 7.0

Atterberg Limits

PL= NP LL= NP PI= NP NM= 10.8

Coefficients

D_{90}= 1.5553 D_{85}= 1.1018 D_{60}= 0.2527
D_{50}= 0.1350 D_{30}= 0.0533 D_{15}= 0.0341
D_{10}= 0.0139 C_u= 18.17 C_c= 0.81

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Source of Sample: TP-05-03, 5 ft

Date: 7/31/2020

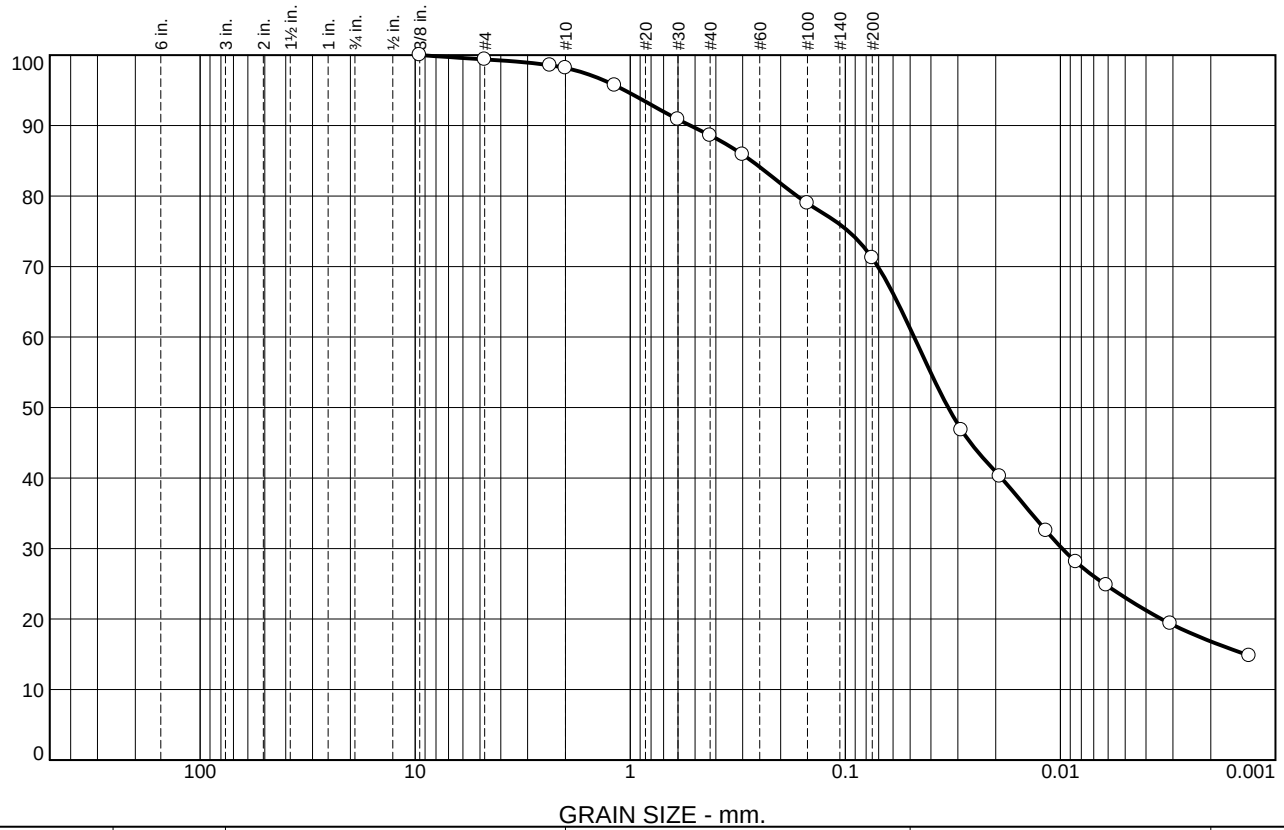
ASTM Specifications performed may include: D421, D422, D2216, D2217, and D4318.

GEO-TECHNOLOGY ASSOCIATES, INC.
3445-A Box Hill Corporate Center Drive
Abingdon, MD 21009

Client: Toll Brothers
Project: Crebilly Farm
Project No: 31161348 **Figure**

Tested By: W. Pinder **Checked By:** E. Church

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.0	0.6	1.2	3.6	4.9	5.6	8.7	14.2	20.3	24.1	16.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.4		
#8	98.6		
#10	98.2		
#16	95.7		
#30	90.9		
#40	88.6		
#50	85.9		
#100	79.0		
#200	71.2		
0.0289 mm.	46.8		
0.0191 mm.	40.3		
0.0117 mm.	32.5		
0.0085 mm.	28.1		
0.0061 mm.	24.8		
0.0031 mm.	19.3		
0.0013 mm.	14.8		

* (no specification provided)

Source of Sample: TP-05-05, 5 ft

Soil Description

USDA Classification - LOAM
T88 Textural Analysis -
% Sand: 28.2 % Silt: 48.2 % Clay: 23.0

Atterberg Limits

PL= 28 LL= 38 PI= 10 NM= 22.3

Coefficients

D_{90}= 0.5257 D_{85}= 0.2732 D_{60}= 0.0479
D_{50}= 0.0332 D_{30}= 0.0098 D_{15}= 0.0014
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(7)

Remarks

Date: 7/31/2020

GEO-TECHNOLOGY ASSOCIATES, INC.
3445-A Box Hill Corporate Center Drive
Abingdon, MD 21009

Client: Toll Brothers
Project: Crebilly Farm
Project No: 31161348 **Figure**

Tested By: W. Pinder **Checked By:** E. Church

ASTM Specifications performed may include: D421, D422, D2216, D2217, and D4318.

Drainage Area Plans

8