STORMWATER MANAGEMENT REPORT

PRINCETON EXECUTIVE PARK

Phase 1

BLOCK 9, LOTS 12.01 & 12.02, BLOCK 9.03, LOTS 12.02
TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NJ

Dated: January 15, 2020
Revised: March 16, 2020

Prepared by:
(BCG #080136-F3-001)

303 West Main Street
Freehold, NJ 07728
NJ Certificate of Authorization 24GA280443700

R. Michael McKenna
New Jersey Professional Engineer
License No. 24GE02590400

TABLE OF CONTENTS

LIST OF APPENDICES

No. 1: GENERAL DESIGN INFORMATION AND CALCULATIONS

- **Storm Sewer Design Calculations 25 and 100-year**
- **Typical Swale Calculations**
- **Groundwater Recharge Analysis**
- **New Jersey 24 Hour Rainfall Frequency Data**
- **Web Soils Survey of Site Hydrologic Soil Groups**
- **GTA Stormwater Management Testing Report**

No. 2: TR-55 CALCULATIONS – EXISTING CONDITIONS

No. 3: TR-55 CALCULATIONS – PROPOSED CONDITIONS

No. 4: DRAINAGE AREA MAPS

I. INTRODUCTION

The purpose of this report is to provide supplemental documentation demonstrating the proposed Phase 1 improvements meet applicable regulatory requirements.

This report has been prepared in conjunction with the overall stormwater management report for the project to describe and document (through engineering calculations and related technical data) the stormwater management system design for Phase 1, which is approximately 7.6 acres of the total mix-use development proposed on block 9, lots 12.01 & 12.02 and block 9.03, lots 12.02 in the Township of West Windsor, New Jersey, consisting of 47+/- acres. The Phase 1 portion consists of the hotel site and basin 1.

This report accompanies a set of plans prepared by Bowman Consulting Group, LTD, which illustrates the existing and proposed conditions upon the subject property, as well as provides details for the various stormwater management facilities described herein. Therefore, this report must be reviewed and considered in conjunction with these plans.

A. Location of Project Site

As described in the overall stormwater management report for the full project build out, the development site is divided by Meadow Road. The northly portion of the site is bound by Meadow Road, Route 1 and onramp to the west, Carnegie Center Drive to the north and east. The southerly portion is bound by Meadow Road, Old Meadow Road and Wooded areas to the east. Phase 1 is the northwesterly portion of the site fronting Route 1.

Table No. 1 below summarizes the soil type and “Hydrologic Soil Group” for the soil type per the *Web Soil Survey*.

TABLE 1
SUMMARY OF ON-SITE SOILS

Mapping Identification	Soil Type	Hydrologic Soils Group (HSG)
GafB	Galloway sandy loam 0-5% slopes	A

None of the soils listed in Table No. 1 above are classified as “acid producing soils,” nor is the project site located in an area of the State where acid producing soils are commonly encountered. Therefore, the on-site soils are not considered “acid-producing.”

B. Project Description

As described in the overall stormwater management report for the full project build out, the proposed project consists of mixed-use residential apartment units, hotel site, and commercial and retail pad sites. Amenities such as two clubhouses and active/passive recreational facilities are also proposed.

Stormwater for Phase 1 discharges towards the existing culverts on the northerly side of Meadow Road. Basin 1 provides the required detention to meet post development discharge reduction requirements as well as achieving water quality prior to discharge for the phased development. Basin 1 is an extended detention basin with a sand bottom strip to facilitate groundwater recharge.

II. OVERVIEW OF REGULATORY REQUIREMENTS

The storm water management system for the proposed project will be designed to comply with current regulatory requirements and standards. The applicable regulations and standards are as follows:

- The State of New Jersey's *"Stormwater Management Rules*", as set forth at NJAC 7:8
- Residential Site Improvement Standards, NJAC 5:21
- The Stormwater Management requirements of the County and Township
- The "*Standards for Soil Erosion and Sediment Control in New Jersey*"

Compliance with each of the above-referenced standards necessitates the preparation of a storm water management plan and design that addresses multiple considerations with respect to controlling and managing post-development storm water runoff. These considerations are as follows:

- Use of Non-Structural Strategies to the maximum extent practicable
- Maintenance of average annual groundwater recharge volume
- Compliance with applicable Water Quality Management Standards
- "Quantity Control," achieved through peak flow attenuation
- Minimization of erosion and sedimentation
- Providing an effective collection and conveyance system
- Assuring effective operation and perpetual maintenance for the system

The remainder of this report will detail the manner in which the project's stormwater management design will address each of the above considerations, except for the requirement relevant to maintenance. The maintenance requirements are to be addressed in a separate Operations and Maintenance document.

The Appendices of this report contain engineering calculations and related technical documentation supporting the project's design as described herein.

III. METHODOLOGIES

This section of this report describes the engineering methodologies employed for the design of the project's storm water management system. All of the methods are specifically referenced in the applicable regulations and/or in one or more of the "References" listed in Section VIII of this report. Most of the methods are specified and/or detailed in *The New Jersey Stormwater Best Management Practices Manual*, hereinafter referred to as "the BMP Manual." Specifically, the various methods used in the preparation of the project's plans and stormwater management design to address each of the multiple considerations described above were as follows:

A. Estimates of Runoff Rates and Volumes

1. Pre-Development versus Post-Development

The hydrologic estimates and modeling conducted for the design of project's storm water management system utilized the "NRCS Methodology" which is specifically referenced for such applications in the BMP Manual. This method is also commonly known as the "TR-55 Method." Storm frequencies of 2, 10 and 100-years were modeled, as required to demonstrate compliance with the "quantity control" provisions of the subject Rules. The models were created using the SCS Type III, 24-hour rainfall distribution with the Standard unit hydrograph, also consistent with the guidance provided in the BMP Manual. According to data published by the State Office of the Natural Resources Conservation Service (copy provided in **Appendix No. 1**), the 24-hour rainfall depths for the County's storm frequencies modeled are as follows:

- 2-year = 3.31 inches
- 10-year = 5.01 inches
- 100-year = 8.33 inches

2. Runoff Curve Numbers and Times of Concentration

As indicated in Subsection I-A of this report, the soils within the project site have been determined to be categorized within "Hydrologic Soil Group" A (HSG-A) based upon the geotechnical subsurface investigation. Copies of relevant information obtained from the above referenced soil survey and various Soil Conservation Service (SCS) technical publications pertaining to the soils mapping and HSG determination(s) are provided in **Appendix No. 1** of this report. Accordingly, the following CN values have been employed for the various existing and proposed combinations of soil types and land cover:

Impervious Surface	98
Crop Rows (C&T)	62
Wooded Areas (w/ grass)	32
Open Space	39

Appendix No. 1 also contains documentation from SCS publications relevant to the above values.

In addition to CN values, the above referenced NRCS Methodology for estimating stormwater runoff rates and volumes also necessitates the determination of a time of concentration for each subwatershed/drainage area. The times of concentration were estimated in accordance with the criteria given in the SCS 1986 TR-55 publication using 6 minute (0.10 hour) minimum Tc.

3. Weighted Average Volume Technique

Under proposed conditions, several of the subwatershed areas considered in the analyses include a significant quantity of "directly connected" impervious surfaces. As stated in the BMP Manual, due to the non-linear character of the runoff equations inherent in the TR-55 methodology, variations in cover conditions are not always accurately reflected by calculating a weighted average CN value for the entire subwatershed. Rather, a procedure termed the "weighted average volume technique" was presented and recommended in the BMP Manual for such subwatershed areas. Many of the post-development subwatershed areas considered in the design of the project's stormwater management system utilized the weighted average volume technique. In such cases, two hydrographs (one representing the directly connected impervious acreage within the area and the other representing the remaining acreage) were developed for the subwatershed. The hydrograph representing the impervious area was given the suffix "IMP" for identification. The hydrograph representing the remainder of the area was assigned the suffix "PERV". Section V of this report identifies the subwatershed areas considered on a weighted average volume basis.

4. Collection and Conveyance System Design

The project's collection and conveyance system design is based upon a 25-year storm event. The proposed storm sewer system has also been analyzed under 100-year conditions to ensure runoff from larger storms will be collected and attenuated by the proposed stormwater management basins. In no case does the 100-year hydraulic grade line exceed a catch basin's grate elevation which would result in a flooded condition.

B. Water Quality Management

The project's Water Quality Management design will be based upon a 1.25-inch rainfall, having a two-hour distribution as specified on Figure 5-2 of the BMP Manual.

As described in detail in Section V below, compliance with the regulatory requirement for removing total suspended solids (TSS) from the post-project runoff for Phase 1 will be achieved through Basin 1 infiltrating the entire water quality storm runoff volume to achieve the 80% TSS removal rate required for the project.

IV. EXISTING SITE CONDITIONS AND STORMWATER RUNOFF ESTIMATES

The following is a description of the Drainage Areas (DA) and Analysis Point (AP) depicted on the accompanying drainage area maps in order to evaluate the change existing and proposed conditions for Phase 1.

Existing Drainage Area to Analysis Point 1

Phase 1 discharges to the existing culverts on the northerly side of Meadow Road, which is the analysis point for Phase 1.

A summary of the Existing Weighted CN number and time of concentration is

TABLE 2

EX. Drainage Area	Area (Ac.)	Weighted CN	Tc (hour)
X-1 perv	7.6	59	1.0

The path used to estimate the time of concentration for the watershed is also illustrated on the subject Drainage Area Map. The calculations for the time of concentration, weighted CN value and peak runoff rates for the areas under existing conditions are provided in **Appendix No. 2.**

The peak rates of runoff for each of the storms studied are summarized in Table No. 3 below.

TABLE 3		
SUMMARY OF EXISTING PEAK RUNOFF RATES		
Analysis Point	**Storm Frequency (Years)**	**Peak Rate of Runoff (cfs)**
AP-1	2	0.94
	10	3.74
	100	11.73

V. DESCRIPTION OF PROPOSED CONDITIONS

The following is a description of the Drainage Areas (DA) and Analysis Points (AP) depicted on the accompanying drainage area maps.

Proposed Drainage Area P-1 Phase 1

Approximately 5.5 acres of the proposed impervious cover and 2.1 acres of open space will be collected by the proposed on-site storm sewer system and directed to Basin 1 for attenuation and water quality treatment.

A summary of the Proposed CN number and time of concentration is:

TABLE 4

Proposed Drainage Area	Area (Ac.)	CN	Tc (hour)
P1-IMP	5.5	98	0.1
P1-PERV	2.1	39	0.1

Water Quality Treatment

As required by the State's Stormwater Management Rules, eighty percent (80%) removal of total suspended solids (TSS) from the project's runoff during the water quality design storm is required. This will be achieved through Basin 1 infiltrating the entire water quality storm runoff volume to achieve the requirement for 80% TSS removal for Phase 1.

VI. COMPLIANCE WITH STORMWATER MANAGEMENT RULES

This section of this report is intended to demonstrate that the stormwater management system designed for the project, as above described, is compliant with all of the regulatory requirements pursuant to the applicable Rules. The various considerations relevant to the design of the system were listed in Section II of this report. To reiterate, these considerations are as follows:

- Use of Non-Structural Strategies to the maximum extent practicable
- Maintenance of average annual groundwater recharge volume
- Compliance with applicable Water Quality Management Standards
- "Quantity Control," achieved through peak flow attenuation
- Providing an effective collection and conveyance system
- Assuring minimization of erosion and sedimentation
- Providing for proper maintenance of the system

Except for the requirement relevant to the maintenance of the proposed system, this section of this report will address each of the above considerations with respect

to complying with the applicable rules and standards. As indicated above, the requirement relevant to system maintenance will be addressed in a separate report.

1. Use of Non-Structural Strategies

In accordance with N.J.A.C. 7:8-5.3 Nonstructural Stormwater Management Strategies, each design shall to the maximum extent possible incorporate nonstructural stormwater strategies to meet the stormwater runoff quantity, quality, and groundwater recharge requirements of the Stormwater Management Regulations. In order to determine if the proposed nonstructural strategies are sufficient for a development, the nine nonstructural strategies identified in both N.J.A.C. 7:8-5.3 and the New Jersey Stormwater Best Management Practices Manual are to be addressed. The nine strategies are identified below with a discussion of how each strategy has been incorporated into the proposed design.

1. *Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.*

Areas previously disturbed by the farming activity will be re-vegetated. Mature treed areas of the site will be preserved to the extent practical to facilitate the development.

2. *Minimize Impervious Surfaces and break up or disconnect the flow of runoff over impervious surfaces.*

Impervious surfaces will be minimized to the extent practical for this type of development. Where possible, grassed areas will be used for stormwater conveyance to the on-site stormwater facilities. This enhances water quality, promotes groundwater recharge and increases time of concentration ultimately reducing runoff from the project.

3. *Maximize the protection of natural drainage features and vegetation.*

Previously disturbed portions of the site will be replanted. Mature treed areas on site will remain undisturbed. Stormwater will be directed way from steeper slope areas where there is an increased potential for erosion.

4. *Minimize the decrease in the pre-construction "time of concentration."*

The proposed detention basin will over detain stormwater pursuant to the drainage deficiencies downstream. This will decrease the pre-construction time of concentration to the maximum extent practical. It also enhances water quality and promotes groundwater recharge for the project.

5. *Minimize land disturbance including clearing and grading.*

All land disturbances will primarily be limited to the previously disturbed portions of the site from the prior farming activity. Existing slope and contour

of the property was maintained to the maximum extent practical to reduce the grading required.

6. *Minimize soil compaction.*

Soil compaction will be minimized to the extent practical for this project. No excessive soil compaction is proposed. It is understood that soil compaction is required for areas of proposed structures consisting of roadways, buildings, driveways and sidewalks. The construction of the basin bottom is to be performed using lightweight compaction equipment to promote the infiltration and recharge of stormwater into the on-site soils.

7. *Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.*

Plantings are low maintenance species. The amount of lawn space has been limited as much as possible which will reduce fertilizer and pesticide use on the site.

8. *Provided vegetated open-channel conveyance systems discharging into and through stable vegetated areas.*

The construction of vegetated open-channel conveyance systems will be provided to the maximum extent practical. The use of vegetated open-channel conveyance systems however is limited due to the requirement of installing curbs and sidewalks.

9. *Provide other preventative source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff. These source controls include, but are not limited to:*

    a. *Site design features that help to prevent the accumulation of trash and debris in drainage systems;*

    b. *Site design features that help prevent discharge of trash and debris from drainage systems;*

    c. *Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and*

    d. *When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and implementing rules.*

The stormwater management facilities proposed will result in the removal of 80% total suspended solids for the stormwater runoff discharge from the site.

Preventative source controls provided include NJPDES Phase II inlet curb pieces proposed to be installed on all Type B inlets. The curb piece proposed is a Type "J-eco" curb piece as manufactured by Campbell Foundry. This curb piece will prevent trash and debris from entering the storm drainage system.

Within the onsite basin, conduit outlet protection will be provided to capture trash and debris that does discharge into the inlets and is conveyed to the basins. The basin is designed with a sand bottom where applicable to aid in the maintenance of the facility and the removal of any accumulated trash and debris.

The site requires approval from the Soil Conservation District for Soil Erosion and Sediment Control Plan Certification. Upon disturbance of the land, the site shall be vegetated in accordance with the Soil Erosion Standards of New Jersey and the approved Soil Erosion and Sediment Control Plan for the project. In addition, the site will disturb greater than one acre and require a 5G3 Construction Activity Stormwater (GP) NJPDES permit and the preparation of a Stormwater Pollution Prevention Plan (SWPPP) for the project.

The proposed design of the site has incorporated to the maximum extent possible nonstructural stormwater strategies on-site and therefore meets the intent of the regulation.

2. Maintenance of Average Annual Groundwater Recharge

The soils encountered on site are classified Hydrologic Soils Group A (HSG-A) and are highly suitable for groundwater recharge. Per the GSR-32 spreadsheet, the post-development annual recharge deficit for Phase 1 is 284,201 cubic feet for the post-development site conditions as compared to existing conditions. As a result, basin 1 is provided with sand bottom to facilitate infiltration in order to achieve or exceed the groundwater recharge deficit. The following is a summary of the annual BMP recharge volume provided by the proposed recharge basin:

Basin	Recharge Volume (cf)
1	481,318 (phase 1 conditions)

As a result, the post-development conditions will provide more groundwater recharge than required based on pre-developed conditions maximizing on site recharge as much as practical. Also, in accordance with the BMP rules, the recharge basin is sized so it will fully drain within 72 hours and the bottom of the 6" thick sand filter layer is at least 2' above seasonal high groundwater.

3. Water Quality Management

As previously stated, the regulatory requirement for removing total suspended solids (TSS) from the post-project runoff will be achieved through infiltrating the water quality storm runoff volume in Basin 1 to achieve the 80% TSS removal rate required for the project.

4. Quantity Control (Peak Flow Attenuation)

The project's approach for compliance with the regulatory requirements for "quantity control" are set forth at Subpart 5.4(a)(3)(iii) of the Stormwater Management Regulations (NJAC 7:8). Stormwater management facilities have been designed to provide for the temporary storage of stormwater to attenuate post-project construction peak runoff rates for the 2, 10 and 100-year storm events. As explained in detail below, the stormwater management facilities provide sufficient attenuation to reduce the peak rates of runoff from the developed portion of the project tract by (at least) a reduction factor of 50% for the 2-year storm, 75% for the 10-year storm and 80% for the 100-year storm pursuant to the specific requirements of Subpart 5.4(a)(3)(iii) and without infiltration.

TABLE 7
SUMMARY OF PEAK RUNOFF RATES at ANALYSIS POINT 1

Storm Frequency (yrs)	Existing Peak Rate (cfs)	Reduction Factor	Allowable Peak Rate (cfs)	Proposed Peak Rate (cfs)
2	0.94	50%	0.47	0.29
10	3.74	75%	2.80	1.86
100	11.73	80%	9.38	8.93

The TR55 calculations for post-project conditions are provided in **Appendix No. 3.** The following table identifies the performance summaries of the detention basin:

Table 8.1

Performance Summary of Basin 1 – Phase 1 Conditions

Storm Freq. (yrs)	Peak Inflow (cfs)	Peak Outflow (cfs)	Maximum Storage Peak	
			Volume (ac-ft)	Elevation (ft)
2	13.30	0.37	1.23	71.87
10	20.28	2.61	1.52	72.16
100	35.84	18.74	2.27	72.93

5. Soil Erosion and Sediment Control Compliance

The project has been designed to minimize erosion and sedimentation in accordance with *The Standards for Soil Erosion and Sediment Control in New Jersey*" "Soil Erosion and Sediment Control Plan" is included in the set of project plans, specifying numerous practices to achieve this goal. The project's "Soil Erosion and Sediment Control Plan" is subject to review and approval by the County Soil Conservation District. The District's certification of the plan is required before any construction may commence, which provides further assurance that the project's implementation will minimize erosion and sedimentation.

In addition to the above referenced construction practice, the project's stormwater management system has also been designed consistent with the subject standards. In particular, the stormwater management system has been designed compliant with the standards for off-site stability per the information provided in Tables 7 and 8.

6. Collection and Conveyance System Design

The project's storm water management system includes a network of storm sewer pipes to convey the stormwater runoff to and from the various management facilities. Similarly, stormwater inlets are strategically located to collect runoff from the surface of the ground. The collection and conveyance system are designed for the peak rate of runoff during a 25-year storm for the full buildout. The system was also analyzed under 100-yr storm conditions which result in non-flooding conditions for pipe sections that exceeded gravity flow capacity. Calculations are provided in **Appendix No. 1**

VII. Summary and Conclusions

This report has described the design of the stormwater management system proposed for Phase 1 of the project, as illustrated on the project's Site Plans. The stormwater facilities proposed will comply with quantity control requirements of reducing the peak rate by 50% for the 2-year storm, 75% for the 10-year storm and 80% for the 100-year storm for at Analysis Point. Water Quality treatment of stormwater runoff from the project results in 80% TSS removal.

This report also identified the regulatory requirements pertaining to the system's design and, as supported by the engineering calculations and related technical data contained in the appendices of this report, documenting the system's compliance with the regulatory requirements.

As a result, the project will have minimal impacts to the surrounding areas.

VIII. REFERENCES

The following documents were relied upon during the preparation of the project's stormwater management plan:

1. New Jersey Stormwater Best Management Practices Manual, New Jersey Department of Environmental Protection; April 2004 (Revised November, 2009).

2. Residential Site Improvement Standards, New Jersey Administrative Code Title 5, Chapter 21; Adopted January 6, 1997; Revised June 4, 2007.

3. Standards for Soil Erosion and Sediment Control in New Jersey, New Jersey State Soil Conservation Committee; Adopted July 1999.

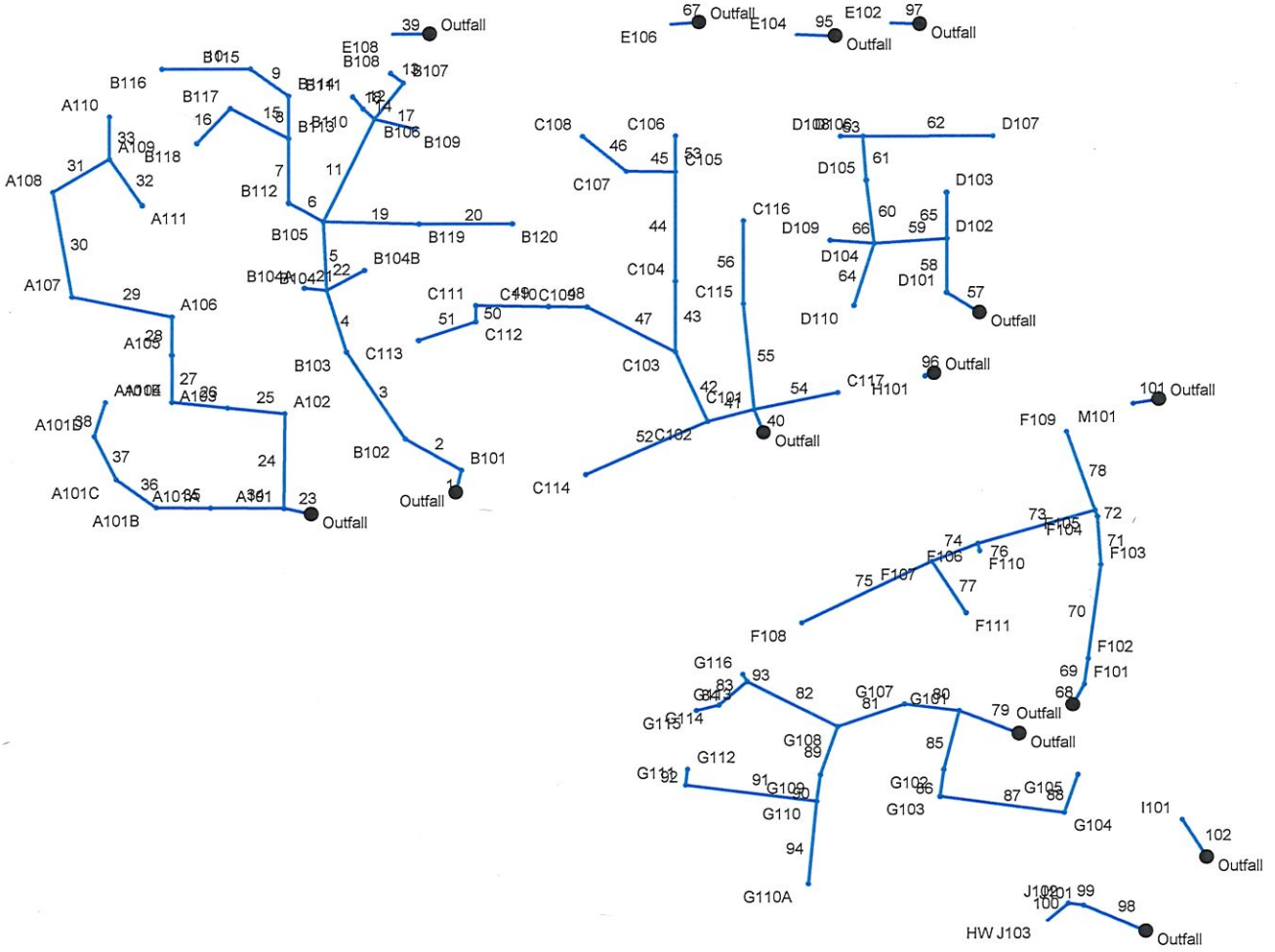
4. Urban Hydrology for Small Watersheds, United States Department of Agriculture, Soil Conservation Service; June 1986.

5. Soil Survey of Somerset County, United States Department of Agriculture, Soil Conservation Service, December 1976.

APPENDIX NO. 1
GENERAL DESIGN INFORMATION

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan

25-YR



Project File: master pipe network - 01-15-20.stm	Number of lines: 102	Date: 1/14/2020

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	35.000	0.32	5.57	0.90	0.29	5.01	10.0	19.4	4.9	24.32	29.91	5.36	36	0.17	70.00	70.06	71.81	71.92	72.86	74.00	B101-100
2	1	98.092	0.39	5.25	0.90	0.35	4.72	10.0	19.0	4.9	23.19	33.43	4.13	36	0.21	70.06	70.27	72.34	72.44	74.00	74.00	B102-101
3	2	161.000	0.00	4.86	0.90	0.00	4.37	10.0	18.2	5.0	21.91	31.19	3.89	36	0.19	70.27	70.57	72.58	72.73	74.00	75.30	B103-102
4	3	100.451	0.30	4.86	0.90	0.27	4.37	10.0	17.7	5.1	22.19	32.24	4.02	36	0.20	70.57	70.77	72.81	72.91	75.30	74.60	B104-103
5	4	106.221	0.21	3.88	0.90	0.19	3.49	10.0	17.3	5.1	17.92	26.22	3.85	30	0.35	70.77	71.14	73.17	73.29	74.60	74.50	B105-104
6	5	60.415	0.47	1.44	0.90	0.42	1.30	10.0	16.9	5.2	6.73	14.45	2.14	24	0.35	71.14	71.35	73.54	73.58	74.50	74.70	B112-105
7	6	99.113	0.12	0.97	0.90	0.11	0.87	10.0	16.0	5.3	4.66	14.56	1.49	24	0.35	71.35	71.70	73.65	73.68	74.70	75.00	B113-112
8	7	65.836	0.13	0.38	0.90	0.12	0.34	10.0	15.3	5.4	1.86	4.95	1.52	15	0.50	72.00	72.33	73.71	73.76	75.00	75.00	B114-113
9	8	71.501	0.14	0.25	0.90	0.13	0.23	10.0	14.3	5.6	1.26	4.96	1.06	15	0.50	72.33	72.69	73.79	73.81	75.00	75.50	B115-114
10	9	135.000	0.11	0.11	0.90	0.10	0.10	10.0	10.0	6.5	0.64	3.35	0.65	15	0.23	72.69	73.00	73.82	73.83	75.50	75.50	B116-115
11	5	176.078	0.15	1.13	0.90	0.14	1.02	10.0	14.9	5.5	5.60	15.45	1.84	24	0.40	71.14	71.84	73.54	73.62	74.50	74.60	B106-105
12	11	70.688	0.06	0.11	0.90	0.05	0.10	10.0	11.7	6.1	0.61	6.77	0.34	18	0.35	71.84	72.09	73.67	73.67	74.60	74.70	B107-106
13	12	24.252	0.05	0.05	0.90	0.05	0.05	10.0	10.0	6.5	0.29	4.92	0.24	15	0.49	72.09	72.21	73.67	73.68	74.70	74.70	B108-107
14	11	23.590	0.17	0.40	0.90	0.15	0.36	10.0	10.4	6.4	2.31	6.20	1.31	18	0.30	71.84	71.91	73.67	73.68	74.60	74.60	B110-106
15	7	100.446	0.29	0.47	0.90	0.26	0.42	10.0	10.9	6.3	2.66	4.58	2.17	15	0.43	71.70	72.13	73.71	73.86	75.00	75.00	B117-113
16	15	74.134	0.18	0.18	0.90	0.16	0.16	10.0	10.0	6.5	1.05	2.73	1.34	12	0.50	72.13	72.50	73.93	73.98	75.00	74.50	B118-117
17	11	63.118	0.47	0.47	0.90	0.42	0.42	10.0	10.0	6.5	2.75	8.10	1.56	18	0.51	71.84	72.16	73.67	73.71	74.60	74.40	B109-106
18	14	24.398	0.23	0.23	0.90	0.21	0.21	10.0	10.0	6.5	1.35	4.25	1.10	15	0.37	71.91	72.00	73.69	73.69	74.60	74.60	B111-110
19	5	145.738	0.46	1.10	0.90	0.41	0.99	10.0	10.8	6.3	6.25	12.18	1.99	24	0.25	71.14	71.50	73.54	73.63	74.50	74.30	B119-105
20	19	142.000	0.64	0.64	0.90	0.58	0.58	10.0	10.0	6.5	3.74	4.15	3.05	15	0.35	71.50	72.00	73.64	74.05	74.30	74.00	B120-119
21	4	34.000	0.37	0.37	0.90	0.33	0.33	10.0	10.0	6.5	2.16	3.79	1.76	15	0.29	71.15	71.25	73.17	73.20	74.60	74.50	B104A-104

Project File: master pipe network - 01-15-20.stm

Number of lines: 102

Run Date: 1/14/2020

NOTES:Intensity = 106.91 / (Inlet time + 13.90) ^ 0.88 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
22	4	65.121	0.31	0.31	0.90	0.28	0.28	10.0	10.0	6.5	1.81	4.16	1.48	15	0.35	70.77	71.00	73.17	73.21	74.60	74.00	B104B-104
23	End	42.891	0.00	5.10	0.90	0.00	4.59	10.0	16.4	5.3	24.17	33.10	5.49	36	0.21	70.00	70.09	71.77	71.90	73.30	76.00	A101-100
24	23	145.752	0.40	3.98	0.90	0.36	3.58	10.0	15.8	5.4	19.20	19.82	4.15	30	0.20	70.09	70.38	72.35	72.58	76.00	74.00	A102-101
25	24	87.977	0.15	3.58	0.90	0.14	3.22	10.0	15.4	5.4	17.47	20.10	3.58	30	0.20	70.38	70.56	72.85	72.97	74.00	74.00	A103-102
26	25	85.434	0.19	3.43	0.90	0.17	3.09	10.0	15.0	5.5	16.94	17.99	3.48	30	0.16	70.56	70.70	73.00	73.11	74.00	74.00	A104-103
27	26	71.866	0.39	3.24	0.90	0.35	2.92	10.0	14.7	5.5	16.18	20.30	3.30	30	0.21	70.70	70.85	73.30	73.35	74.00	74.20	A105-104
28	27	59.454	0.80	2.85	0.90	0.72	2.57	10.0	14.4	5.6	14.37	18.22	2.93	30	0.17	70.85	70.95	73.38	73.43	74.20	74.25	A106-105
29	28	155.921	0.62	2.05	0.90	0.56	1.85	10.0	13.2	5.8	10.72	17.06	2.19	30	0.15	70.95	71.18	73.57	73.65	74.25	74.80	A107-106
30	29	164.237	0.23	1.43	0.90	0.21	1.29	10.0	12.2	6.0	7.75	12.24	2.47	24	0.25	71.18	71.59	73.72	73.89	74.80	76.00	A108-107
31	30	100.368	0.59	1.20	0.90	0.53	1.08	10.0	11.4	6.2	6.67	12.23	2.12	24	0.25	71.59	71.84	73.98	74.05	76.00	75.00	A109-108
32	31	87.694	0.14	0.14	0.90	0.13	0.13	10.0	10.0	6.5	0.82	2.73	1.04	12	0.50	72.56	73.00	74.12	74.16	75.00	75.00	A111-109
33	31	64.751	0.47	0.47	0.90	0.42	0.42	10.0	10.0	6.5	2.75	4.92	2.24	15	0.49	72.18	72.50	74.12	74.22	75.00	75.00	A110-109
34	23	111.858	0.18	1.12	0.90	0.16	1.01	10.0	13.1	5.8	5.89	10.87	1.87	24	0.20	70.09	70.31	72.35	72.41	76.00	73.70	A101A-100
35	34	82.742	0.28	0.94	0.90	0.25	0.85	10.0	12.2	6.0	5.08	11.11	1.62	24	0.21	70.31	70.48	72.42	72.46	73.70	74.00	A101B-101A
36	35	74.838	0.00	0.66	0.90	0.00	0.59	10.0	11.7	6.1	3.64	8.00	2.06	18	0.49	70.48	70.85	72.48	72.56	74.00	74.00	A101C-101B
37	36	74.628	0.48	0.66	0.90	0.43	0.59	10.0	11.1	6.2	3.71	5.10	2.10	18	0.20	70.85	71.00	72.59	72.67	74.00	74.00	A101D-101C
38	37	55.573	0.18	0.18	0.90	0.16	0.16	10.0	10.0	6.5	1.05	4.97	0.86	15	0.50	71.00	71.28	72.72	72.74	74.00	74.00	A101E-101D
39	End	56.718	0.91	0.91	0.60	0.55	0.55	10.0	10.0	6.5	3.55	6.57	4.08	15	0.88	70.50	71.00	71.43	71.76	72.00	73.00	E108-107
40	End	38.596	0.34	6.15	0.90	0.31	5.54	10.0	13.5	5.8	31.92	43.52	6.38	36	0.36	67.00	67.14	69.03	69.11	68.44	72.10	C101-100
41	40	72.836	0.00	4.55	0.90	0.00	4.10	10.0	13.1	5.8	23.89	42.33	3.78	36	0.34	67.14	67.39	69.76	69.81	72.10	73.10	C102-101
42	41	116.889	0.32	3.96	0.90	0.29	3.56	10.0	12.5	6.0	21.24	42.79	3.43	36	0.35	67.39	67.80	70.04	70.10	73.10	72.60	C103-102

Project File: master pipe network - 01-15-20.stm

Number of lines: 102

Run Date: 1/14/2020

NOTES:Intensity = 106.91 / (Inlet time + 13.90) ^ 0.88 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
43	42	109.868	0.37	1.84	0.90	0.33	1.66	10.0	11.8	6.1	10.10	14.41	3.40	24	0.35	68.30	68.68	70.24	70.37	72.60	72.60	C104-103
44	43	169.102	0.33	1.47	0.90	0.30	1.32	10.0	11.2	6.2	8.24	8.39	4.87	18	0.54	68.93	69.85	70.40	71.15	72.60	72.60	C105-104
45	44	75.002	0.25	0.64	0.90	0.23	0.58	10.0	10.8	6.3	3.64	4.98	2.97	15	0.51	70.10	70.48	71.55	71.73	72.60	74.00	C107-105
46	45	85.920	0.39	0.39	0.90	0.35	0.35	10.0	10.0	6.5	2.28	4.95	2.03	15	0.50	70.48	70.91	71.82	71.90	74.00	74.60	C108-107
47	42	152.180	0.73	1.80	0.90	0.66	1.62	10.0	11.7	6.1	9.92	14.46	3.16	24	0.35	67.80	68.33	70.24	70.49	72.60	73.40	C109-103
48	47	58.965	0.20	1.07	0.90	0.18	0.96	10.0	11.4	6.2	5.96	7.98	3.37	18	0.49	68.58	68.87	70.56	70.73	73.40	73.50	C110-109
49	48	110.785	0.16	0.87	0.90	0.14	0.78	10.0	10.7	6.3	4.96	8.02	4.67	18	0.50	69.87	70.42	70.75	71.28	73.50	74.50	C111-110
50	49	24.656	0.36	0.71	0.90	0.32	0.64	10.0	10.6	6.4	4.06	4.88	4.45	15	0.49	70.42	70.54	71.29	71.41	74.50	74.50	C112-111
51	50	91.867	0.35	0.35	0.90	0.32	0.32	10.0	10.0	6.5	2.05	2.73	2.64	12	0.50	70.54	71.00	71.71	71.94	74.50	74.00	C113-112
52	41	203.000	0.59	0.59	0.90	0.53	0.53	10.0	10.0	6.5	3.45	4.73	3.13	15	0.46	68.64	69.57	70.04	70.52	73.10	73.10	C114-102
53	44	55.132	0.50	0.50	0.90	0.45	0.45	10.0	10.0	6.5	2.92	4.99	2.38	15	0.51	69.22	69.50	71.55	71.65	72.60	72.90	C106-105
54	40	129.970	0.18	0.18	0.90	0.16	0.16	10.0	10.0	6.5	1.05	4.91	1.07	15	0.49	68.36	69.00	69.76	69.79	72.10	71.50	C117-101
55	40	163.863	0.46	1.08	0.90	0.41	0.97	10.0	10.7	6.3	6.15	8.05	3.48	18	0.50	67.69	68.51	69.76	70.24	72.10	72.00	C115-101
56	55	127.964	0.62	0.62	0.90	0.56	0.56	10.0	10.0	6.5	3.63	4.95	2.95	15	0.50	68.51	69.15	70.27	70.62	72.00	72.40	C116-115
57	End	59.114	0.37	2.83	0.90	0.33	2.55	10.0	13.8	5.7	14.55	26.48	5.27	30	0.36	67.00	67.21	68.43	68.53	69.80	71.40	D101-100
58	57	83.390	0.00	2.46	0.90	0.00	2.21	10.0	13.2	5.8	12.86	26.20	3.87	30	0.35	67.21	67.50	68.94	69.00	71.40	72.50	D102-101
59	58	110.817	0.17	2.03	0.90	0.15	1.83	10.0	12.7	5.9	10.80	16.46	4.13	24	0.45	67.50	68.00	69.27	69.40	72.50	71.25	D104-102
60	59	98.288	0.42	1.33	0.90	0.38	1.20	10.0	12.3	6.0	7.17	7.61	4.06	18	0.45	68.00	68.44	69.73	70.12	71.25	71.50	D105-104
61	60	67.873	0.26	0.91	0.90	0.23	0.82	10.0	11.9	6.1	4.97	7.81	2.81	18	0.47	68.44	68.76	70.16	70.26	71.50	72.20	D106-105
62	61	197.932	0.36	0.36	0.90	0.32	0.32	10.0	10.0	6.5	2.11	4.95	2.08	15	0.50	68.76	69.75	70.38	70.57	72.20	72.00	D107-106
63	61	34.000	0.29	0.29	0.90	0.26	0.26	10.0	10.0	6.5	1.70	4.95	1.38	15	0.50	68.76	68.93	70.38	70.40	72.20	72.00	D108-106

Project File: master pipe network - 01-15-20.stm

Number of lines: 102

Run Date: 1/14/2020

NOTES:Intensity = 106.91 / (Inlet time + 13.90) ^ 0.88 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
64	59	100.940	0.36	0.36	0.90	0.32	0.32	10.0	10.0	6.5	2.11	2.72	2.68	12	0.50	68.00	68.50	69.73	70.03	71.25	71.00	D110-104
65	58	71.506	0.43	0.43	0.90	0.39	0.39	10.0	10.0	6.5	2.51	4.96	2.24	15	0.50	68.00	68.36	69.27	69.34	72.50	71.40	D103-102
66	59	67.076	0.17	0.17	0.90	0.15	0.15	10.0	10.0	6.5	0.99	2.75	1.27	12	0.51	68.00	68.34	69.73	69.77	71.25	71.50	D109-104
67	End	42.165	1.16	1.16	0.60	0.70	0.70	10.0	10.0	6.5	8.07	12.67	3.87	19 x 30 e	0.28	68.40	68.52	69.48	69.53	70.40	70.52	E106-105
68	End	36.000	0.27	3.10	0.90	0.24	2.79	10.0	15.0	5.5	15.32	23.42	5.07	30	0.28	65.25	65.35	66.73	66.82	68.11	71.15	F101-100
69	68	40.000	0.24	2.83	0.90	0.22	2.55	10.0	14.8	5.5	14.08	18.59	4.05	30	0.17	65.32	65.39	66.99	67.05	71.15	71.15	F102-101
70	69	145.000	0.33	2.59	0.90	0.30	2.33	10.0	13.9	5.7	13.25	25.83	4.30	30	0.34	65.39	65.88	67.09	67.23	71.15	71.30	F103-102
71	70	74.652	0.20	2.26	0.90	0.18	2.03	10.0	13.6	5.7	11.68	13.60	4.87	24	0.31	66.13	66.36	67.56	67.79	71.30	70.80	F104-103
72	71	10.491	0.28	2.06	0.90	0.25	1.85	10.0	13.5	5.8	10.66	15.13	4.10	24	0.38	66.36	66.40	67.92	67.93	70.80	70.80	F105-104
73	72	185.426	0.31	1.63	0.90	0.28	1.47	10.0	12.5	6.0	8.74	13.47	3.29	24	0.30	66.40	66.96	68.20	68.39	70.80	70.80	F106-105
74	73	75.203	0.38	1.00	0.90	0.34	0.90	10.0	12.1	6.0	5.43	6.29	3.08	18	0.31	66.96	67.19	68.60	68.77	70.80	70.70	F107-106
75	74	219.340	0.37	0.37	0.90	0.33	0.33	10.0	10.0	6.5	2.16	4.95	2.10	15	0.50	67.19	68.29	68.91	69.14	70.70	70.70	F108-107
76	73	11.568	0.32	0.32	0.90	0.29	0.29	10.0	10.0	6.5	1.87	5.04	2.64	15	0.52	67.49	67.55	68.60	68.09	70.80	70.80	F110-106
77	74	94.449	0.25	0.25	0.90	0.23	0.23	10.0	10.0	6.5	1.46	4.93	1.20	15	0.50	67.28	67.75	68.91	68.95	70.70	71.00	F111-107
78	72	128.625	0.15	0.15	0.90	0.14	0.14	10.0	10.0	6.5	0.88	4.97	0.73	15	0.51	66.40	67.05	68.20	68.22	70.80	70.30	F109-105
79	End	98.000	0.60	4.89	0.90	0.54	4.40	10.0	13.9	5.7	25.03	53.63	6.06	36	0.55	65.25	65.79	67.05	67.40	68.63	71.85	G101-100
80	79	84.000	0.78	3.21	0.90	0.70	2.89	10.0	13.3	5.8	16.74	55.18	4.99	36	0.58	65.79	66.28	67.40	67.59	71.85	70.15	G107-101
81	80	108.000	0.07	2.43	0.90	0.06	2.19	10.0	12.4	6.0	13.08	36.13	4.57	36	0.25	66.28	66.55	67.59	67.79	70.15	72.00	G108-107
82	81	154.411	0.33	0.91	0.90	0.30	0.82	10.0	11.2	6.2	5.10	7.27	3.17	18	0.41	66.55	67.18	68.08	68.35	72.00	71.00	G113-108
83	82	56.142	0.11	0.33	0.90	0.10	0.30	10.0	10.6	6.4	1.89	4.94	3.71	15	0.50	67.99	68.27	68.53	68.82	71.00	71.60	G114-113
84	83	35.192	0.22	0.22	0.90	0.20	0.20	10.0	10.0	6.5	1.29	5.00	2.88	15	0.51	68.27	68.45	68.82	68.90	71.60	71.70	G115-114

Project File: master pipe network - 01-15-20.stm

Number of lines: 102

Run Date: 1/14/2020

NOTES:Intensity = 106.91 / (Inlet time + 13.90) ^ 0.88 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
85	79	93.000	0.28	1.08	0.90	0.25	0.97	10.0	11.9	6.1	5.89	9.36	4.40	18	0.68	66.14	66.77	67.40	67.71	71.85	71.70	G102-101
86	85	42.000	0.22	0.80	0.90	0.20	0.72	10.0	11.7	6.1	4.41	8.04	4.18	18	0.50	66.77	66.98	67.71	67.78	71.70	71.80	G103-102
87	86	190.664	0.15	0.58	0.90	0.14	0.52	10.0	10.5	6.4	3.33	4.96	4.33	15	0.50	67.23	68.19	67.98	68.94	71.80	71.20	G104-103
88	87	62.296	0.43	0.43	0.90	0.39	0.39	10.0	10.0	6.5	2.51	4.93	3.17	15	0.50	68.19	68.50	69.23	69.13	71.20	71.30	G105-104
89	81	78.097	0.28	1.45	0.90	0.25	1.31	10.0	11.8	6.1	7.94	13.30	3.27	24	0.29	66.55	66.78	68.08	68.15	72.00	71.70	G109-108
90	89	40.950	0.23	1.17	0.90	0.21	1.05	10.0	11.5	6.2	6.48	12.11	2.81	24	0.24	66.78	66.88	68.19	68.22	71.70	71.80	G110-109
91	90	200.646	0.42	0.63	0.90	0.38	0.57	10.0	10.4	6.4	3.63	4.94	3.35	15	0.50	66.96	67.96	68.35	68.88	71.80	71.80	G111-110
92	91	24.183	0.21	0.21	0.90	0.19	0.19	10.0	10.0	6.5	1.23	4.93	2.13	15	0.50	67.96	68.08	69.10	68.52	71.80	71.80	G112-111
93	82	12.926	0.25	0.25	0.90	0.23	0.23	10.0	10.0	6.5	1.46	5.15	2.52	15	0.54	67.68	67.75	68.52	68.23	71.00	71.00	G116-113
94	90	128.162	0.31	0.31	0.90	0.28	0.28	10.0	10.0	6.5	1.81	4.79	2.82	15	0.47	67.50	68.10	68.35	68.63	71.80	71.50	G110A-110
95	End	59.658	0.44	0.44	0.60	0.26	0.26	10.0	10.0	6.5	9.79	13.75	4.35	19 x 30 e	0.34	67.50	67.70	68.47	68.78	69.50	69.70	E104-103
96	End	14.767	0.34	0.34	0.90	0.31	0.31	10.0	10.0	6.5	1.99	5.76	3.73	15	0.68	67.50	67.60	68.06	68.16	68.94	70.60	H101-100
97	End	44.109	0.47	0.47	0.60	0.28	0.28	10.0	10.0	6.5	11.62	15.99	4.91	19 x 30 e	0.45	67.20	67.40	68.19	68.60	69.30	69.40	E102-101
98	End	102.787	0.07	1.93	0.90	0.06	1.19	10.0	10.5	6.4	7.61	7.64	2.45	24	0.10	66.40	66.50	68.34	68.43	68.73	69.25	J101-100
99	98	23.496	0.04	1.86	0.90	0.04	1.13	10.0	10.3	6.4	7.25	8.76	2.32	24	0.13	66.50	66.53	68.46	68.47	69.25	69.28	J102-101
100	99	40.996	1.82	1.82	0.60	1.09	1.09	10.0	10.0	6.5	7.10	7.65	2.26	24	0.10	66.53	66.57	68.54	68.57	69.28	69.32	J103-102
101	End	40.107	0.85	0.85	0.90	0.77	0.77	10.0	10.0	6.5	4.97	8.03	2.81	18	0.50	65.00	65.20	68.59	68.67	68.00	69.80	M101-100
102	End	69.128	0.32	0.32	0.90	0.29	0.29	10.0	10.0	6.5	1.87	6.84	1.06	18	0.36	65.00	65.25	67.61	67.63	71.00	71.00	I101-100

Project File: master pipe network - 01-15-20.stm

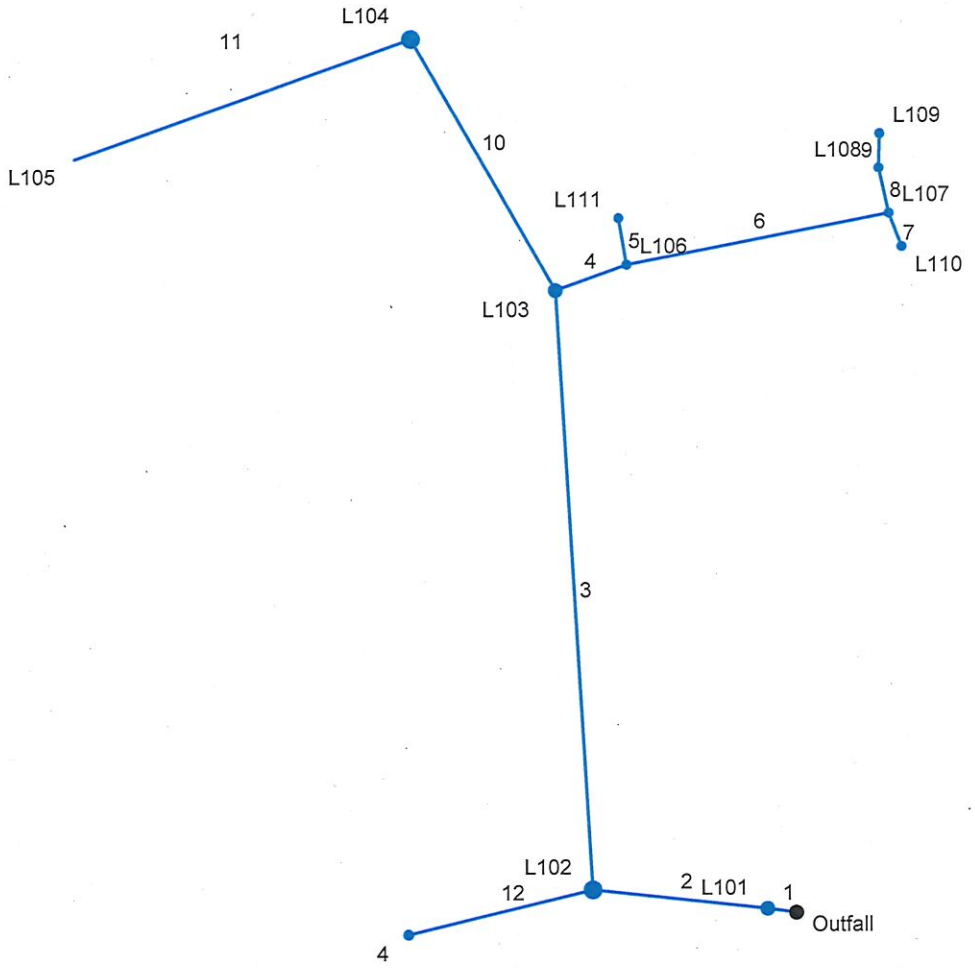
Number of lines: 102

Run Date: 1/14/2020

NOTES:Intensity = 106.91 / (Inlet time + 13.90) ^ 0.88 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan

25-YR



Project File: L-line network - 01-15-20.stm	Number of lines: 12	Date: 1/14/2020

Storm Sewer Tabulation

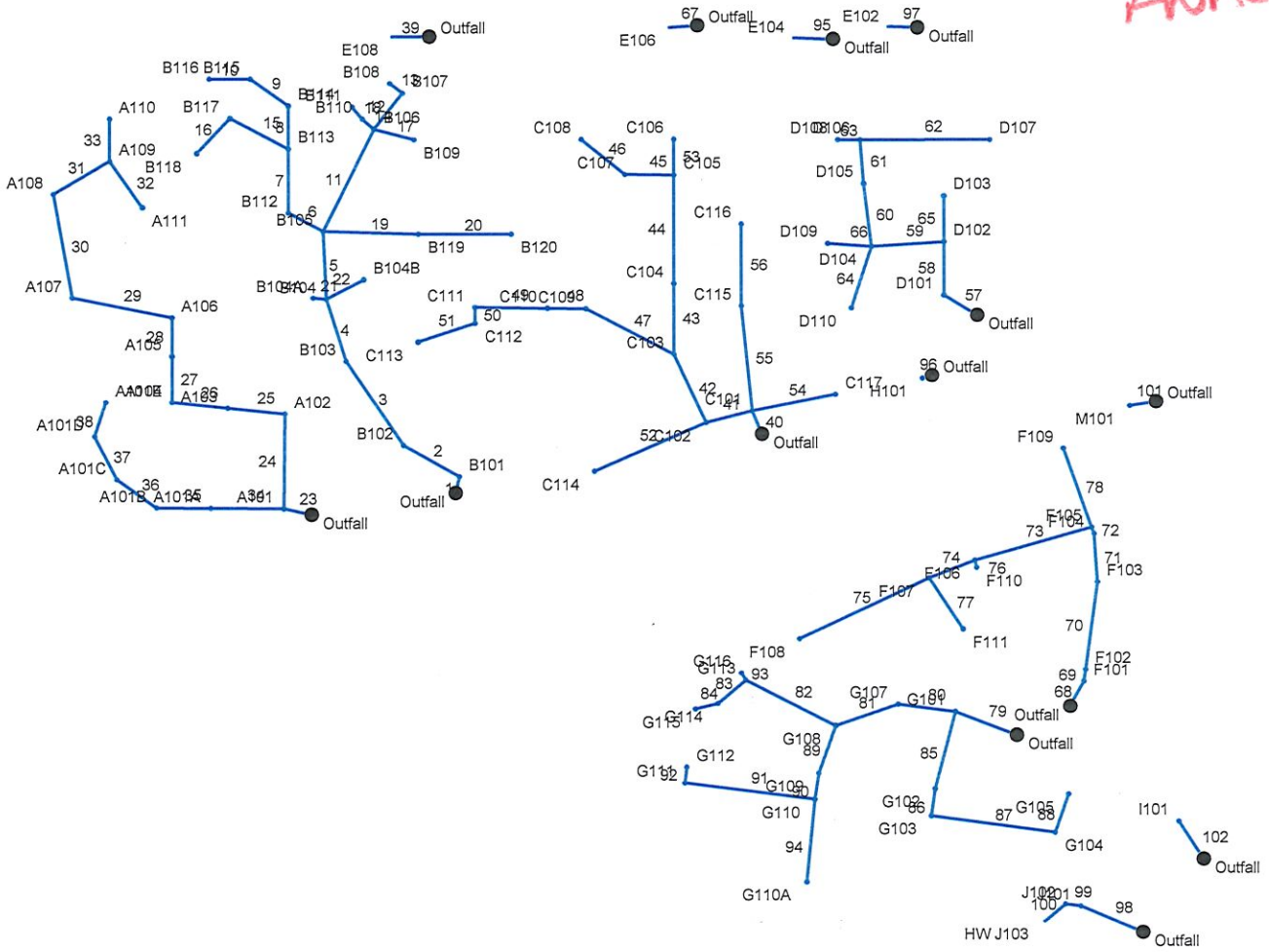
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	14.508	0.00	5.48	0.90	0.00	3.55	10.0	12.7	5.9	79.98	108.1	7.78	48	0.48	60.87	60.94	64.46	63.65	65.53	71.75	L101-100
2	1	87.964	0.00	5.48	0.90	0.00	3.55	10.0	12.4	6.0	80.14	111.3	9.24	48	0.51	62.43	62.88	64.94	65.59	71.75	72.60	L102-101
3	2	304.649	0.00	5.48	0.90	0.00	3.55	10.0	11.4	6.2	60.73	109.2	7.31	48	0.49	62.88	64.38	65.59	66.73	72.60	72.30	L103-102
4	3	37.862	0.10	0.86	0.90	0.09	0.77	10.0	11.2	6.2	4.81	4.96	4.44	15	0.50	65.68	65.87	66.73	66.89	72.30	71.25	L106-103
5	4	23.947	0.09	0.09	0.90	0.08	0.08	10.0	10.0	6.5	0.53	4.95	2.58	15	0.50	67.93	68.05	68.21	68.33	71.25	71.25	L111-106
6	4	133.836	0.13	0.67	0.90	0.12	0.60	10.0	10.5	6.4	3.85	4.95	3.36	15	0.50	65.87	66.54	67.20	67.56	71.25	71.00	L107-106
7	6	18.193	0.21	0.21	0.90	0.19	0.19	10.0	10.0	6.5	1.23	7.52	2.21	15	1.15	66.79	67.00	67.76	67.44	71.00	70.40	L110-107
8	6	23.448	0.10	0.33	0.90	0.09	0.30	10.0	10.3	6.4	1.91	5.00	2.78	15	0.51	66.79	66.91	67.76	67.46	71.00	71.00	L108-107
9	8	17.510	0.23	0.23	0.90	0.21	0.21	10.0	10.0	6.5	1.35	5.02	2.95	15	0.51	66.91	67.00	67.46	67.46	71.00	70.40	L109-108
10	3	147.000	0.00	4.62	0.90	0.00	2.77	10.0	10.7	6.3	56.38	118.3	7.54	48	0.58	64.38	65.23	66.73	67.49	72.30	70.85	L104-103
11	10	179.000	4.62	4.62	0.60	2.77	2.77	10.0	10.0	6.5	56.81	106.0	7.75	48	0.46	65.23	66.06	67.49	68.33	70.85	70.56	L105-104
12	2	95.000	0.00	0.00	0.90	0.00	0.00	10.0	10.0	0.0	20.19	32.23	5.33	30	0.53	63.25	63.75	65.59	65.27	72.60	68.50	OS4-L102

Project File: L-line network - 01-15-20.stm | Number of lines: 12 | Run Date: 1/14/2020

NOTES:Intensity = 106.91 / (Inlet time + 13.90) ^ 0.88 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan

100 YR ANALYSIS



Project File: master pipe network - 10-23-19.stm	Number of lines: 102	Date: 10/23/2019

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
102	End	69.128	0.32	0.32	0.90	0.29	0.29	10.0	10.0	7.8	2.24	6.84	1.27	18	0.36	65.00	65.25	67.61	67.64	71.00	71.00	I101-100
101	End	40.107	0.85	0.85	0.90	0.77	0.77	10.0	10.0	7.8	5.96	8.03	3.37	18	0.50	65.00	65.20	68.59	68.70	68.00	69.80	M101-100
100	99	40.996	1.82	1.82	0.60	1.09	1.09	10.0	10.0	7.8	8.51	7.65	2.71	24	0.10	66.53	66.57	68.62	68.67	69.28	69.32	J103-102
99	98	23.496	0.04	1.86	0.90	0.04	1.13	10.0	10.3	7.7	8.71	8.76	2.77	24	0.13	66.50	66.53	68.51	68.53	69.25	69.28	J102-101
98	End	102.787	0.07	1.93	0.90	0.06	1.19	10.0	10.4	7.7	9.15	7.64	2.93	24	0.10	66.40	66.50	68.34	68.47	68.73	69.25	J101-100
97	End	44.109	0.47	0.47	0.60	0.28	0.28	10.0	10.0	7.8	11.99	15.99	5.06	19 x 30 e	0.45	67.20	67.40	68.19	68.60	69.30	69.40	E102-101
96	End	14.767	0.34	0.34	0.90	0.31	0.31	10.0	10.0	7.8	2.38	5.76	4.21	15	0.68	67.50	67.60	68.06	68.22	68.94	70.60	H101-100
95	End	59.658	0.44	0.44	0.60	0.26	0.26	10.0	10.0	7.8	10.13	13.75	4.38	19 x 30 e	0.34	67.50	67.70	68.47	68.84	69.50	69.70	E104-103
94	90	128.162	0.31	0.31	0.90	0.28	0.28	10.0	10.0	7.8	2.17	4.79	2.13	15	0.47	67.50	68.10	68.82	68.94	71.80	71.50	G110A-110
93	82	12.926	0.25	0.25	0.90	0.23	0.23	10.0	10.0	7.8	1.75	5.15	1.43	15	0.54	67.68	67.75	69.18	69.19	71.00	71.00	G116-113
92	91	24.183	0.21	0.21	0.90	0.19	0.19	10.0	10.0	7.8	1.47	4.93	1.20	15	0.50	67.96	68.08	69.80	69.81	71.80	71.80	G112-111
91	90	200.646	0.42	0.63	0.90	0.38	0.57	10.0	10.3	7.7	4.36	4.94	3.56	15	0.50	66.96	67.96	68.82	69.60	71.80	71.80	G111-110
90	89	40.950	0.23	1.17	0.90	0.21	1.05	10.0	11.3	7.5	7.85	12.11	2.57	24	0.24	66.78	66.88	68.68	68.72	71.70	71.80	G110-109
89	81	78.097	0.28	1.45	0.90	0.25	1.31	10.0	11.5	7.4	9.64	13.30	3.11	24	0.29	66.55	66.78	68.55	68.65	72.00	71.70	G109-108
88	87	62.296	0.43	0.43	0.90	0.39	0.39	10.0	10.0	7.8	3.01	4.93	2.46	15	0.50	68.19	68.50	69.67	69.75	71.20	71.30	G105-104
87	86	190.664	0.15	0.58	0.90	0.14	0.52	10.0	10.4	7.7	4.01	4.96	3.26	15	0.50	67.23	68.19	68.88	69.51	71.80	71.20	G104-103
86	85	42.000	0.22	0.80	0.90	0.20	0.72	10.0	11.4	7.4	5.34	8.04	3.02	18	0.50	66.77	66.98	68.65	68.74	71.70	71.80	G103-102
85	79	123.216	0.28	1.08	0.90	0.25	0.97	10.0	11.6	7.4	7.16	8.13	4.05	18	0.51	66.14	66.77	68.12	68.61	70.00	71.70	G102-101
84	83	35.192	0.22	0.22	0.90	0.20	0.20	10.0	10.0	7.8	1.54	5.00	3.04	15	0.51	68.27	68.45	68.87	68.94	71.60	71.70	G115-114
83	82	56.142	0.11	0.33	0.90	0.10	0.30	10.0	10.5	7.7	2.28	4.94	2.89	15	0.50	67.99	68.27	69.18	68.87	71.00	71.60	G114-113
82	81	154.411	0.33	0.91	0.90	0.30	0.82	10.0	11.0	7.5	6.17	7.27	3.49	18	0.41	66.55	67.18	68.55	69.00	72.00	71.00	G113-108

Project File: master pipe network - 10-23-19.stm

Number of lines: 102

Run Date: 10/23/2019

NOTES:Intensity = 150.20 / (Inlet time + 15.60) ^ 0.91 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

- DENOTES SURCHARGED PIPE HGL at OR Below Rim ELEV. (NO QUANTITATIVE FLOW

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
81	80	100.953	0.07	2.43	0.90	0.06	2.19	10.0	12.0	7.3	15.93	36.67	3.30	36	0.26	66.29	66.55	68.34	68.39	70.00	72.00	G108-107
80	79	88.002	0.78	3.21	0.90	0.70	2.89	10.0	12.7	7.1	20.53	36.13	4.16	36	0.25	66.07	66.29	68.12	68.20	70.00	70.00	G107-101
79	End	100.172	0.60	4.89	0.90	0.54	4.40	10.0	13.2	7.0	30.78	33.08	6.28	36	0.21	65.25	65.46	67.05	67.63	68.63	70.00	G101-100
78	72	128.625	0.15	0.15	0.90	0.14	0.14	10.0	10.0	7.8	1.05	4.97	0.86	15	0.51	66.40	67.05	68.55	68.58	70.80	70.30	F109-105
77	74	94.449	0.25	0.25	0.90	0.23	0.23	10.0	10.0	7.8	1.75	4.93	1.43	15	0.50	67.28	67.75	69.53	69.59	70.70	71.00	F111-107
76	73	11.568	0.32	0.32	0.90	0.29	0.29	10.0	10.0	7.8	2.24	5.04	1.83	15	0.52	67.49	67.55	69.06	69.07	70.80	70.80	F110-106
75	74	219.340	0.37	0.37	0.90	0.33	0.33	10.0	10.0	7.8	2.59	4.95	2.11	15	0.50	67.19	68.29	69.53	69.83	70.70	70.70	F108-107
74	73	75.203	0.38	1.00	0.90	0.34	0.90	10.0	11.7	7.3	6.61	6.29	3.74	18	0.31	66.96	67.19	69.06	69.31	70.80	70.70	F107-106
73	72	185.426	0.31	1.63	0.90	0.28	1.47	10.0	12.1	7.3	10.65	13.47	3.41	24	0.30	66.40	66.96	68.55	68.88	70.80	70.80	F106-105
72	71	10.491	0.28	2.06	0.90	0.25	1.85	10.0	13.0	7.1	13.07	15.13	4.27	24	0.38	66.36	66.40	68.25	68.27	70.80	70.80	F105-104
71	70	74.652	0.20	2.26	0.90	0.18	2.03	10.0	13.0	7.0	14.32	13.60	4.90	24	0.31	66.13	66.36	67.89	68.12	71.30	70.80	F104-103
70	69	136.494	0.33	2.59	0.90	0.30	2.33	10.0	13.3	7.0	16.27	24.35	4.60	30	0.30	65.47	65.88	67.28	67.48	71.30	71.30	F103-102
69	68	18.704	0.24	2.83	0.90	0.22	2.55	10.0	14.0	6.8	17.41	25.16	4.67	30	0.32	65.41	65.47	67.20	67.23	71.30	71.30	F102-101
68	End	43.995	0.27	3.10	0.90	0.24	2.79	10.0	14.0	6.8	19.01	26.79	6.06	30	0.36	65.25	65.41	66.73	66.98	68.11	71.30	F101-100
67	End	42.165	1.16	1.16	0.60	0.70	0.70	10.0	10.0	7.8	8.97	12.67	3.99	19 x 30 e	0.28	68.40	68.52	69.48	69.60	70.40	70.52	E106-105
66	59	67.076	0.17	0.17	0.90	0.15	0.15	10.0	10.0	7.8	1.19	2.75	1.52	12	0.51	68.00	68.34	70.11	70.17	71.25	71.50	D109-104
65	58	71.506	0.43	0.43	0.90	0.39	0.39	10.0	10.0	7.8	3.01	4.96	2.46	15	0.50	68.00	68.36	69.53	69.66	72.50	71.40	D103-102
64	59	100.940	0.36	0.36	0.90	0.32	0.32	10.0	10.0	7.8	2.52	2.72	3.21	12	0.50	68.00	68.50	70.11	70.54	71.25	71.00	D110-104
63	61	34.000	0.29	0.29	0.90	0.26	0.26	10.0	10.0	7.8	2.03	4.95	1.66	15	0.50	68.76	68.93	71.11	71.14	72.20	72.00	D108-106
62	61	197.932	0.36	0.36	0.90	0.32	0.32	10.0	10.0	7.8	2.52	4.95	2.06	15	0.50	68.76	69.75	71.11	71.37	72.20	72.00	D107-106
61	60	67.873	0.26	0.91	0.90	0.23	0.82	10.0	11.6	7.4	6.04	7.81	3.42	18	0.47	68.44	68.76	70.74	70.93	71.50	72.20	D106-105

Project File: master pipe network - 10-23-19.stm

Number of lines: 102

Run Date: 10/23/2019

NOTES:Intensity = 150.20 / (Inlet time + 15.60) ^ 0.91 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
60	59	98.288	0.42	1.33	0.90	0.38	1.20	10.0	11.9	7.3	8.73	7.61	4.94	18	0.45	68.00	68.44	70.11	70.68	71.25	71.50	D105-104
59	58	110.817	0.17	2.03	0.90	0.15	1.83	10.0	12.3	7.2	13.18	16.46	4.31	24	0.45	67.50	68.00	69.53	69.80	72.50	71.25	D104-102
58	57	83.390	0.00	2.46	0.90	0.00	2.21	10.0	12.7	7.1	15.74	26.20	4.05	30	0.35	67.21	67.50	69.18	69.24	71.40	72.50	D102-101
57	End	59.114	0.37	2.83	0.90	0.33	2.55	10.0	13.1	7.0	17.86	26.48	5.90	30	0.36	67.00	67.21	68.43	68.74	69.80	71.40	D101-100
56	55	127.964	0.62	0.62	0.90	0.56	0.56	10.0	10.0	7.8	4.35	4.95	3.54	15	0.50	68.51	69.15	70.85	71.34	72.00	72.40	C116-115
55	40	163.863	0.46	1.08	0.90	0.41	0.97	10.0	10.6	7.6	7.41	8.05	4.20	18	0.50	67.69	68.51	70.11	70.80	72.10	72.00	C115-101
54	40	129.970	0.18	0.18	0.90	0.16	0.16	10.0	10.0	7.8	1.26	4.91	1.05	15	0.49	68.36	69.00	70.11	70.15	72.10	71.50	C117-101
53	44	55.132	0.50	0.50	0.90	0.45	0.45	10.0	10.0	7.8	3.51	4.99	2.86	15	0.51	69.22	69.50	72.85	72.99	72.60	72.90	C106-105
52	41	186.617	0.59	0.59	0.90	0.53	0.53	10.0	10.0	7.8	4.14	4.94	3.37	15	0.50	68.64	69.57	70.48	71.13	73.10	73.10	C114-102
51	50	91.867	0.35	0.35	0.90	0.32	0.32	10.0	10.0	7.8	2.45	2.73	3.12	12	0.50	70.54	71.00	72.33	72.70	74.50	74.00	C113-112
50	49	24.656	0.36	0.71	0.90	0.32	0.64	10.0	10.5	7.7	4.89	4.88	3.99	15	0.49	70.42	70.54	71.97	72.09	74.50	74.50	C112-111
49	48	110.785	0.16	0.87	0.90	0.14	0.78	10.0	10.6	7.6	5.97	8.02	3.47	18	0.50	69.87	70.42	71.51	71.78	73.50	74.50	C111-110
48	47	58.965	0.20	1.07	0.90	0.18	0.96	10.0	11.1	7.5	7.21	7.98	4.08	18	0.49	68.58	68.87	71.23	71.47	73.40	73.50	C110-109
47	42	152.180	0.73	1.80	0.90	0.66	1.62	10.0	11.4	7.4	12.03	14.46	3.83	24	0.35	67.80	68.33	70.75	71.12	72.60	73.40	C109-103
46	45	85.920	0.39	0.39	0.90	0.35	0.35	10.0	10.0	7.8	2.73	4.95	2.23	15	0.50	70.48	70.91	73.28	73.41	74.00	74.60	C108-107
45	44	75.002	0.25	0.64	0.90	0.23	0.58	10.0	10.6	7.6	4.39	4.98	3.58	15	0.51	70.10	70.48	72.85	73.14	72.60	74.00	C107-105
44	43	169.102	0.33	1.47	0.90	0.30	1.32	10.0	11.0	7.5	9.96	8.39	5.63	18	0.54	68.93	69.85	71.06	72.36	72.60	72.60	C105-104
43	42	109.868	0.37	1.84	0.90	0.33	1.66	10.0	11.5	7.4	12.25	14.41	3.90	24	0.35	68.30	68.68	70.75	71.02	72.60	72.60	C104-103
42	41	116.889	0.32	3.96	0.90	0.29	3.56	10.0	12.0	7.3	25.88	42.79	3.71	36	0.35	67.39	67.80	70.48	70.60	73.10	72.60	C103-102
41	40	72.836	0.00	4.55	0.90	0.00	4.10	10.0	12.6	7.1	29.22	42.33	4.19	36	0.34	67.14	67.39	70.11	70.20	72.10	73.10	C102-101
40	End	38.596	0.34	6.15	0.90	0.31	5.54	10.0	12.9	7.1	39.11	43.52	7.37	36	0.36	67.00	67.14	69.03	69.33	68.44	72.10	C101-100

Project File: master pipe network - 10-23-19.stm | Number of lines: 102 | Run Date: 10/23/2019

NOTES:Intensity = 150.20 / (Inlet time + 15.60) ^ 0.91 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
39	End	56.718	0.91	0.91	0.60	0.55	0.55	10.0	10.0	7.8	4.25	6.57	4.62	15	0.88	70.50	71.00	71.43	71.83	72.00	73.00	E108-107
38	37	55.573	0.18	0.18	0.90	0.16	0.16	10.0	10.0	7.8	1.26	4.97	1.03	15	0.50	71.00	71.28	73.20	73.22	74.00	74.00	A101E-101D
37	36	74.628	0.48	0.66	0.90	0.43	0.59	10.0	10.9	7.5	4.48	5.10	2.54	18	0.20	70.85	71.00	73.01	73.13	74.00	74.00	A101D-101C
36	35	74.838	0.00	0.66	0.90	0.00	0.59	10.0	11.4	7.4	4.41	8.00	2.50	18	0.49	70.48	70.85	72.85	72.96	74.00	74.00	A101C-101B
35	34	82.742	0.28	0.94	0.90	0.25	0.85	10.0	11.9	7.3	6.18	11.11	1.97	24	0.21	70.31	70.48	72.76	72.81	73.70	74.00	A101B-101A
34	23	111.858	0.18	1.12	0.90	0.16	1.01	10.0	12.6	7.1	7.20	10.87	2.29	24	0.20	70.09	70.31	72.65	72.75	76.00	73.70	A101A-100
33	31	64.751	0.47	0.47	0.90	0.42	0.42	10.0	10.0	7.8	3.30	4.92	2.69	15	0.49	72.18	72.50	75.47	75.61	75.00	75.00	A110-109
32	31	87.694	0.14	0.14	0.90	0.13	0.13	10.0	10.0	7.8	0.98	2.73	1.25	12	0.50	72.56	73.00	75.47	75.52	75.00	75.00	A111-109
31	30	100.368	0.59	1.20	0.90	0.53	1.08	10.0	11.2	7.5	8.08	12.23	2.57	24	0.25	71.59	71.84	75.25	75.36	76.00	75.00	A109-108
30	29	164.237	0.23	1.43	0.90	0.21	1.29	10.0	11.8	7.3	9.42	12.24	3.00	24	0.25	71.18	71.59	74.88	75.12	74.80	76.00	A108-107
29	28	155.921	0.62	2.05	0.90	0.56	1.85	10.0	12.7	7.1	13.12	17.06	2.67	30	0.15	70.95	71.18	74.64	74.77	74.25	74.80	A107-106
28	27	59.454	0.80	2.85	0.90	0.72	2.57	10.0	13.6	6.9	17.70	18.22	3.61	30	0.17	70.85	70.95	74.35	74.44	74.20	74.25	A106-105
27	26	71.866	0.39	3.24	0.90	0.35	2.92	10.0	13.9	6.8	19.95	20.30	4.07	30	0.21	70.70	70.85	74.16	74.31	74.00	74.20	A105-104
26	25	85.434	0.19	3.43	0.90	0.17	3.09	10.0	14.2	6.8	20.94	17.99	4.27	30	0.16	70.56	70.70	73.69	73.88	74.00	74.00	A104-103
25	24	87.977	0.15	3.58	0.90	0.14	3.22	10.0	14.5	6.7	21.64	20.10	4.41	30	0.20	70.38	70.56	73.44	73.64	74.00	74.00	A103-102
24	23	145.752	0.40	3.98	0.90	0.36	3.58	10.0	14.9	6.6	23.82	19.82	4.85	30	0.20	70.09	70.38	72.65	73.07	76.00	74.00	A102-101
23	End	42.891	0.00	5.10	0.90	0.00	4.59	10.0	15.3	6.6	30.07	33.10	6.41	36	0.21	70.00	70.09	71.77	72.12	73.30	76.00	A101-100
22	4	65.121	0.31	0.31	0.90	0.28	0.28	10.0	10.0	7.8	2.17	4.16	1.77	15	0.35	70.77	71.00	73.67	73.74	74.60	74.00	B104B-104
21	4	20.046	0.37	0.37	0.90	0.33	0.33	10.0	10.0	7.8	2.59	4.94	2.11	15	0.50	71.15	71.25	73.67	73.70	74.60	74.50	B104A-104
20	19	142.000	0.64	0.64	0.90	0.58	0.58	10.0	10.0	7.8	4.49	4.15	3.66	15	0.35	71.50	72.00	74.44	75.03	74.30	74.00	B120-119
19	5	145.738	0.46	1.10	0.90	0.41	0.99	10.0	10.6	7.6	7.54	12.18	2.40	24	0.25	71.14	71.50	74.29	74.43	74.50	74.30	B119-105

Project File: master pipe network - 10-23-19.stm

Number of lines: 102

Run Date: 10/23/2019

NOTES:Intensity = 150.20 / (Inlet time + 15.60) ^ 0.91 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

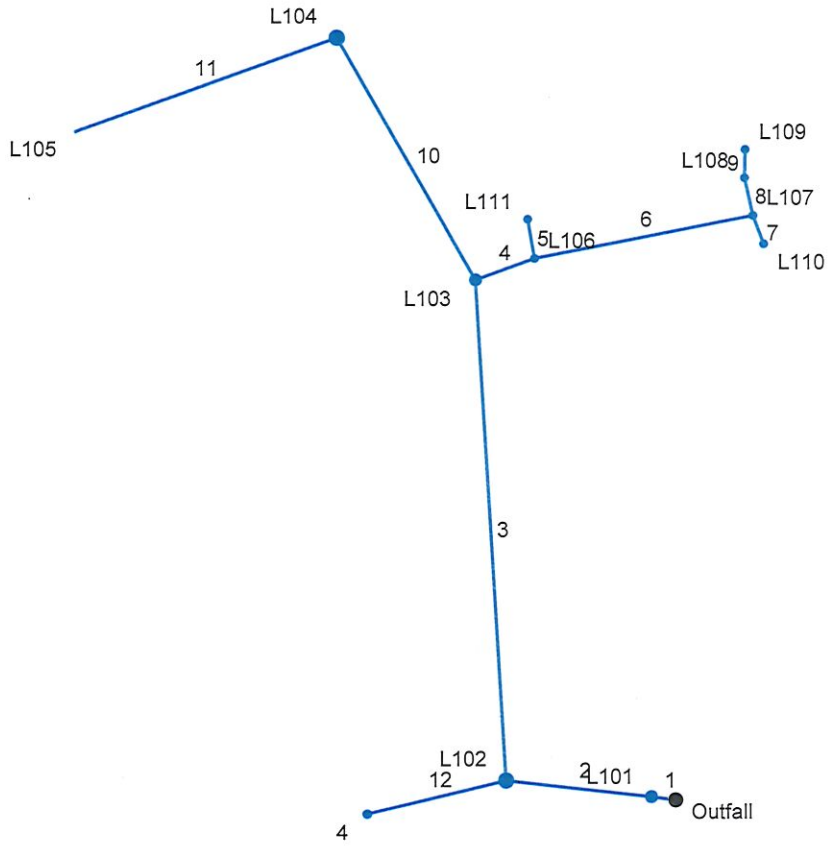
Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
18	14	24.398	0.23	0.23	0.90	0.21	0.21	10.0	10.0	7.8	1.61	4.25	1.31	15	0.37	71.91	72.00	74.53	74.54	74.60	74.60	B111-110
17	11	63.118	0.47	0.47	0.90	0.42	0.42	10.0	10.0	7.8	3.30	8.10	1.86	18	0.51	71.84	72.16	74.51	74.56	74.60	74.40	B109-106
16	15	74.134	0.18	0.18	0.90	0.16	0.16	10.0	10.0	7.8	1.26	2.73	1.61	12	0.50	72.13	72.50	74.92	74.99	75.00	74.50	B118-117
15	7	100.446	0.29	0.47	0.90	0.26	0.42	10.0	10.8	7.6	3.21	4.58	2.61	15	0.43	71.70	72.13	74.60	74.81	75.00	75.00	B117-113
14	11	23.590	0.17	0.40	0.90	0.15	0.36	10.0	10.3	7.7	2.77	6.20	1.57	18	0.30	71.84	71.91	74.51	74.52	74.60	74.60	B110-106
13	12	24.252	0.05	0.05	0.90	0.05	0.05	10.0	10.0	7.8	0.35	4.92	0.29	15	0.49	72.09	72.21	74.51	74.51	74.70	74.70	B108-107
12	11	70.688	0.06	0.11	0.90	0.05	0.10	10.0	11.4	7.4	0.73	6.77	0.42	18	0.35	71.84	72.09	74.51	74.51	74.60	74.70	B107-106
11	5	176.078	0.15	1.13	0.90	0.14	1.02	10.0	14.1	6.8	6.91	15.45	2.20	24	0.40	71.14	71.84	74.29	74.43	74.50	74.60	B106-105
10	9	62.748	0.11	0.11	0.90	0.10	0.10	10.0	10.0	7.8	0.77	4.92	0.63	15	0.49	72.69	73.00	74.79	74.80	75.50	75.50	B116-115
9	8	71.501	0.14	0.25	0.90	0.13	0.23	10.0	11.7	7.4	1.65	4.96	1.35	15	0.50	72.33	72.69	74.73	74.77	75.00	75.50	B115-114
8	7	65.836	0.13	0.38	0.90	0.12	0.34	10.0	12.5	7.2	2.45	4.95	1.99	15	0.50	72.00	72.33	74.60	74.68	75.00	75.00	B114-113
7	6	99.113	0.12	0.97	0.90	0.11	0.87	10.0	13.0	7.0	6.14	14.56	1.96	24	0.35	71.35	71.70	74.48	74.55	74.70	75.00	B113-112
6	5	60.415	0.47	1.44	0.90	0.42	1.30	10.0	13.8	6.9	8.89	14.45	2.83	24	0.35	71.14	71.35	74.29	74.37	74.50	74.70	B112-105
5	4	106.221	0.21	3.88	0.90	0.19	3.49	10.0	15.3	6.6	22.90	26.22	4.67	30	0.35	70.77	71.14	73.67	73.95	74.60	74.50	B105-104
4	3	100.451	0.30	4.86	0.90	0.27	4.37	10.0	15.7	6.5	28.40	32.24	4.30	36	0.20	70.57	70.77	73.26	73.38	75.30	74.60	B104-103
3	2	157.459	0.00	4.86	0.90	0.00	4.37	10.0	16.0	6.4	28.09	31.54	4.27	36	0.19	70.27	70.57	72.96	73.16	74.00	75.30	B103-102
2	1	98.092	0.39	5.25	0.90	0.35	4.72	10.0	16.6	6.3	29.82	33.43	4.65	36	0.21	70.06	70.27	72.65	72.79	74.00	74.00	B102-101
1	End	25.884	0.32	5.57	0.90	0.29	5.01	10.0	17.0	6.2	31.32	34.79	6.63	36	0.23	70.00	70.06	71.81	72.06	72.86	74.00	B101-100

Project File: master pipe network - 10-23-19.stm | Number of lines: 102 | Run Date: 10/23/2019

NOTES:Intensity = 150.20 / (Inlet time + 15.60) ^ 0.91 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: L-line network - 10-23-19.stm	Number of lines: 12	Date: 10/23/2019

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	14.508	0.00	5.48	0.90	0.00	3.55	10.0	12.7	5.9	79.98	108.1	7.78	48	0.48	60.87	60.94	64.46	63.65	65.53	71.75	L101-100
2	1	87.964	0.00	5.48	0.90	0.00	3.55	10.0	12.4	6.0	80.14	111.3	9.24	48	0.51	62.43	62.88	64.94	65.59	71.75	72.60	L102-101
3	2	304.649	0.00	5.48	0.90	0.00	3.55	10.0	11.4	6.2	60.73	109.2	7.31	48	0.49	62.88	64.38	65.59	66.73	72.60	72.30	L103-102
4	3	37.862	0.10	0.86	0.90	0.09	0.77	10.0	11.2	6.2	4.81	4.96	4.44	15	0.50	65.68	65.87	66.73	66.89	72.30	71.25	L106-103
5	4	23.947	0.09	0.09	0.90	0.08	0.08	10.0	10.0	6.5	0.53	4.95	2.58	15	0.50	67.93	68.05	68.21	68.33	71.25	71.25	L111-106
6	4	133.836	0.13	0.67	0.90	0.12	0.60	10.0	10.5	6.4	3.85	4.95	3.36	15	0.50	65.87	66.54	67.20	67.56	71.25	71.00	L107-106
7	6	18.193	0.21	0.21	0.90	0.19	0.19	10.0	10.0	6.5	1.23	7.52	2.21	15	1.15	66.79	67.00	67.76	67.44	71.00	70.40	L110-107
8	6	23.448	0.10	0.33	0.90	0.09	0.30	10.0	10.3	6.4	1.91	5.00	2.78	15	0.51	66.79	66.91	67.76	67.46	71.00	71.00	L108-107
9	8	17.510	0.23	0.23	0.90	0.21	0.21	10.0	10.0	6.5	1.35	5.02	2.95	15	0.51	66.91	67.00	67.46	67.46	71.00	70.40	L109-108
10	3	169.139	0.00	4.62	0.90	0.00	2.77	10.0	10.6	6.4	56.41	110.3	7.54	48	0.50	64.38	65.23	66.73	67.49	72.30	70.85	L104-103
11	10	167.286	4.62	4.62	0.60	2.77	2.77	10.0	10.0	6.5	56.81	109.6	7.75	48	0.50	65.23	66.06	67.49	68.33	70.85	70.56	L105-104
12	2	86.127	0.00	0.00	0.90	0.00	0.00	10.0	10.0	0.0	20.19	33.85	5.33	30	0.58	63.25	63.75	65.59	65.27	72.60	68.50	OS4-L102

25 YR DESIGN

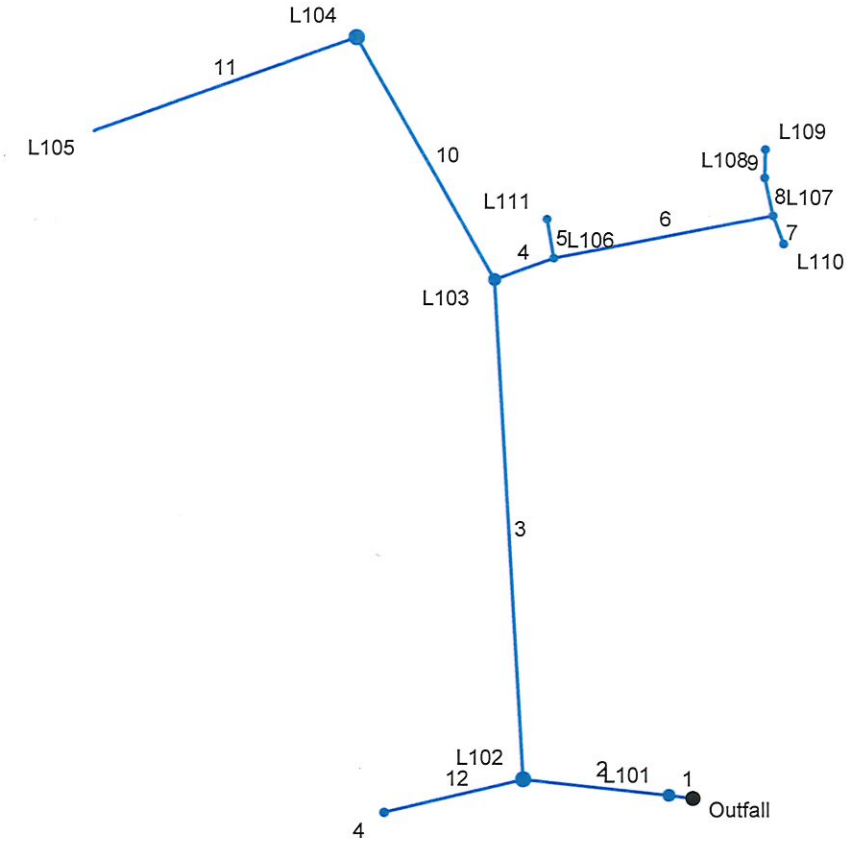
Project File: L-line network - 10-23-19.stm

Number of lines: 12

Run Date: 10/23/2019

NOTES:Intensity = 106.91 / (Inlet time + 13.90) ^ 0.88 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: L-line network - 10-23-19.stm	Number of lines: 12	Date: 10/23/2019

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	14.508	0.00	5.48	0.90	0.00	3.55	10.0	12.4	7.2	84.46	108.1	8.08	48	0.48	60.87	60.94	64.46	63.72	65.53	71.75	L101-100
2	1	87.964	0.00	5.48	0.90	0.00	3.55	10.0	12.2	7.2	84.65	111.3	9.40	48	0.51	62.43	62.88	65.04	65.67	71.75	72.60	L102-101
3	2	304.649	0.00	5.48	0.90	0.00	3.55	10.0	11.2	7.5	65.32	109.2	7.57	48	0.49	62.88	64.38	65.67	66.82	72.60	72.30	L103-102
4	3	37.862	0.10	0.86	0.90	0.09	0.77	10.0	11.0	7.5	5.82	4.96	4.74	15	0.50	65.68	65.87	66.93	67.19	72.30	71.25	L106-103
5	4	23.947	0.09	0.09	0.90	0.08	0.08	10.0	10.0	7.8	0.63	4.95	2.71	15	0.50	67.93	68.05	68.23	68.36	71.25	71.25	L111-106
6	4	133.836	0.13	0.67	0.90	0.12	0.60	10.0	10.4	7.7	4.63	4.95	3.77	15	0.50	65.87	66.54	67.54	68.12	71.25	71.00	L107-106
7	6	18.193	0.21	0.21	0.90	0.19	0.19	10.0	10.0	7.8	1.47	7.52	1.20	15	1.15	66.79	67.00	68.34	68.35	71.00	70.40	L110-107
8	6	23.448	0.10	0.33	0.90	0.09	0.30	10.0	10.2	7.7	2.30	5.00	1.87	15	0.51	66.79	66.91	68.34	68.37	71.00	71.00	L108-107
9	8	17.510	0.23	0.23	0.90	0.21	0.21	10.0	10.0	7.8	1.61	5.02	1.31	15	0.51	66.91	67.00	68.39	68.40	71.00	70.40	L109-108
10	3	169.139	0.00	4.62	0.90	0.00	2.77	10.0	10.6	7.6	59.96	110.3	7.68	48	0.50	64.38	65.23	66.82	67.56	72.30	70.85	L104-103
11	10	167.286	4.62	4.62	0.60	2.77	2.77	10.0	10.0	7.8	60.40	109.6	7.93	48	0.50	65.23	66.06	67.56	68.40	70.85	70.56	L105-104
12	2	86.127	0.00	0.00	0.90	0.00	0.00	10.0	10.0	0.0	20.19	33.85	5.30	30	0.58	63.25	63.75	65.67	65.27	72.60	68.50	OS4-L102

100YR ANALYSIS

Project File: L-line network - 10-23-19.stm

Number of lines: 12

Run Date: 10/23/2019

NOTES:Intensity = 150.20 / (Inlet time + 15.60) ^ 0.91 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

West Windsor - Mimimum Swale Slope

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

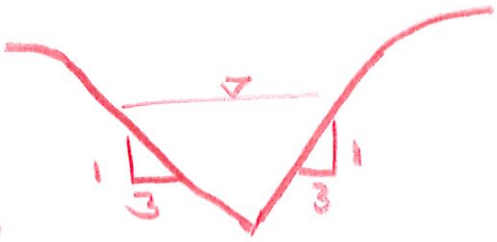
Roughness Coefficient	0.045	
Channel Slope	0.00250	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	10.00	ft³/s

← MIN SLOPE

← MAX

Results

Normal Depth	1.57	ft
Flow Area	7.38	ft²
Wetted Perimeter	9.92	ft
Hydraulic Radius	0.74	ft
Top Width	9.41	ft
Critical Depth	0.93	ft
Critical Slope	0.04088	ft/ft
Velocity	1.36	ft/s
Velocity Head	0.03	ft
Specific Energy	1.60	ft
Froude Number	0.27	
Flow Type	Subcritical	



MINIMUM SWALE SECTION ANALYSED

UNDER MIN & MAX SLOPE CONDITION

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.57	ft
Critical Depth	0.93	ft
Channel Slope	0.00250	ft/ft
Critical Slope	0.04088	ft/ft

FOR MAX 25-YR FLOW CASE.

RESULT: SWALES TO BE LINED W/ EROSION CONTROL MATTING TO PREVENT EROSION DURING CONSTRUCTION

West Windsor - Maximum Swale Slope

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.045	
Channel Slope	0.02000	ft/ft – MAX 2%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	10.00	ft³/s – MAX

Results

Normal Depth	1.06	ft
Flow Area	3.38	ft²
Wetted Perimeter	6.72	ft
Hydraulic Radius	0.50	ft
Top Width	6.37	ft
Critical Depth	0.93	ft
Critical Slope	0.04088	ft/ft
Velocity	2.96	ft/s ← SWALE TO BE LINED
Velocity Head	0.14	ft
Specific Energy	1.20	ft
Froude Number	0.72	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.06	ft
Critical Depth	0.93	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.04088	ft/ft

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MERCER CO., WEST WINDSOR TWP	44.9	1.43

Project Name:	Sample Project
Description:	west windsor phase 1
Analysis Date:	01/15/20

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	6.9	Row Crop	Galestown	14.5	363,219
2	0.7	Woods-grass combination	Galestown	14.7	37,417
3					
4					
5					
6					
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	7.6			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				14.5	400,636

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	5.5	Impervious areas	Galestown	0.0	-
2	2.1	Open space	Galestown	15.3	116,435
3					
4					
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	7.6			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				4.2	116,435
				Total Impervious Area (sq.ft)	239,580

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	
Post-Development Annual Recharge Deficit=	***284,201***	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	1.59	(in)	DRWC=	1.59	(in)
ERWC =	0.45	(in)	EDRWC=	0.45	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
Sample Project	west windsor phase 1	01/15/20	basin 1

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	6700.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	21.0	in
Upper level of the BMP surface (negative if above ground)	dBMPu	-21.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	0.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	2	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.60	in
ERWC Modified to consider dEXC	EDRWC	0.60	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.47	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.61	in
Inches of Rainfall to capture	Pdesign	0.75	in
Recharge Provided Avg. over Imp. Area		24.1	in
Runoff Captured Avg. over imp. Area		25.1	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.03	unitless
BMP Volume	VBMP	11,725	cu.ft

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	284,201	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	239,580	sq.ft
Root Zone Water Capacity	RWC	2.10	in
RWC Modified to consider dEXC	DRWC	2.10	in
Climatic Factor	C-factor	1.43	no units
Average Annual P	Pavg	44.9	in
Recharge Requirement over Imp. Area	dr	14.2	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		481,318	cu.ft
Avg BMP Recharge Efficiency		95.9%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.7%	%
%Runoff Infiltrated		72.0%	%
%Runoff Recharged		69.1%	%
%Rainfall Recharged		53.7%	%

CALCULATION CHECK MESSAGES

Volume Balance-> **Solve Problem to satisfy Annual Recharge**
dBMP Check---> **OK**
dEXC Check---> **OK**
BMP Location---> **OK**

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

NEW JERSEY 24 HOUR RAINFALL FREQUENCY DATA

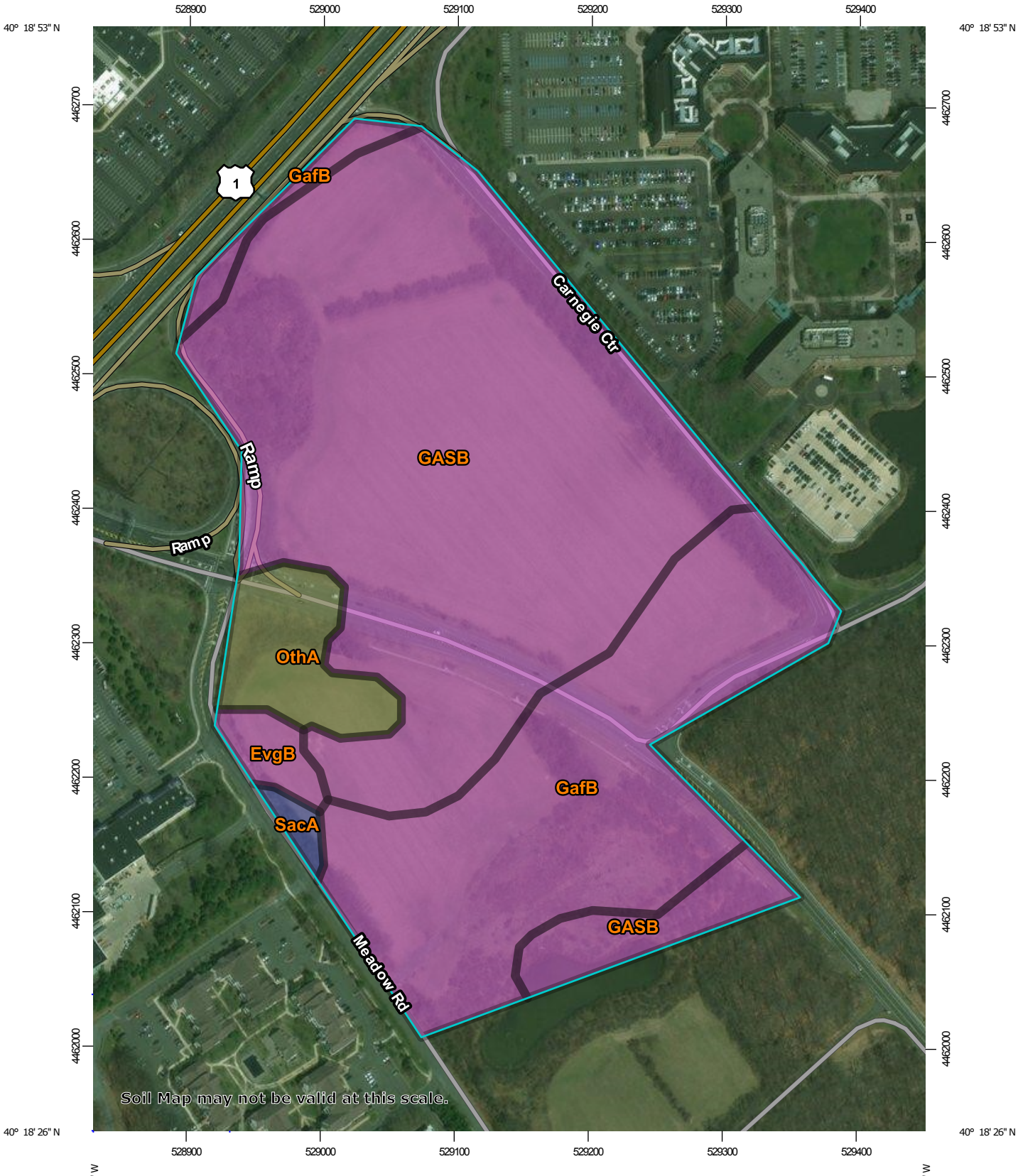
Rainfall amounts in Inches

County	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Atlantic	2.72	3.31	4.30	5.16	6.46	7.61	8.90
Bergen	2.75	3.34	4.27	5.07	6.28	7.32	8.47
Burlington	2.77	3.36	4.34	5.18	6.45	7.56	8.81
Camden	2.73	3.31	4.25	5.06	6.28	7.34	8.52
Cape May	2.67	3.25	4.22	5.07	6.34	7.47	8.73
Cumberland	2.69	3.27	4.25	5.09	6.37	7.49	8.76
Essex	2.85	3.44	4.40	5.22	6.44	7.49	8.66
Gloucester	2.71	3.29	4.24	5.05	6.29	7.36	8.55
Hudson	2.73	3.31	4.23	5.02	6.19	7.20	8.31
Hunterdon	2.80	3.38	4.26	5.00	6.09	7.02	8.03
Mercer	2.74	3.31	4.23	5.01	6.19	7.20	8.33
Middlesex	2.76	3.35	4.30	5.12	6.36	7.43	8.63
Monmouth	2.79	3.38	4.38	5.23	6.53	7.66	8.94
Morris	2.94	3.54	4.47	5.24	6.37	7.32	8.35
Ocean	2.81	3.42	4.45	5.33	6.68	7.87	9.20
Passaic	2.87	3.47	4.42	5.23	6.43	7.47	8.62
Salem	2.69	3.26	4.20	5.00	6.22	7.28	8.45
Somerset	2.76	3.34	4.25	5.01	6.15	7.13	8.21
Sussex	2.68	3.22	4.02	4.70	5.72	6.60	7.58
Union	2.80	3.39	4.35	5.17	6.42	7.49	8.69
Warren	2.78	3.34	4.18	4.89	5.93	6.83	7.82

Notes: The average point rainfall amounts listed above were developed from data contained in NOAA Atlas 14 Volume 2.

Point rainfall estimates for specific locations may be obtained from the Precipitation Frequency Data Server located at http://www.nws.noaa.gov/ohd/hdsc/

For most hydrologic design procedures, the rainfall amounts listed above may be rounded to the nearest tenth of an inch.



Map Scale: 1:4,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Mercer County, New Jersey
Survey Area Data: Version 13, Oct 6, 2017

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

Date(s) aerial images were photographed: Aug 14, 2015—Apr 2, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EvgB	Evesboro loamy sand, 0 to 5 percent slopes	A	0.9	1.7%
GafB	Galestown sandy loam, 0 to 5 percent slopes	A	15.7	30.7%
GASB	Galloway variant soils, 0 to 5 percent slopes	A	31.3	61.4%
OthA	Othello silt loams, 0 to 2 percent slopes, Northern Coastal Plain	C/D	2.7	5.4%
SacA	Sassafras sandy loam, 0 to 2 percent slopes, Northern Coastal Plain	B	0.4	0.7%
Totals for Area of Interest			**50.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

STORMWATER MANAGEMENT TESTING REPORT

West Windsor Residential Development

West Windsor Township, Mercer County, New Jersey

March 2019

Prepared For:

BOWMAN CONSULTING
303 West Main Street, Suite 350
Freehold, New Jersey 07728

Attn: Mr. R. Michael McKenna, P.E., P.P.

Prepared By:

GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
14 Worlds Fair Drive, Suite A
Somerset, New Jersey 08873

GTA Job No: 31190147

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm

March 8, 2019

Bowman Consulting
303 West Main Street, Suite 350
Freehold, New Jersey 07728

Attn: Mr. R. Michael McKenna, P.E., P.P.

Re: Stormwater Management Testing Report
West Windsor Residential Development
West Windsor Township, Mercer County, New Jersey

Dear Mr. McKenna:

In accordance with our agreement dated January 24, 2019, Geo-Technology Associates, Inc. (GTA) has performed subsurface explorations and testing for the planning and design of stormwater management (SWM) facilities related to a proposed residential development to be constructed in West Windsor Township, Mercer County, New Jersey. The exploration consisted of excavating 37 test pits with in-situ infiltration testing at the site, visually classifying the encountered soils, and performing limited laboratory testing. The results of the field and laboratory testing, and GTA's recommendations regarding the design and construction of the proposed SWM facilities are included in this report.

GTA appreciates the opportunity to have been of assistance to you on this project. Please contact our office at (732) 271-9301 if you have questions or require additional information.

Very truly yours,
GEO-TECHNOLOGY ASSOCIATES, INC.

Allison Tether

Allison Tether, P.G.
Senior Project Manager

Dennis C. Loh, P.E.
Vice President

AMT/DCL: at
Job No. 31190147
Attachments

TABLE OF CONTENTS

STORMWATER MANAGEMENT TESTING REPORT

WEST WINDSOR RESIDENTIAL DEVELOPMENT
WEST WINDSOR TOWNSHIP
MERCER COUNTY, NEW JERSEY
MARCH 2019

INTRODUCTION

This report presents the results of subsurface explorations and in-situ infiltration testing performed by Geo-Technology Associates, Inc. (GTA) for the planning and design of stormwater management (SWM) facilities related to a proposed residential development to be constructed in West Windsor Township, Mercer County, New Jersey. The subject site is located southeast of Route 1 between Old Meadow Road and Carnegie Center Drive. The site is divided into two portions by Meadow Road located to the north and south.

GTA was provided with a plan prepared by Bowman Consulting titled "Plan Showing Test Pit Locations" dated February 5, 2019. The plan indicates the existing topography and locations of 37 requested test pits with infiltration testing throughout the site. GTA was also provided with an untitled plan prepared by Bowman Consulting dated December 4, 2018. The plan indicates the locations and dimensions of the proposed residential structures, clubhouse structures, parking areas, and potential recharge basins.

The scope of GTA's services was to perform test pits and infiltration testing following the guidance of Appendix E of the NJ Stormwater BMP Manual and prepare a report of our findings and recommendations. According to Appendix E, test pits and infiltration tests should be performed at each infiltration location at the level of infiltration or deeper if hydraulically restrictive soils are present within 8 feet of the proposed basin bottom level. Therefore, at this site the test pits must extend at least 8 feet below the planned level of infiltration to satisfy the Appendix E guidance.

BACKGROUND

GTA previously performed a geotechnical exploration for proposed hotel and restaurant structures located adjacently north of the proposed residential development, as well as SWM testing services in a proposed basin area located adjacently east of the intersection of Old Meadow Road

and Meadow Road. Our previous explorations generally encountered sandy silt soils overlying silty sands and poorly-graded sands with silt. The explorations in the basin area were performed in November and generally encountered groundwater at depths of about 6 to 7½ feet below the ground surface, corresponding to about Elevation (EL) 65 feet. The in-situ infiltration testing indicated the sandy silts were relatively impermeable compared to the underlying poorly-graded sands.

SITE CONDITIONS

The site is divided into two portions by Meadow Road, located to the north and south. The northern portion of the site is bounded by Meadow Road and the on-ramp to U.S. Route 1 north to the west, Carnegie Center Drive to the south and east, and borders agricultural land to north. The southern portion of the site is bounded by Meadow Road to the north and east, Old Meadow Road to the west, and borders wooded areas to the south. At the time of our study, the site contained agricultural land, and trees were present along the bordering roadways.

Based on our visual observations and review of the ground surface topography shown on the plan provided to us, the existing ground surface in the northern half of the site generally slopes gently downward from about Elevation (EL) 75 feet in the north to about EL 68 feet in the south along Meadow Road, where it then slopes steeply upward to the road to about EL 72 to 75 feet. The southern half of the site contains a topographic high at about EL 74 feet in the southcentral portion and gently slopes down to about EL 67 feet in the central portion of the site and back up to about EL 72 feet in the north. The southern portion of the site contains an existing basin, which is established at about EL 61 feet, and is surrounded by a berm that slopes steeply up to about EL 71 feet.

PROPOSED CONSTRUCTION

Based on the plans provided to us, we understand that the proposed residential development will include 15 residential structures and a clubhouse structure in the northern portions of the site, and 23 residential structures and a clubhouse structure in the southern portion of the site. The plan indicates three potential recharge basins located in the northern half of the site along Meadow Road, and two potential basins in the southcentral portion of the southern half of the site. Infiltration testing was requested within the potential recharge basin areas, and at several additional locations throughout the site adjacent to the proposed residential structures.

SITE GEOLOGY

The subject site is situated within the Piedmont physiographic province characterized by a low rolling plain divided by a series of higher ridges and predominantly underlain by sedimentary rocks of Triassic and Jurassic age. The site is underlain by the Stockton Formation of the Upper Triassic Period of the Mesozoic Era, as shown on the *Bedrock Geologic Map of the Princeton Quadrangle, Mercer and Middlesex Counties, New Jersey (OFM 93, 2012)* published by the New Jersey Geological and Water Survey. This formation is described as an interbedded sequence of gray, grayish-brown, or slightly reddish-brown, medium- to fine-grained, thin- to thick-bedded, conglomerate and arkosic sandstone, and reddish-brown clayey fine-grained sandstone, siltstone, and mudstone. Fining upward sequences are common, and the coarser units commonly occur as lenses. The unit is approximately 4,500 feet in thickness.

According to the *Surficial Geology of New Jersey (DGS07-2, 2013)* published as part of the Digital Geodata Series by the New Jersey Geological and Water Society, generated using data from the United States Geological Survey, the surficial geology of the northern half of the site and the portion of the site adjacently west of Meadow road in the southern half of the site are mapped as Eolian Deposits. The majority of the western portion of the southern half of the site is mapped as weathered shale, mudstone and sandstone, and a relatively thin deposit of alluvium is shown between these two units in the central portion of the southern half of the site. The Eolian deposits are described as very pale brown and yellow-brown windblown fine sand and silt and can be as much as 15 feet thick. The alluvium is described as reddish-brown, yellowish-brown, brown and gray sand, gravel, silt and minor clay with variable amounts of organic matter and can be as much as 20 feet thick. The weathered shale, mudstone, and sandstone is described as reddish-brown, yellow, and light gray silty sand to silty clay with shale, mudstone, or sandstone fragments.

Please refer to the referenced publications for more detailed descriptions of the geologic members.

SUBSURFACE EXPLORATION

The subsurface exploration program consisted of excavating a total of 37 test pits at the locations indicated on the plan provided. The test pits were excavated by Heritage Contracting Company, Inc. on February 14, 15 and 18, 2019 using a Caterpillar 308CR Excavator, and extended

to depths ranging from approximately 7 to 16 feet below the existing surface grades. The exploration locations were selected and staked by Bowman Consulting prior to our exploration. In-situ infiltration tests were performed adjacent to each of the test pits at depths ranging from about 2 to 10 feet below the ground surface. Please note that the numbers shown on the test pits logs and location plan are consistent with the numbers indicated on the field stakes at each location. However, the original number sequence on the plan provided to us and the corresponding field stakes skipped a few numbers including 217, 220, 226 and 227. Therefore, even though only 37 test pits were performed, the numbering of the test pits goes up to TP-241 and the skipped numbers do not represent explorations performed for this study.

The approximate locations of the explorations performed for this study are shown on the Test Pit Location Plan, which is included as Figure 2 in Appendix A. Detailed descriptions of the encountered subsurface conditions are indicated on the Logs of Test Pits, which are presented in Appendix B. The ground surface elevations indicated on the exploration logs were obtained by interpolation between topographic contours shown on the plans, and should be considered approximate.

Soil samples obtained from the test pits were brought to GTA's laboratory for visual classification by a geotechnical engineer and limited laboratory testing. The soil descriptions shown on the logs are therefore based on visual observation of the samples, supplemented by the laboratory results.

LABORATORY TESTING

Laboratory testing performed for this study included grain-size distribution and Atterberg Limits testing for classification of the soils in accordance with the Unified Soil Classification System (USCS), and natural moisture content determinations. Detailed results of the laboratory testing performed for this study are included in Appendix C. The results of the testing are summarized in the following table:

SUMMARY OF LABORATORY TESTING

Test Pit Location	Depth (Ft)	LL (%)	PI (%)	USCS Classification	NMC (%)
TP-201	4-5	NP	NP	Silty SAND (SM)	20.6
TP-205	6½-7½	NP	NP	Poorly-graded SAND with silt (SP-SM)	10.2
TP-207	12-13	NP	NP	Poorly-graded SAND with silt and gravel (SP-SM)	27.7
TP-214	3½-4½	35.5	20.7	Sandy Lean CLAY (CL)	23.3
TP-218	2-3	19.6	4.9	Sandy, Silty CLAY (CL-ML)	18.2
TP-222	2-3	24.1	5.7	Silty, Clayey SAND (SC-SM)	18.1
TP-224	4½-5½	NP	NP	Poorly-graded SAND (SP)	22.5
TP-229	3-4	NP	NP	Well-graded SAND with silt (SW-SM)	17.6
TP-237	6-7	NP	NP	Poorly-graded SAND with gravel (SP)	10.6

Note: NMC=Natural Moisture Content, LL=Liquid Limit, PI=Plasticity Index, NP=Non-plastic

SUBSURFACE CONDITIONS

An approximately 10- to 12-inch thick layer of topsoil was encountered at the ground surface in the test pits performed for this study. The natural soils encountered below the topsoil appear to be consistent with the geologic mapping, and in the northern half of the site generally consisted of fine-grained silt or clay soils overlying silty sands and poorly-graded sands with varying amounts of silt. Clayey sands and silty, clayey sands were encountered at the surface in the eastern portion of the southern half of the site, and silty sands were encountered at the surface in the western portion of the southern half, overlying mainly poorly-graded sands with some well-graded sands encountered in Test Pits TP-228 and TP-229.

Fill materials were encountered at the ground surface in Test Pits TP-231, TP-233, TP-234, TP-235 and TP-236 performed for this study in the southern portion of the southern half of the site, adjacent to the existing basin. The extent of the fill in this area can be seen on the topographic plan. The fill extended to depths ranging from about 6 to 8½ feet below the ground surface and generally consisted of sandy silt, silty sand and poorly-graded sand soils. Relatively minor amounts of asphalt and concrete fragments were encountered within the fill.

Groundwater was encountered in 36 of the 37 test pits at depths ranging from about 4 to 13½ feet below the ground surface. Long-term groundwater readings were not obtained because the test pits were backfilled upon completion for safety considerations. Fluctuations in the groundwater level typically occur due to several factors, including variations in precipitation, seasonal changes, and site development activities. Soil mottling indicative of the seasonal high groundwater level was not observed in the test pits. We believe the seasonal high groundwater level generally corresponds to the groundwater level encountered in the explorations.

INFILTRATION TEST RESULTS

In-situ infiltration tests were performed adjacent to each of the test pits performed for this study using a double-ring infiltrometer in accordance with the ASTM D 3385 test procedure. The tests were performed at depths ranging from approximately 2 to 10 feet below the ground surface within the natural soils, and at 4 of the test locations (TP-231, TP-234, TP-235, and TP-236) the infiltration tests were performed within the existing fill materials. The results of the infiltration tests performed for this study are summarized in the following table. A factor of safety of at least 2 should be applied to the measured infiltration rates.

SUMMARY OF INFILTRATION TEST RESULTS

Test Pit Location	Approximate Test Depth* (ft)	Final Water Level Drop (in)	Time Interval (min)	USCS Classification	Measured Infiltration Rate (in/hr)
TP-201	4	⅛	10	Silty SAND with gravel (SM)	0.75
TP-202	3	0	10	Silty SAND (SM)	0
TP-203	5	2	5	Poorly-graded SAND (SP)	24
TP-204	4	1¼	6	Poorly-graded SAND with silt (SP-SM)	12.5
TP-205	6.5	2¼	10	Poorly-graded SAND with silt and gravel (SP-SM)	13.5
TP-206	5	⅛	30	Silty SAND (SM)	0.25
TP-207	5½	½	10	Silty SAND (SM)	3
TP-208	5	1	15	Poorly-graded SAND with silt and gravel (SP-SM)	4
TP-209	5	½	30	Silty SAND (SM)	3
TP-210	4½	⅝	6	Poorly-graded SAND with silt (SP-SM)	6.25
TP-211	2½	0	30	Sandy SILT (ML)	0

Test Pit Location	Approximate Test Depth* (ft)	Final Water Level Drop (in)	Time Interval (min)	USCS Classification	Measured Infiltration Rate (in/hr)
TP-212	3	0	30	Sandy SILT (ML)	0
TP-213	3	¼	10	Silty SAND (SM)	1.5
TP-214	3½	⅛	10	Sandy SILT (ML)	0.75
TP-215	2	0	10	Silty SAND (SM)	0
TP-216	2½	⅛	10	Silty SAND (SM)	0.75
TP-218	2½	0	30	Sandy SILT (ML)	0
TP-219	2	0	30	Sandy SILT (ML)	0
TP-221	4½	½	5	Silty SAND (SM)	6
TP-222	3½	⅛	30	Sandy SILT (ML)	0.25
TP-223	5	1¼	5	Poorly-graded SAND with silt (SP-SM)	15
TP-224	5	2	5	Poorly-graded SAND (SP)	24
TP-225	5	1	5	Poorly-graded SAND with silt (SP-SM)	12
TP-228	4½	¼	30	Poorly-graded SAND with silt (SP-SM)	0.5
TP-229	3	2½	10	Poorly-graded SAND with silt (SP-SM)	15
TP-230	4½	½	5	Silty SAND (SM)	6
TP-231	7	1½	10	FILL: Silty SAND with gravel (SM)	9
TP-232	4	1	10	Silty SAND (SM)	6
TP-233	10	0	30	Sandy SILT (ML)	0
TP-234	5	3	10	FILL: Poorly-graded SAND with silt (SP-SM)	18
TP-235	6	0	30	FILL: Sandy SILT (ML)	0
TP-236	5	0	30	FILL: Sandy SILT (ML)	0
TP-237	4	3	5	Poorly-graded SAND with gravel (SP)	36
TP-238	5½	2¼	10	Poorly-graded SAND with silt (SP-SM)	13.5
TP-239	3	1	10	Poorly-graded SAND with silt (SP-SM)	6
TP-240	5	2½	10	Poorly-graded SAND with silt (SP-SM)	15
TP-241	3½	¼	10	Poorly-graded SAND with silt (SP-SM)	1.5

*Beneath the existing ground surface.

CONCLUSIONS AND RECOMMENDATIONS

The primary conditions that affect the ability to infiltrate water through soil are the soil gradation and density properties and the presence of hydraulically restrictive layers such as silt or clay (fines), rock, or groundwater, each of which would restrict the flow of water into the underlying aquifer. The soil profile generally consisted of fine-grained silt and clay soils overlying silty sands and poorly-graded sands. Groundwater was encountered in the test pits at depths ranging from about 4 to 13½ feet below the ground surface. In general, the fine-grained soils (ML, CL, CL-ML) were not receptive to infiltration, the granular soils with high fines percentages (SC-SM, SC, SM) were somewhat receptive to infiltration, and the deeper coarse-grained sands (SP-SM, SP, SW-SM) appeared receptive to infiltration. GTA recommends that the existing fill materials should not be relied upon for infiltration.

We believe the infiltration test results and groundwater observations indicate that infiltration of collected stormwater is generally feasible within the deeper, natural poorly-graded sand layer and in portions of the silty sand soils. However, it appears that fine-grained soils will be present at shallow depths across most of the site and these soils are relatively impermeable. Therefore, where fine-grained soils are present at the planned level of infiltration, it will be necessary to excavate through the fine-grained soils to expose the more permeable granular soils. This process may also be required in some areas where silty sand soils are present at the planned infiltration level. In some cases, it may be possible to scarify relatively compact silty sand soils to improve their infiltration properties. We recommend additional testing be performed at the time of construction to verify the design assumptions. This testing should be performed after the subgrades are properly prepared.

Excavation for the proposed recharge areas may also encounter localized areas of silty fine-grained sand, cemented sands, clay clods and thin clay layers, or dense soils. If these soils are encountered at the planned infiltration depths, we recommend that they be undercut to expose the underlying more permeable soils. The overexcavation should then be backfilled to the proposed bottom of basin elevation using granular soils, washed gravel, or sand meeting the design infiltration rate. We anticipate a significant portion of the excavated soils will be suitable for reuse provided the clay soils can be adequately removed from the sandy soils matrix. The backfill should be placed loosely, to promote infiltration.

It will be important to limit disturbance and compaction of the infiltration surface during construction. Infiltration areas should not be exposed to unstabilized runoff that may contribute to sedimentation and clogging of the subgrade, and possible system failure, prior to the completion of construction. Where possible, the operation of heavy construction equipment directly on the infiltration area subgrades should be avoided or kept to a minimum. After grubbing and rough grading, infiltration areas should be tilled with a disc or rotary tiller followed by a leveling drag, to restore the soils to a loose condition.

Construction oversight by competent engineering personnel during installation of stormwater management facilities is critical to successful functioning of the system. Ideally, construction oversight should be provided by the geotechnical engineer, or qualified representative, retained by the project owner to document construction operations and assure that project specifications and special construction requirements are met. Periodic inspection and maintenance of the infiltration system will be required to maximize the efficiency and design life of the system.

ADDITIONAL SERVICES

We recommended that GTA be retained during construction of the subject project to provide geotechnical consultation and construction observation and testing services as outlined below:

- Provide on-site observation and testing during construction.
- Perform infiltration testing at the time of construction to document that the infiltration subgrades have been properly prepared.

LIMITATIONS

This report, including all supporting test pit logs, field data, field notes, laboratory test data, calculations, estimates and other documents prepared by GTA in connection with this project have been prepared for the exclusive use of Bowman Consulting (Client) pursuant to the Agreement between GTA and Client dated January 24, 2019, and in accordance with generally accepted engineering practice. All terms and conditions set forth in the Agreement and the General Provisions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein. Use and reproduction of this report by any other person without the expressed written permission of GTA and Client is unauthorized and such use is at the sole risk of the user.

The analysis and recommendations contained in this report are based on the data obtained from limited observation and testing of the encountered materials. Test pits indicate soil conditions only at specific locations and times, and only at the depths penetrated. They do not necessarily reflect strata or variations that may exist between test pit locations. Consequently, the analysis and recommendations must be considered preliminary until the subsurface conditions can be verified by direct observation at the time of construction. If variations of subsurface conditions from those described in this report are noted during construction, recommendations in this report may need to be re-evaluated.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing. GTA is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of GTA.

The scope of our services for this geotechnical exploration did not include any environmental assessment or investigation for the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the logs regarding odors or unusual or suspicious items or conditions observed are strictly for the information of our Client.

This report and the attached logs are instruments of service. The subject matter of this report is limited to the facts and matters stated herein. Absence of a reference to any other conditions or subject matter shall not be construed by the reader to imply approval by the writer.

31190147 **GEO-TECHNOLOGY ASSOCIATES, INC.**

Important Information about Your

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical-Engineering Report Is Based on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical-engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical-engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold-prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical-engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold-prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your GBA-Member Geotechncial Engineer for Additional Assistance

Membership in the GEOPROFESSIONAL BUSINESS ASSOCIATION exposes geotechnical engineers to a wide array of risk confrontaton techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your GBA-member geotechnical engineer for more information.

GEOPROFESSIONAL BUSINESS ASSOCIATION
8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX A

Figures

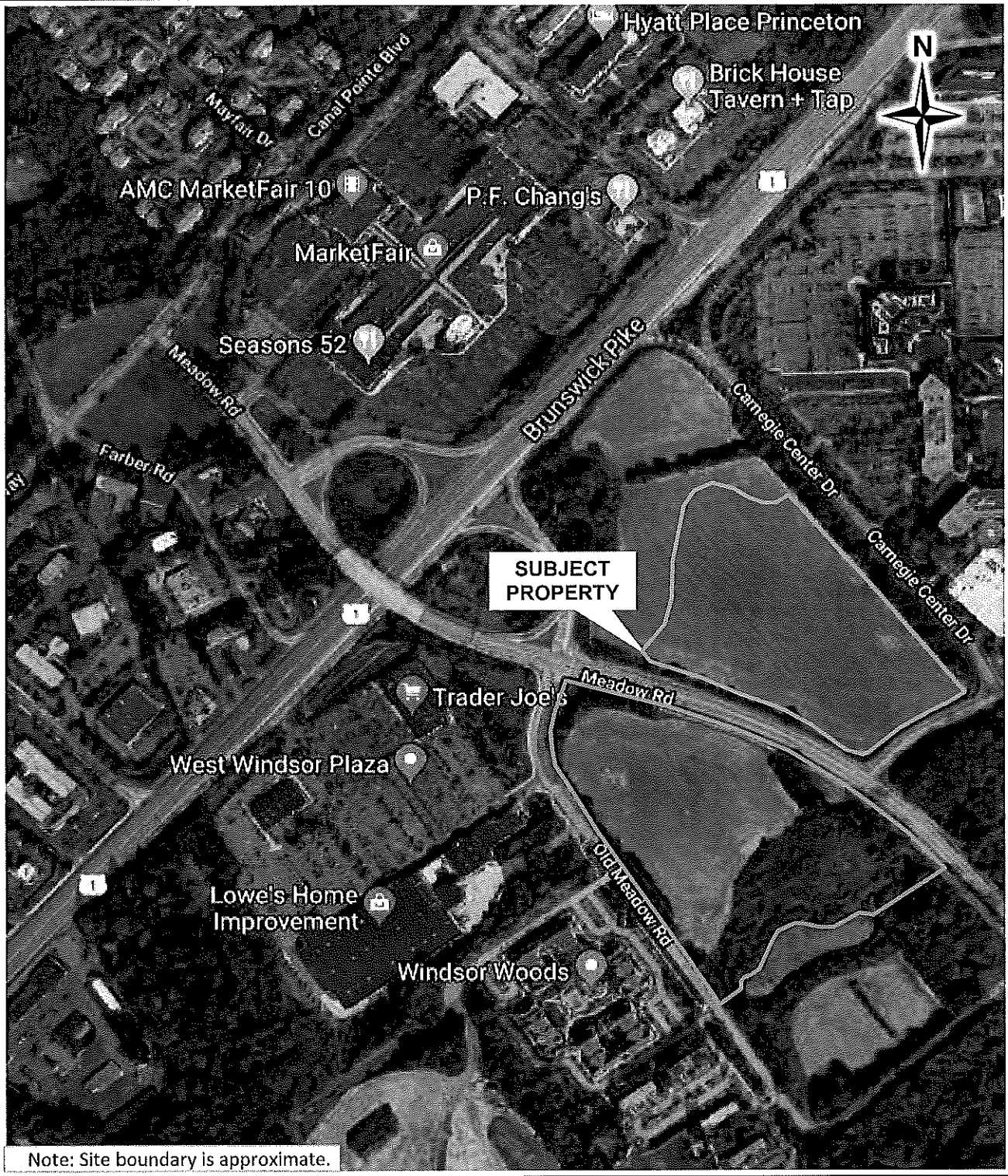


FIGURE 1: SITE LOCATION MAP

WEST WINDSOR RESIDENTIAL DEVELOPMENT

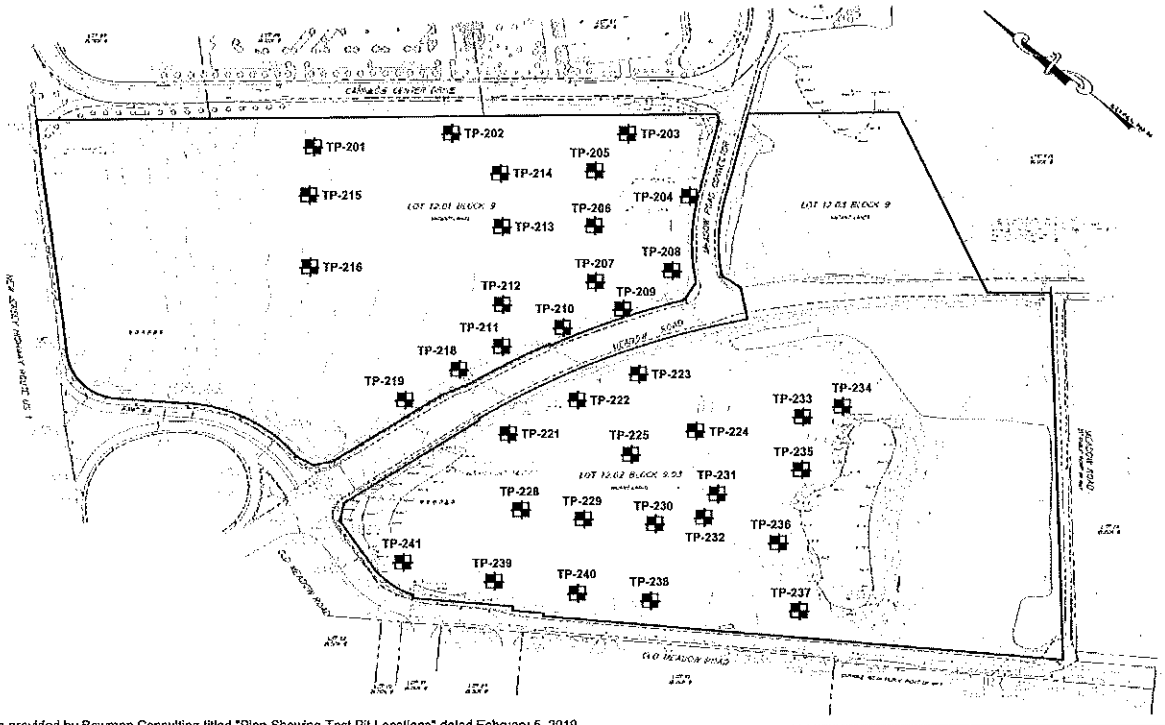
West Windsor Township,
Mercer County, New Jersey

Prepared For: Bowman Consulting

14 Worlds Fair Drive, Suite B
Somerset, New Jersey 08873
(732) 271-9301
fax (732) 271-9306

GEO-TECHNOLOGY ASSOCIATES, INC.

SOURCE: Google Map		
SCALE: NTS	DATE: FEB. 2019	PROJECT #: 31190147



*Base plan provided by Bowman Consulting titled "Plan Showing Test Pit Locations" dated February 5, 2019.

LEGEND:

TP-X

Indicates the numbers and approximate locations of test pits performed for this study.

TEST PIT LOCATION PLAN

14 Worlds Fair Drive, Suite B
Somerset, New Jersey 08873
(732) 271-9301
fax (732) 271-9306

GEO-TECHNOLOGY ASSOCIATES, INC.

WEST WINDSOR RESIDENTIAL DEVELOPMENT

West Windsor Township,
Mercer County, New Jersey

Prepared For: Bowman Consulting

DESIGN BY: *	DRAWN BY: AMT	REVIEWED BY: DCL
SCALE: NTS	DATE: FEB. 2019	PROJECT #: 31190147

Figure 2

APPENDIX B

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 GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 15% 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 15% 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	SILT OR CLAY (<15% RETAINED ON THE NO. 200 SIEVE)		SILTS AND LEAN CLAYS LIQUID LIMIT LESS THAN 50		ML
					CL
					OL
	SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED ON THE NO. 200 SIEVE)				
	SANDY OR GRAVELLY SILT OR CLAY (>30% RETAINED ON THE NO. 200 SIEVE)		ELASTIC SILTS AND FAT CLAYS LIQUID LIMIT GREATER THAN 50		MH
					CH
					OH
HIGHLY ORGANIC SOILS					PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS WHICH CONTAIN AN ESTIMATED 5 TO 15% FINES BASED ON VISUAL CLASSIFICATION OR BETWEEN 5 AND 12% FINES BASED ON LABORATORY TESTING; AND FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSS-HATCHED AREA. FINE-GRAINED SOILS ARE CLASSIFIED AS ORGANIC (OL OR OH) WHEN ENOUGH ORGANIC PARTICLES ARE PRESENT TO INFLUENCE ITS PROPERTIES. LABORATORY TEST RESULTS ARE USED TO SUPPLEMENT SOIL CLASSIFICATION BY THE VISUAL-MANUAL PROCEDURES OF ASTM D 2488.

ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

	DESCRIPTION		GRAPHIC SYMBOLS
ADDITIONAL DESIGNATIONS	TOPSOIL		
	MAN MADE FILL		
	GLACIAL TILL		
	COBBLES AND BOULDERS		
RESIDUAL SOIL DESIGNATIONS	DESCRIPTION	"N" VALUE	
	HIGHLY WEATHERED ROCK	50 TO 50/1"	
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR 1" OF PENETRATION OR LESS, 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 D 1586

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
SOIL SAMPLE	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-201

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **6 Ft.**
GROUND SURFACE ELEVATION: **73 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
72.2		ML		Dark yellow-brown, distinct pale brown mottling, moist, SILT with sand	
70.5	2	SM		Dark yellow-brown, moist, Silty SAND with gravel	- NMC = 20.6% - Infiltration rate = 0.75 in/hr at 4 Ft.
68.0	4	SP-SM		Dark yellow-brown, moist, Poorly-graded SAND with silt - Wet at 6 Ft.	- Sidewall collapse at 5 Ft.
	6				
	8				
	10			- with gravel at 10 Ft.	
61.0	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-201

LOG OF TEST PIT NO. TP-202

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **6 Ft.**
GROUND SURFACE ELEVATION: **72 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
71.2		CL		Yellow-brown, moist, Sandy Lean CLAY	
	2				
69.5		SM		Dark yellow-brown, moist, Silty SAND with gravel	- Infiltration rate = 0 in/hr at 3 Ft.
	4				
	6			- Wet at 6 Ft.	▼ = Sidewall collapse at 6 Ft.
64.0	8	CL		Dark brown, wet, Lean CLAY with shale fragments	
	10				
60.0	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-202

LOG OF TEST PIT NO. TP-203

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **9 Ft.**
GROUND SURFACE ELEVATION: **71 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
70.2		ML		Dark yellow-brown, moist, SILT with sand and gravel	
	2				
	4				
66.0		SP		Dark yellow-brown, moist, Poorly-graded SAND	- Infiltration rate = 24 in/hr at 5 Ft.
	6				
	8				
				- Wet at 9 Ft.	▼
	10				
59.0	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-203

LOG OF TEST PIT NO. TP-204

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **8 Ft.**
GROUND SURFACE ELEVATION: **68 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
67.2		ML		Dark yellow-brown, moist, SILT with sand and gravel	
66.0	2	SP-SM		Dark yellow-brown, moist, Poorly-graded SAND with silt and clay clods	
	4				- Infiltration rate = 12.5 in/hr at 4 Ft.
63.0		SM		Dark yellow-brown and light olive-brown, moist, Silty SAND with clay clods	
	6				
60.0	8	SP-SM		Dark yellow-brown, wet, Poorly-graded SAND with silt and gravel	▼
	10				
57.0				Test pit complete at 11 Ft.	
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-204

LOG OF TEST PIT NO. TP-205

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **11 Ft.**
GROUND SURFACE ELEVATION: **72 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
71.2		ML		Dark yellow-brown, moist, SILT with sand and gravel	
	2				
	4				
	6				
65.5		SP-SM		Dark yellow-brown, moist, Poorly-graded SAND with silt and gravel	- NMC = 10.2% - Infiltration rate = 13.5 in/hr at 6-1/2 Ft.
	8				
	10			- Gravel grades out at 10 Ft.	
				- Wet at 11 Ft.	▼
	12			- Yellow-brown at 12 Ft.	
59.0				Test pit complete at 13 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-205

LOG OF TEST PIT NO. TP-206

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **9 Ft.**
GROUND SURFACE ELEVATION: **72 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
71.2		ML		Dark yellow-brown, moist, SILT with sand and gravel	
	2				
69.0		SM		Dark yellow-brown, moist, Silty SAND with clay clods	
	4				
	6				- Infiltration rate = 0.25 in/hr at 5 Ft.
	8				
				- Wet, with gravel at 9 Ft.	▼
	10				
61.0				Test pit complete at 11 Ft.	
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-206

LOG OF TEST PIT NO. TP-207

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7.5 Ft.**
GROUND SURFACE ELEVATION: **71 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
70.2		SM		Dark yellow-brown, moist, Silty SAND with gravel	
	2				
				- Yellow-brown at 5 Ft.	
	4				
	6				- Infiltration rate = 3 in/hr at 5-1/2 Ft.
64.0		SP-SM		Dark yellow-brown, wet, Poorly-graded SAND with silt and gravel	▼
	8				
	10				
	12				- NMC = 27.7%
	14				
55.0	16			Test pit complete at 16 Ft.	
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-207

LOG OF TEST PIT NO. TP-208

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7 Ft.**
GROUND SURFACE ELEVATION: **69 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
68.2	2	ML		Dark yellow-brown, moist, Sandy SILT with gravel	
65.0	4	SP-SM		Light yellow-brown, moist, Poorly-graded SAND with silt and gravel	- Infiltration rate = 4 in/hr at 5 Ft.
	6			- Wet at 7 Ft.	
	8				
	10			- Gravel grades out at 10 Ft.	
57.0	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-208

LOG OF TEST PIT NO. TP-209

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7 Ft.**
GROUND SURFACE ELEVATION: **68 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
67.2		ML		Dark yellow-brown, moist, SILT with sand and gravel	
	2				
	4				
63.0		SM		Light olive-brown, moist, Silty SAND	- Infiltration rate = 3 in/hr at 5 Ft.
	6			- Wet at 7 Ft.	▼
	8				
	10				
56.0	12	SP-SM		Dark yellow-brown, wet, Poorly-graded SAND with silt and gravel	
	14				
53.0				Test pit complete at 15 Ft.	
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-209

LOG OF TEST PIT NO. TP-210

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7 Ft.**
GROUND SURFACE ELEVATION: **68 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
67.2		ML		Dark yellow-brown, moist, SILT with sand and gravel	
	2				
65.5		SP-SM		Yellow-brown, moist, Poorly-graded SAND with silt	
	4				- Infiltration rate = 6.25 in/hr at 4-1/2 Ft.
	6			- Wet at 6 Ft.	▼
	8			- Dark yellow-brown at 8 Ft.	
	10				
	12				
55.0				Test pit complete at 13 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-210

LOG OF TEST PIT NO. TP-211

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **5 Ft.**
GROUND SURFACE ELEVATION: **69 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
68.2		ML		Dark yellow-brown, moist, Sandy SILT with gravel	
	2				- Infiltration rate = 0 in/hr at 2-1/2 Ft.
	4			- Wet at 5 Ft.	▼
63.0	6	SP-SM		Light yellow-brown, wet, Poorly-graded SAND with silt	
	8			- Dark yellow-brown at 8 Ft.	
	10				
57.0	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-211

LOG OF TEST PIT NO. TP-212

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **5.5 Ft.**
GROUND SURFACE ELEVATION: **70 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
69.2		ML		Dark yellow-brown, moist, SILT with sand and gravel	
	2				
	4				- Infiltration rate = 0 in/hr at 3 Ft.
65.0		SP-SM		Light yellow-brown, wet, Poorly-graded SAND with silt	▼
	6				
				- Dark yellow-brown at 7 Ft.	
	8				
60.0	10			Test pit complete at 10 Ft. due to sidewall collapse.	
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-212

LOG OF TEST PIT NO. TP-213

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **5 Ft.**
GROUND SURFACE ELEVATION: **71.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
70.7		CL		Yellow-brown, moist, Sandy Lean CLAY	
69.0	2	SM		Dark yellow-brown, moist, Silty SAND with clay clods	- Infiltration rate = 1.5 in/hr at 3 Ft.
66.5	4	SP		Dark yellow-brown, wet, Poorly-graded SAND	
	6				
	8				
	10				
59.5	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-213

LOG OF TEST PIT NO. TP-214

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **5.5 Ft.**
GROUND SURFACE ELEVATION: **71.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
70.7		ML		Dark yellow-brown, moist, SILT with sand and gravel	
	2				
69.0		CL		Yellow-brown, moist, Sandy Lean CLAY	- NMC = 23.3% - Infiltration rate = 0.75 in/hr at 3-1/2 Ft.
67.5	4	SP-SM		Dark yellow-brown, moist, Poorly-graded SAND with silt - Wet at 5-1/2 Ft.	
	6				
	8				
	10				
59.5	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-214

LOG OF TEST PIT NO. TP-215

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **4 Ft.**
GROUND SURFACE ELEVATION: **73.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
72.7		ML		Dark yellow-brown, moist, SILT with sand and gravel	
	2				
71.0		SM		Light yellow-brown, moist, Silty SAND	- Infiltration rate = 0 in/hr at 2 Ft.
69.5	4	SP-SM		Dark yellow-brown, wet, Poorly-graded SAND with silt	
	6				
	8				
	10				
61.5	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-215

LOG OF TEST PIT NO. TP-216

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **5 Ft.**
GROUND SURFACE ELEVATION: **74 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
73.2		ML		Dark yellow-brown, moist, SILT with sand and gravel	
71.5	2	SM		Dark yellow-brown, moist, Silty SAND	- Infiltration rate = 0.75 in/hr at 2-1/2 Ft.
	4			- Wet at 5 Ft.	
	6				
66.0	8	SC		Gray and dark yellow-brown, mottled, wet, Clayey SAND	
	10				
62.0	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-216

LOG OF TEST PIT NO. TP-218

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/14/2019**
DATE COMPLETED: **2/14/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **5 Ft.**
GROUND SURFACE ELEVATION: **69.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
68.7	2	CL-ML		Dark yellow-brown, moist, Sandy, Silty CLAY	- NMC = 18.2% - Infiltration rate = 0 in/hr at 2-1/2 Ft.
65.5	4	SP-SM		Yellow-brown, moist, Poorly-graded SAND with silt - Wet at 5 Ft. - Dark yellow-brown at 7 Ft. - Dark brown, with cemented soils at 9 Ft.	▼
56.5	12			Test pit complete at 13 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-218

LOG OF TEST PIT NO. TP-219

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **4 Ft.**
GROUND SURFACE ELEVATION: **69 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
68.2	2	CL-ML		Dark yellow-brown, moist, Sandy, Silty CLAY	- Infiltration rate = 0 In/hr at 2 Ft.
66.0	4	SP-SM		Dark yellow-brown, moist, Poorly-graded SAND with silt and clay clods - Wet at 4 Ft.	▼
	6				
	8			- Light yellow-brown at 8 Ft. - Dark yellow-brown and gray, with cemented soils at 9 Ft.	
59.0	10	SP		Red-brown, wet, Poorly-graded SAND	
57.0	12			Test pit complete at 12 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-219

LOG OF TEST PIT NO. TP-221

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **6 Ft.**
GROUND SURFACE ELEVATION: **67 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
66.0		ML		Dark yellow-brown, moist, SILT with sand and gravel	
	2				
64.0		SM		Dark yellow-brown, moist, Silty SAND	
	4			- Cobbles at 4 Ft.	- Infiltration rate = 6 in/hr at 4-1/2 Ft.
62.0		SP		Light yellow-brown, wet, Poorly-graded SAND	
	6				
60.0				Test pit complete at 7 Ft. due to sidewall collapse.	
	8				
	10				
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-221

LOG OF TEST PIT NO. TP-222

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **5.5 Ft.**
GROUND SURFACE ELEVATION: **67 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
66.2	2	SC-SM		Dark yellow-brown, moist, Silty, Clayey SAND	- NMC = 18.1%
	4			- With gravel at 4 Ft.	- Infiltration rate = 0.25 in/hr at 3-1/2 Ft.
62.0	6	SP-SM		Light olive-brown, moist, Poorly-graded SAND with silt - Wet at 5-1/2 Ft.	▼
58.0	8				
	10			Test pit complete at 9 Ft. due to sidewall collapse.	
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-222

LOG OF TEST PIT NO. TP-223

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7 Ft.**
GROUND SURFACE ELEVATION: **68 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
67.2	2	SC-SM		Dark brown, moist, Silty, Clayey SAND	
63.0	6	SP-SM		Dark yellow-brown, moist, Poorly-graded SAND with silt - Wet at 7 Ft.	- Infiltration rate = 15 in/hr at 5 Ft.
57.0	12			Test pit complete at 11 Ft. due to sidewall collapse.	
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-223

LOG OF TEST PIT NO. TP-224

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7.5 Ft.**
GROUND SURFACE ELEVATION: **69 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
68.0	2	SC-SM		Dark brown, moist, Silty, Clayey SAND	
65.0	4	SP		Dark brown, moist, Poorly-graded SAND	- NMC = 22.5% - Infiltration rate = 24 in/hr at 5 Ft.
	6				
	8			- Wet at 7-1/2 Ft.	▼
	10			- Dark yellow-brown at 9 Ft.	
58.0	12			Test pit complete at 11 Ft. due to sidewall collapse.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-224

LOG OF TEST PIT NO. TP-225

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7 Ft.**
GROUND SURFACE ELEVATION: **67 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
66.0	2	SC-SM		Dark brown, moist, Silty, Clayey SAND	
63.0	4	SP-SM		Dark brown, moist, Poorly-graded SAND with silt	- Infiltration rate = 12 in/hr at 5 Ft.
	6			- Light olive-brown at 6 Ft.	
	8			- Wet at 7-1/2 Ft.	
	10				
56.0	12			Test pit complete at 11 Ft. due to sidewall collapse.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-225

LOG OF TEST PIT NO. TP-228

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **6.5 Ft.**
GROUND SURFACE ELEVATION: **70.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
69.5		SC-SM		Dark brown, moist, Silty, Clayey SAND	
68.5	2	SW-SM		Light olive-brown, moist, Well-graded SAND with silt and occasional clay clods	
	4				- Infiltration rate = 0.5 in/hr at 4-1/2 Ft.
	6			- Wet at 6-1/2 Ft.	▼
	8			- Dark yellow-brown at 8 Ft.	
61.5				Test pit complete at 9 Ft. due to sidewall collapse.	
	10				
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-228

LOG OF TEST PIT NO. TP-229

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **6.5 Ft.**
GROUND SURFACE ELEVATION: **69 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
68.0		ML		Dark brown, moist, Sandy SILT	
67.0	2	SW-SM		Light olive-brown, moist, Well-graded SAND with silt	- NMC = 17.6% - Infiltration rate = 15 in/hr at 3 Ft.
	4				
	6			- Wet at 6-1/2 Ft.	
	8				
	10				
58.0				Test pit complete at 11 Ft.	
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-229

LOG OF TEST PIT NO. TP-230

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7 Ft.**
GROUND SURFACE ELEVATION: **67.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
66.5		SM		Dark yellow-brown, moist, Silty SAND	
	2				
	4				- Infiltration rate = 6 in/hr at 4-1/2 Ft.
	6				
				- Wet at 7 Ft.	▼
	8				
	10				
56.5				Test pit complete at 11 Ft. due to sidewall collapse.	
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-230

LOG OF TEST PIT NO. TP-231

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **13 Ft.**
GROUND SURFACE ELEVATION: **73 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0				
72.3				12 In. of Topsoil	
				FILL - Dark brown, moist, silty sand with debris (asphalt and concrete fragments)	
	2				
	4				
	6				
					- Infiltration rate = 9 in/hr at 7 Ft.
65.0	8	SM		Dark brown, moist, Silty SAND with gravel	
	10				
61.0	12	SP		Dark yellow-brown, moist, Poorly-graded SAND with gravel	
				- Wet at 13 Ft.	▼
59.0	14			Test pit complete at 14 Ft.	
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-231

LOG OF TEST PIT NO. TP-232

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **6 Ft.**
GROUND SURFACE ELEVATION: **67 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
66.0	2	SM		Dark brown, moist, Silty SAND	
62.5	4	SP		Dark yellow-brown, moist, Poorly-graded SAND with gravel	- Infiltration rate = 6 in/hr at 4 Ft.
	6			- Wet at 6 Ft.	▼
58.0	8			Test pit complete at 9 Ft. due to sidewall collapse.	
	10				
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-232

LOG OF TEST PIT NO. TP-233

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **74 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
73.3				FILL - Dark brown, moist, silt with sand and gravel	
	2				
	4				
	6			- With concrete and asphalt fragments at 5 Ft.	
	8				- Perched water seepage at 7 Ft.
65.5		ML		Dark brown, moist, Sandy SILT	
	10				- Infiltration rate = 0 in/hr at 10 Ft.
	12				
61.0		SM		Dark yellow-brown, moist, Silty SAND	
60.0	14			Test pit complete at 14 Ft.	
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-233

LOG OF TEST PIT NO. TP-234

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **11 Ft.**
GROUND SURFACE ELEVATION: **71.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
70.5				FILL - Dark brown, moist, poorly-graded sand with silt and gravel	
	2				
	4				- Infiltration rate = 18 in/hr at 5 Ft.
65.5	6	SM		Dark yellow-brown, moist, Silty SAND with gravel and clay clods	
	8				
62.5		SP-SM		Light brown, moist, Poorly-graded SAND with silt	
	10			- Wet at 11 Ft.	▼
	12				
57.5	14			Test pit complete at 14 Ft.	
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-234

LOG OF TEST PIT NO. TP-235

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **12 Ft.**
GROUND SURFACE ELEVATION: **73 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
72.0				FILL - Dark brown, moist, sandy silt with debris (asphalt and concrete fragments)	
	2				
	4				
	6				- Infiltration rate = 0 in/hr at 6 Ft.
65.0	8	ML		Dark brown, moist, SILT with sand	
	10				
62.0		SP-SM		Dark brown, moist, Poorly-graded SAND with silt	
	12			- Wet at 12 Ft.	▼
60.0				Test pit complete at 13 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-235

LOG OF TEST PIT NO. TP-236

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **13.5 Ft.**
GROUND SURFACE ELEVATION: **73 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
72.0				FILL - Dark brown, moist, sandy silt with gravel and cobbles	
	2				
	4				
	6				- Infiltration rate = 0 in/hr at 5 Ft.
65.0	8	SC		Dark yellow-brown, moist, Clayey SAND	
	10				
62.0		SP		Dark yellow-brown, moist, Poorly-graded SAND with gravel	
	12				
				- Wet at 13-1/2 Ft.	▼
59.0	14			Test pit complete at 14 Ft.	
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-236

LOG OF TEST PIT NO. TP-237

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **9 Ft.**
GROUND SURFACE ELEVATION: **67 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
66.0	2	SM		Dark yellow-brown, moist, Silty SAND	
64.0	4	SP-SM		Dark yellow-brown, moist, Poorly-graded SAND with gravel	- Infiltration rate = 36 in/hr at 4 Ft. - NMC = 10.6%
	6				
	8				
	10			- Wet at 9 Ft.	▼
56.0	12			Test pit complete at 11 Ft.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-237

LOG OF TEST PIT NO. TP-238

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7.5 Ft.**
GROUND SURFACE ELEVATION: **68.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
67.5	2	SM		Dark yellow-brown, moist, Silty SAND	
63.5	6	SP-SM		Yellow-brown, moist, Poorly-graded SAND with silt - Wet at 7-1/2 Ft.	- Infiltration rate = 13.5 in/hr at 5-1/2 Ft.
58.5	10			Test pit complete at 10 Ft. due to sidewall collapse.	

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-238

Sheet 1 of 1

LOG OF TEST PIT NO. TP-239

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **7 Ft.**
GROUND SURFACE ELEVATION: **72.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
71.8		SM		Dark yellow-brown, moist, Silty SAND	
	2				
70.0		SP-SM		Light yellow-brown, moist, Poorly-graded SAND with silt	- Infiltration rate = 6 in/hr at 3 Ft.
	4				
	6				
				- Wet at 7 Ft.	
	8				
63.5				Test pit complete at 9 Ft. due to sidewall collapse.	
	10				
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-239

LOG OF TEST PIT NO. TP-240

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/18/2019**
DATE COMPLETED: **2/18/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **8 Ft.**
GROUND SURFACE ELEVATION: **71.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
70.8		SM		Dark yellow-brown, moist, Silty SAND	
69.5	2	SP-SM		Dark yellow-brown, moist, Poorly-graded SAND with silt	
	4				- Infiltration rate = 15 in/hr at 5 Ft.
	6				
	8			- Wet at 8 Ft.	▼
62.5				Test pit complete at 9 Ft. due to sidewall collapse.	
	10				
	12				
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-240

LOG OF TEST PIT NO. TP-241

PROJECT: **West Windsor Residential Development**
PROJECT LOCATION: **West Windsor, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31190147**

DATE STARTED: **2/15/2019**
DATE COMPLETED: **2/15/2019**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Caterpillar 308CR Excavator**

GROUNDWATER ENCOUNTERED: **5.5 Ft.**
GROUND SURFACE ELEVATION: **69.5 Ft.**
DATUM: **TOPO**
LOGGED BY: **JMM**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			12 In. of Topsoil	
68.8		SM		Dark yellow-brown, moist, Silty SAND	
67.0	2	SP-SM		Yellow-brown, wet, Poorly-graded SAND with silt	
	4			- Wet at 5-1/2 Ft.	- Infiltration rate = 1.5 in/hr at 3-1/2 Ft.
63.5	6	SC		Very dark green-gray, wet, Clayey SAND	
	8				
60.5	10	CL		Red-brown, wet, Sandy Lean CLAY	
58.5	12			Test pit complete at 11 Ft. due to sidewall collapse.	
	14				
	16				
	18				
	20				
	22				
	24				

NOTES: **Locations were staked by others.**
Backfilled On Completion.

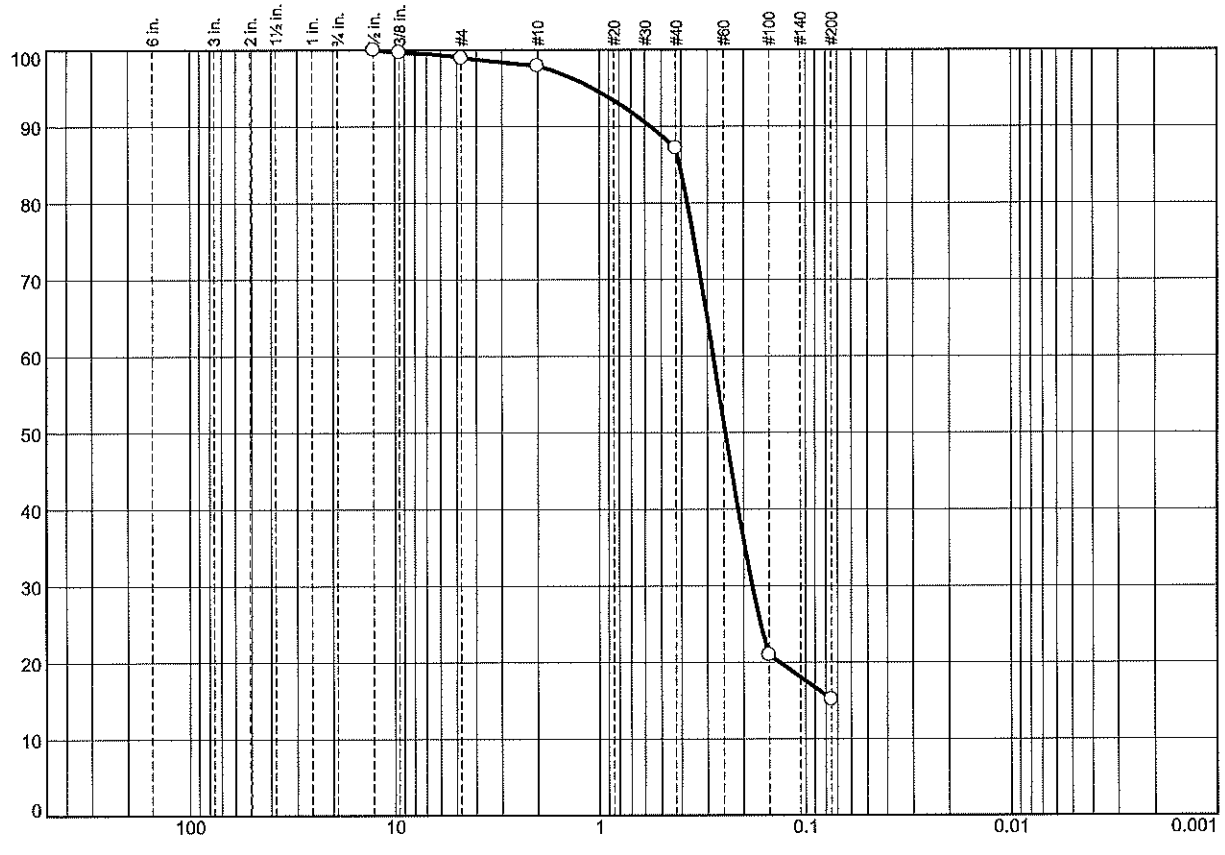
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-241

APPENDIX C

Laboratory Data

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.1	1.0	10.7	72.0	15.2	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NP	NP	0.4079	0.2804	0.2447	0.1811				

Material Description	USCS	AASHTO
○ Silty SAND	SM	A-2-4(0)

Project No. 31190147 **Client:** Bowman Consulting

Project: West Windsor Residential Development

○ **Source of Sample:** TP-201 **Depth:** 4

Date: ○

Remarks:

○NMC = 20.6%

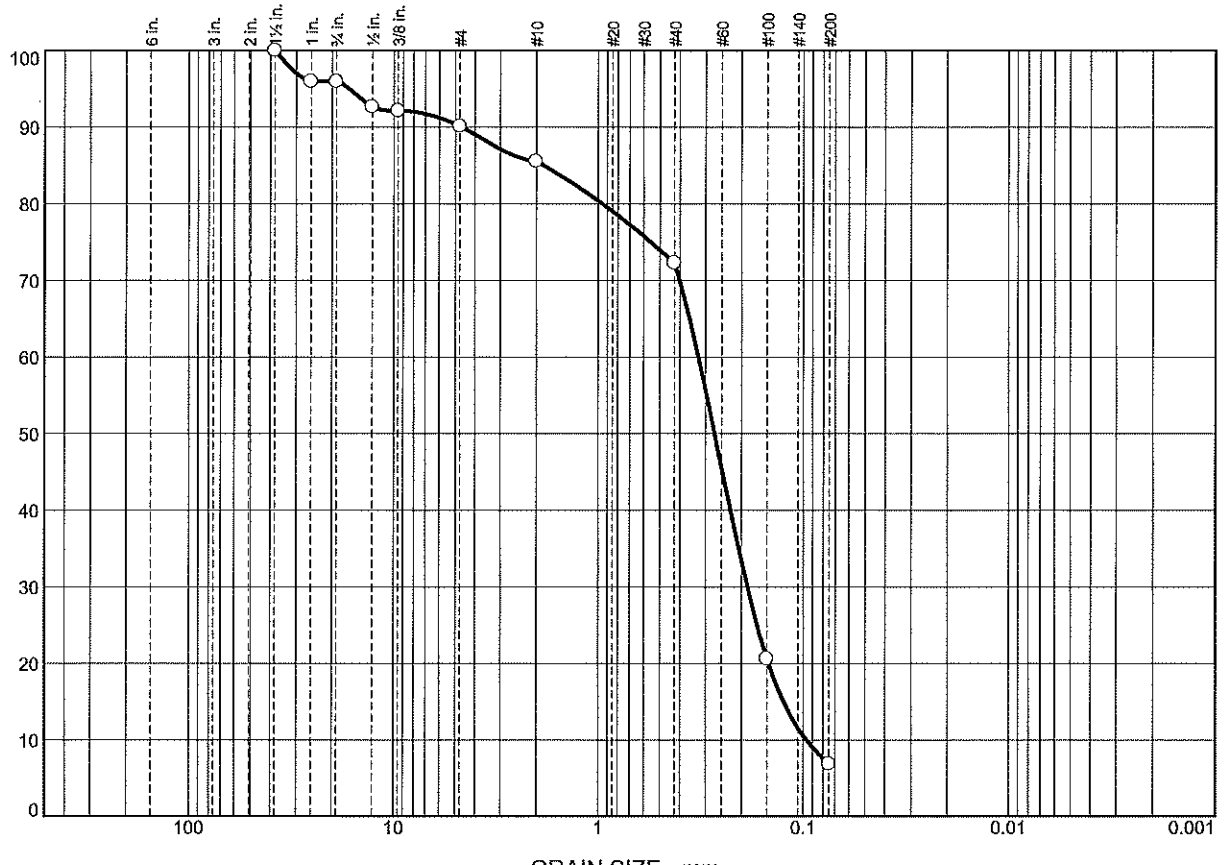
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	4.0	5.9	4.6	13.2	65.5	6.8	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NP	NP	1.8406	0.3255	0.2705	0.1864	0.1247	0.0963	1.11	3.38

Material Description	USCS	AASHTO
○ Poorly-graded SAND with silt	SP-SM	A-3

Project No. 31190147 **Client:** Bowman Consulting

Project: West Windsor Residential Development

○ **Source of Sample:** TP-205 **Depth:** 6.5

Date: ○

Remarks:

○NMC = 10.2%

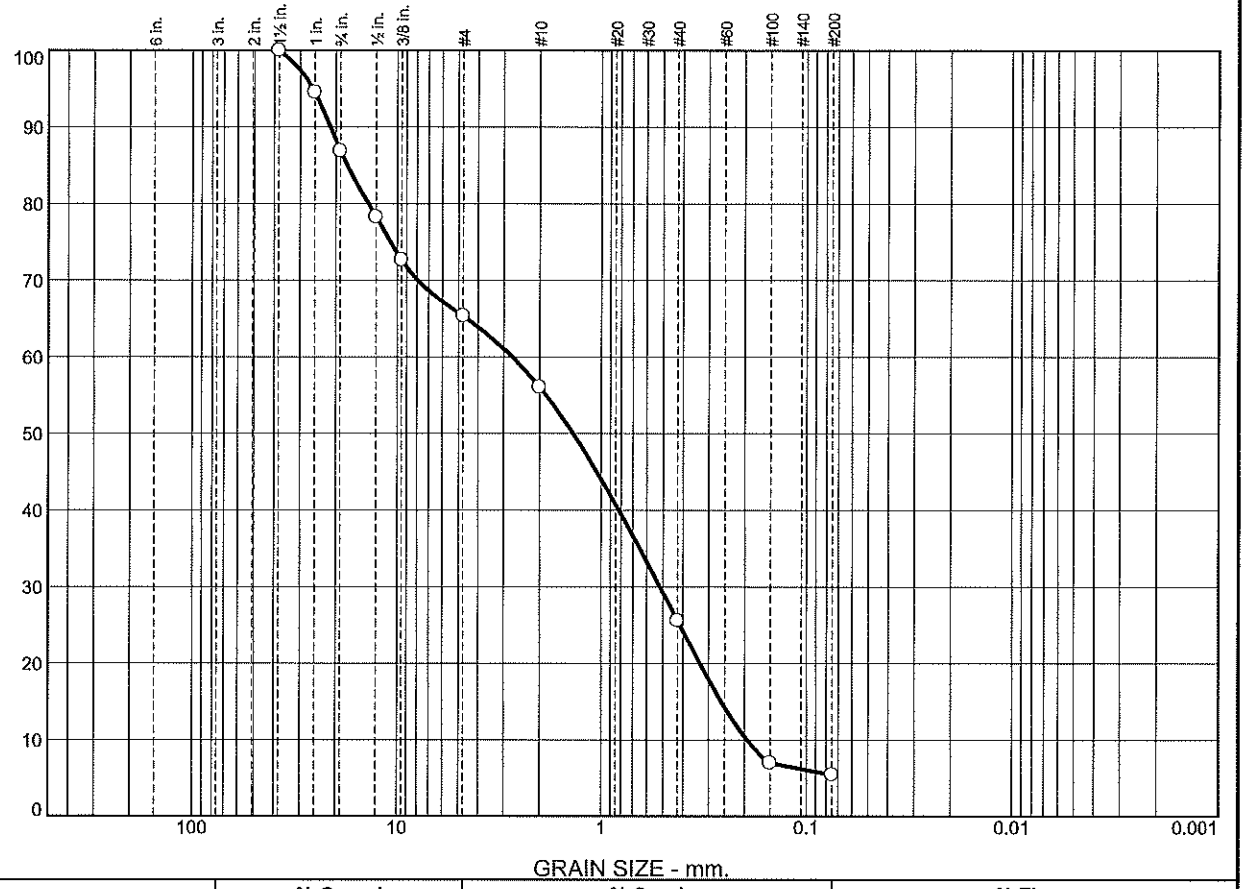
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	13.1	21.6	9.2	30.5	20.2	5.4	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NP	NP	17.6447	2.7185	1.3726	0.5178	0.2597	0.1943	0.51	13.99

Material Description	USCS	AASHTO
○ Poorly-graded SAND with silt and gravel	SP-SM	A-1-b

Project No. 31190147 **Client:** Bowman Consulting

Project: West Windsor Residential Development

○ **Source of Sample:** TP-207 **Depth:** 12

Date: ○

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Remarks:
○NMC = 27.7%

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.3	8.1	38.3	53.3	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		35.5	14.8	0.3221	0.1198						

Material Description	USCS	AASHTO
○ Sandy Lean CLAY	CL	A-6(7)

Project No. 31190147 **Client:** Bowman Consulting

Project: West Windsor Residential Development

○ **Source of Sample:** TP-214 **Depth:** 3.5

Date: ○

Remarks:

○NMC = 23.3%

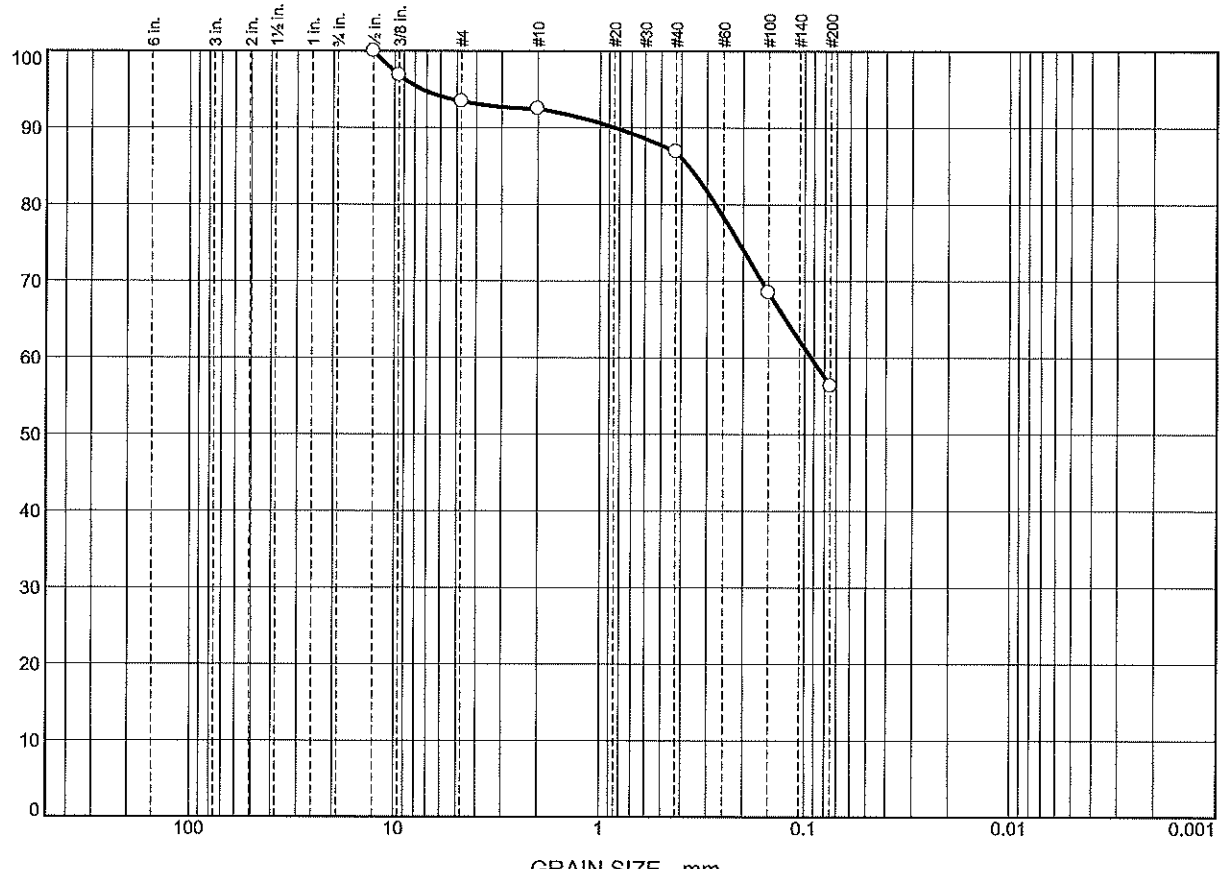
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	6.5	1.0	5.6	30.6	56.3	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		19.6	14.7	0.3692	0.0929						

Material Description	USCS	AASHTO
○ Sandy Silty CLAY	CL-ML	A-4(0)

Project No. 31190147 **Client:** Bowman Consulting

Project: West Windsor Residential Development

○ **Source of Sample:** TP-218 **Depth:** 2

Date: ○

Remarks:

○NMC = 18.2%

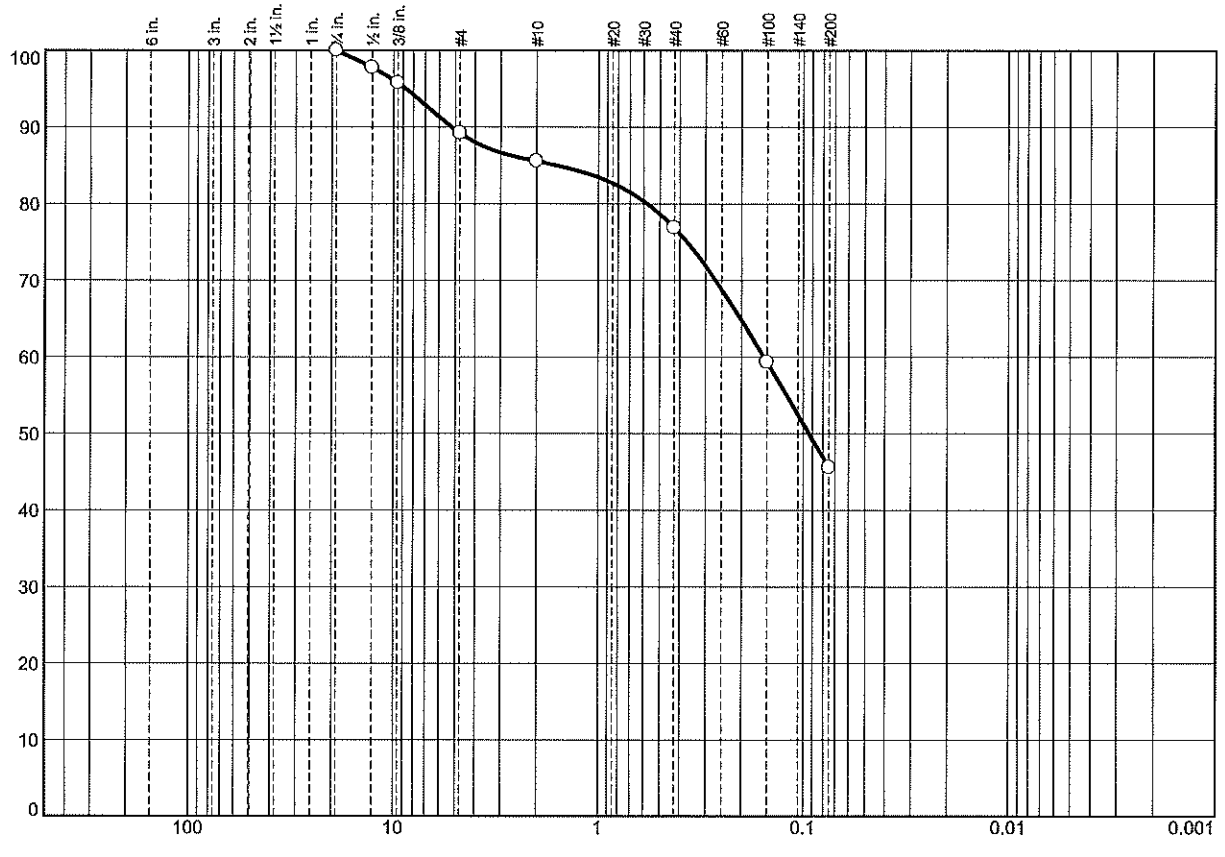
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	10.8	3.6	8.8	31.2	45.6	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		24.1	18.4	1.5912	0.1554	0.0936					

Material Description	USCS	AASHTO
○ Silty, Clayey SAND	SC-SM	A-4(0)

Project No. 31190147 **Client:** Bowman Consulting

Project: West Windsor Residential Development

○ **Source of Sample:** TP-222 **Depth:** 2

Date: ○

Remarks:

○NMC = 18.1%

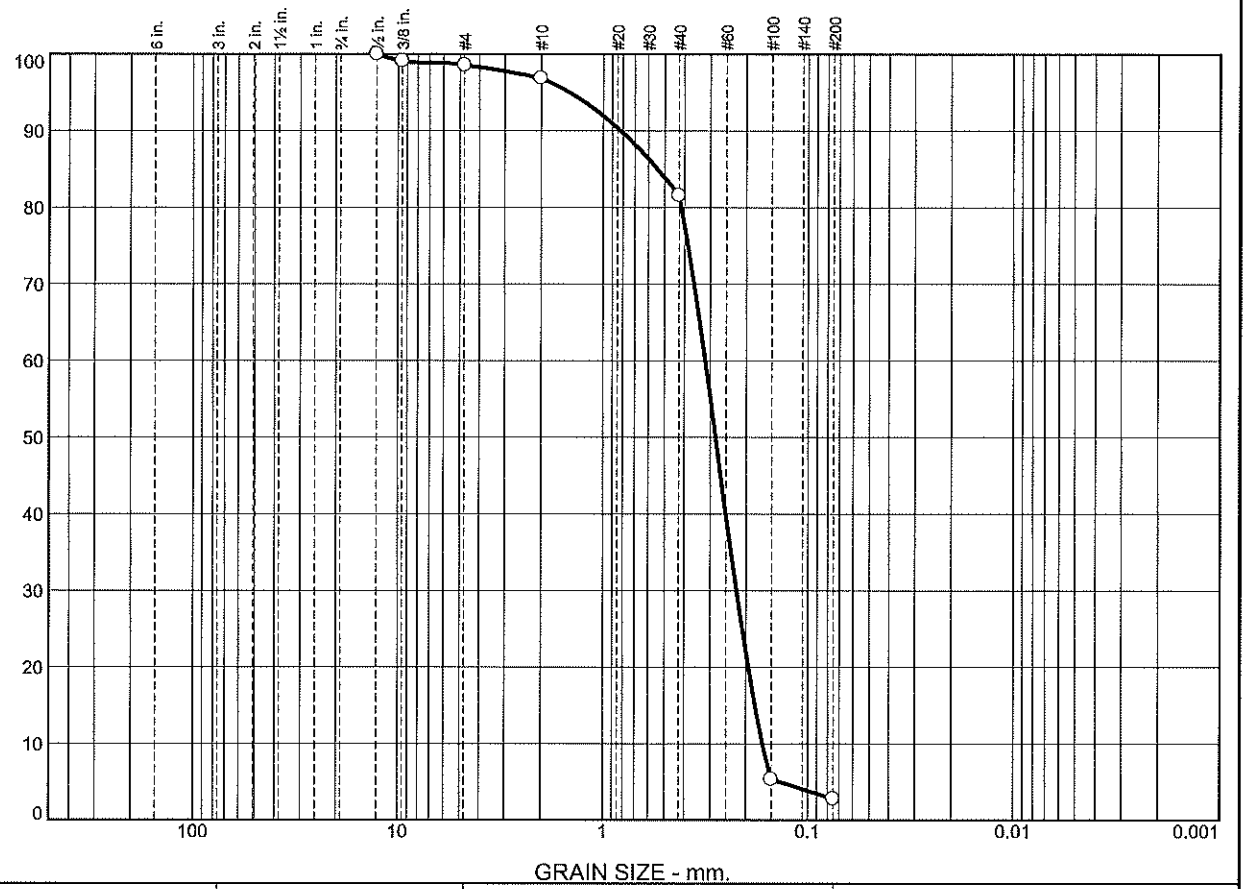
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.4	1.7	15.3	78.8	2.8	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NP	NP	0.5416	0.3170	0.2816	0.2219	0.1805	0.1657	0.94	1.91

Material Description	USCS	AASHTO
○ Poorly-graded SAND	SP	A-3

Project No. 31190147 **Client:** Bowman Consulting

Project: West Windsor Residential Development

○ **Source of Sample:** TP-224 **Depth:** 4.5

Date: ○

Remarks:

○NMC = 22.5%

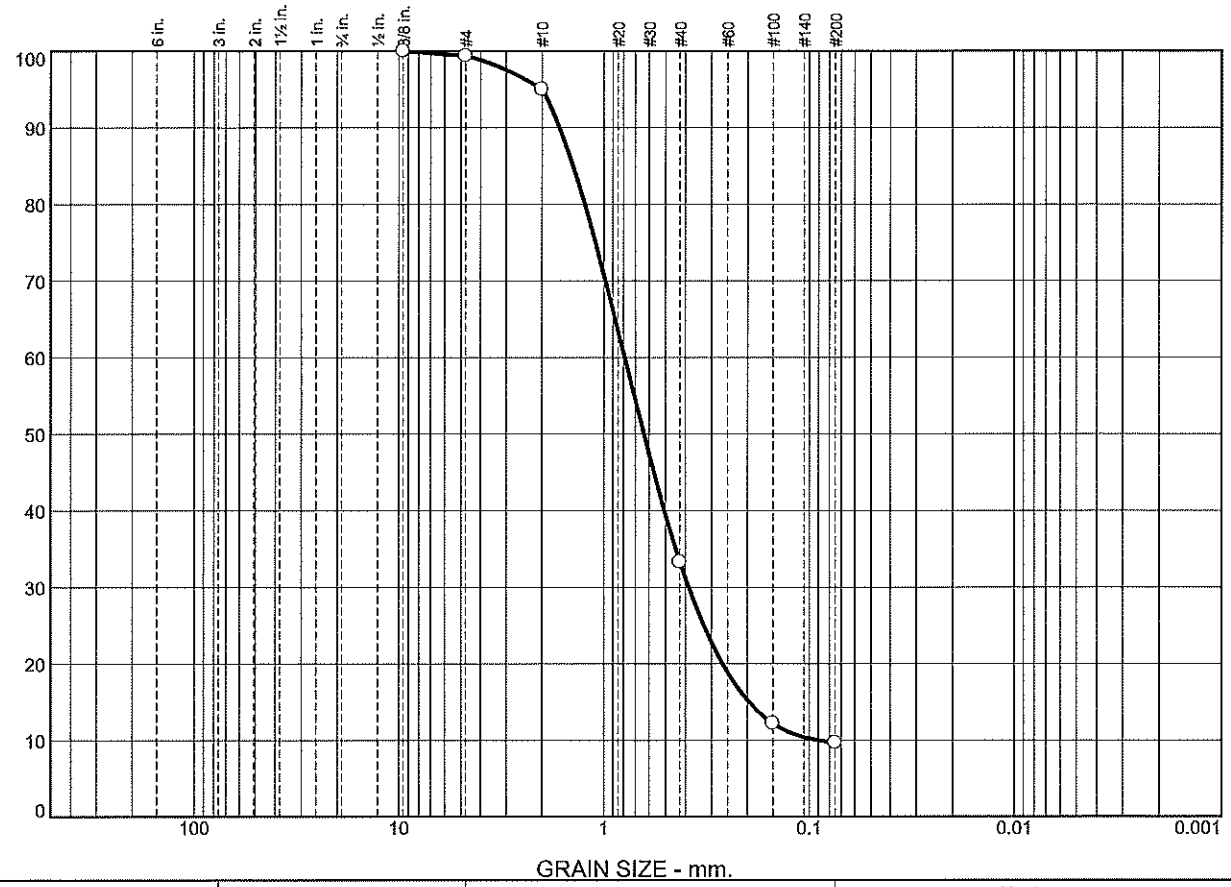
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.6	4.4	61.7	23.6	9.7	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NP	NP	1.4109	0.7893	0.6359	0.3857	0.1959	0.0900	2.09	8.77

Material Description	USCS	AASHTO
○ Well-graded SAND with silt	SW-SM	A-1-b

Project No. 31190147 **Client:** Bowman Consulting

Project: West Windsor Residential Development

○ **Source of Sample:** TP-229 **Depth:** 3

Date: ○

Remarks:

○NMC = 17.6%

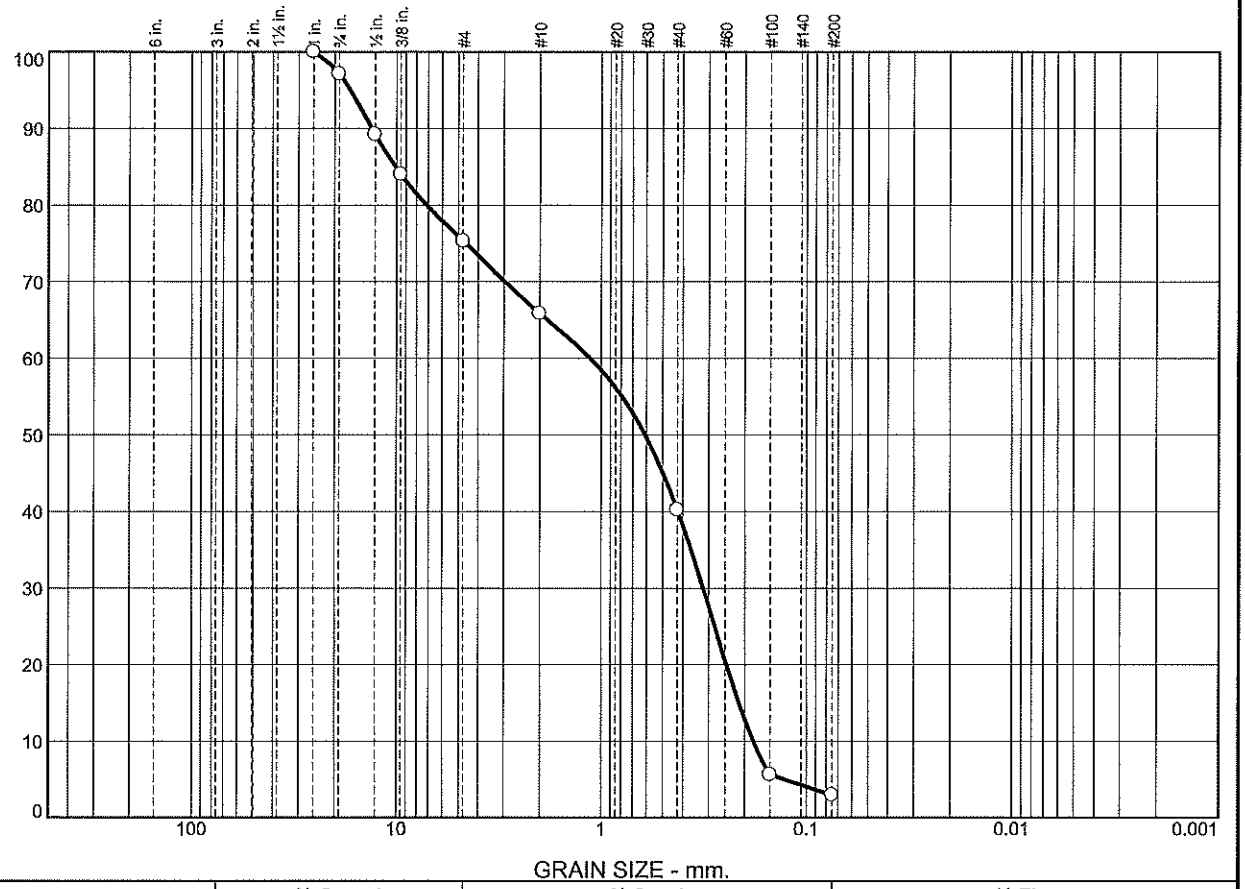
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	2.9	21.8	9.4	25.7	37.2	3.0	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NP	NP	10.1133	1.1313	0.6102	0.3195	0.2132	0.1813	0.50	6.24

Material Description	USCS	AASHTO
○ Poorly-graded SAND with gravel	SP	A-1-b

Project No. 31190147 **Client:** Bowman Consulting

Project: West Windsor Residential Development

○ **Source of Sample:** TP-237 **Depth:** 6

Date: ○

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

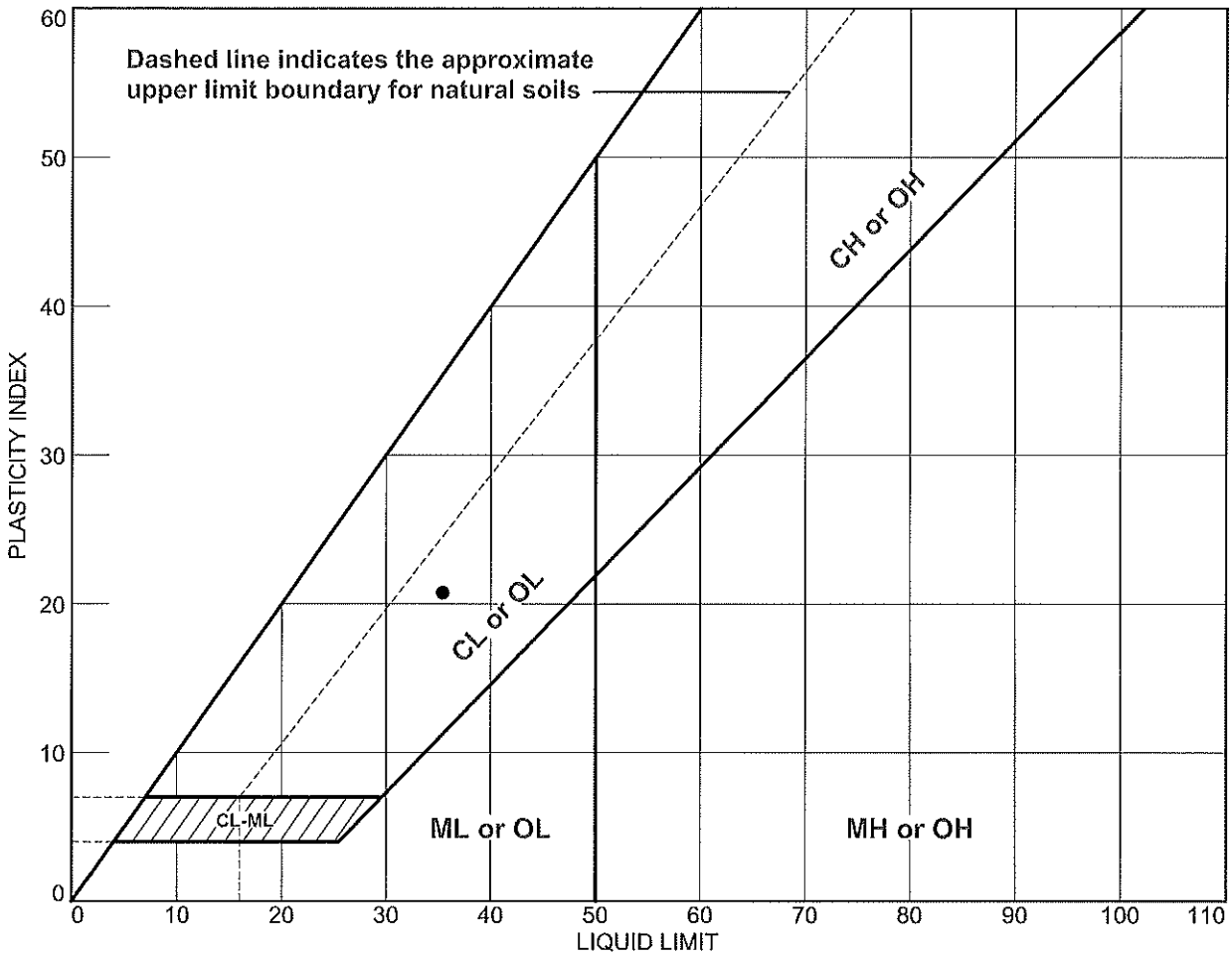
Remarks:
○NMC = 10.6%

Figure

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

Tested By: SB **Checked By:** AMT

LIQUID AND PLASTIC LIMITS TEST REPORT - ASTM D4318



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	TP-214		3.5	23.3	14.8	35.5	20.7	CL

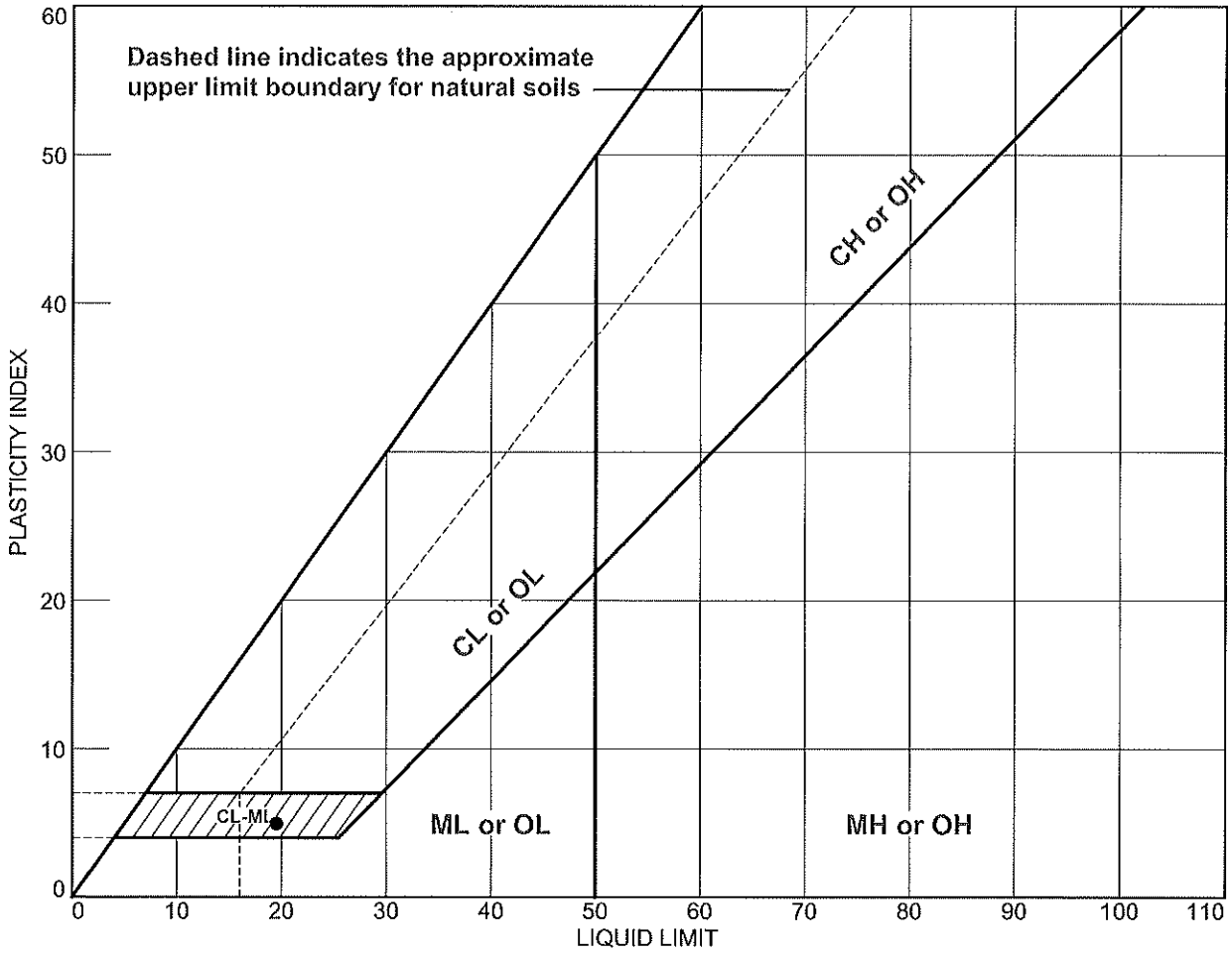
ASTM Specifications performed my include: D421, D422, D2216, D2217, and D4318.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Client: Bowman Consulting
Project: West Windsor Residential Development
Project No.: 31190147 **Figure**

Tested By: SB **Checked By:** AMT

LIQUID AND PLASTIC LIMITS TEST REPORT - ASTM D4318



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	TP-218		2	18.2	14.7	19.6	4.9	CL-ML

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

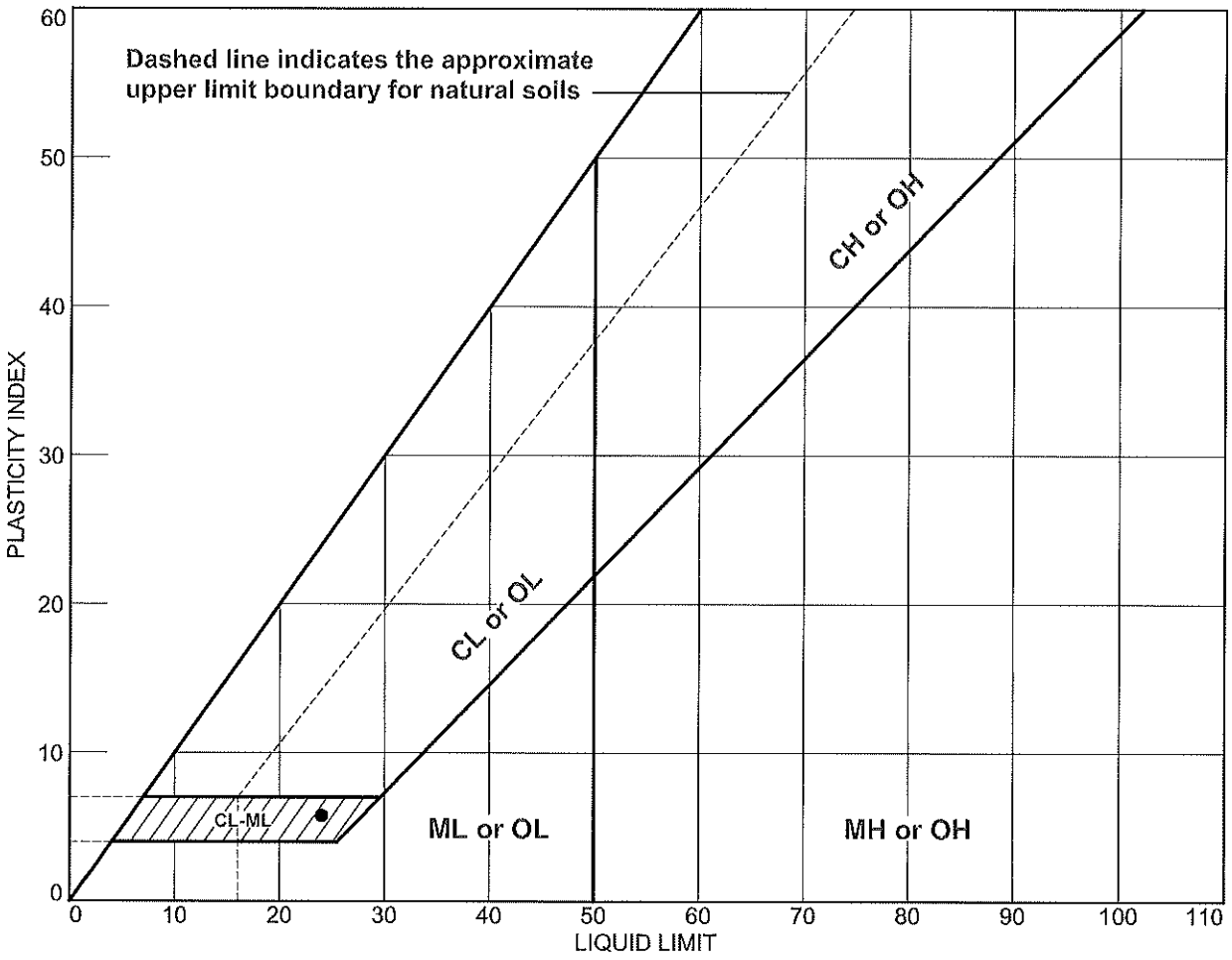
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Client: Bowman Consulting
Project: West Windsor Residential Development

Project No.: 31190147 **Figure**

Tested By: SB **Checked By:** AMT

LIQUID AND PLASTIC LIMITS TEST REPORT - ASTM D4318



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	TP-222		2	18.1	18.4	24.1	5.7	SC-SM

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

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Client: Bowman Consulting
Project: West Windsor Residential Development
Project No.: 31190147 **Figure**

Tested By: SB **Checked By:** AMT

STORMWATER MANAGEMENT TESTING REPORT

West Windsor Hotel Site

West Windsor Township, Mercer County, New Jersey

December 2018

Prepared For:

BOWMAN CONSULTING
303 West Main Street, Suite 350
Freehold, New Jersey 07728

Attn: Mr. R. Michael McKenna, P.E., P.P.

Prepared By:

GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
14 Worlds Fair Drive, Suite B
Somerset, New Jersey 08873

GTA Job No: 31180596x1

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm

December 12, 2018

Bowman Consulting
303 West Main Street, Suite 350
Freehold, New Jersey 07728

Attn: Mr. R. Michael McKenna, P.E., P.P.

Re: Stormwater Management Testing Report
West Windsor Hotel Site
West Windsor Township, Mercer County, New Jersey

Dear Mr. McKenna:

In accordance with our agreement dated October 30, 2018, Geo-Technology Associates, Inc. (GTA) has performed subsurface explorations and testing for the planning and design of stormwater management (SWM) facilities related to proposed hotel and restaurant structures to be constructed in West Windsor Township, Mercer County, New Jersey. The exploration consisted of excavating 3 test pits with in-situ infiltration testing at the site, visually classifying the encountered soils, and performing limited laboratory testing. The results of the field and laboratory testing, and GTA's recommendations regarding the design and construction of the proposed SWM facilities are included in this report.

GTA appreciates the opportunity to have been of assistance to you on this project. Please contact our office at (732) 271-9301 if you have questions or require additional information.

Very truly yours,
GEO-TECHNOLOGY ASSOCIATES, INC.

Allison Tether

Allison Tether, P.G.
Geotechnical Project Manager

DCL

Dennis C. Loh, P.E.
Vice President

AMT/DCL: at
Job No. 31180596x1
Attachments

TABLE OF CONTENTS

STORMWATER MANAGEMENT TESTING REPORT

WEST WINDSOR HOTEL SITE
WEST WINDSOR TOWNSHIP
MERCER COUNTY, NEW JERSEY
DECEMBER 2018

INTRODUCTION

This report presents the results of subsurface explorations and in-situ infiltration testing performed by Geo-Technology Associates, Inc. (GTA) for the planning and design of stormwater management (SWM) facilities related proposed hotel and restaurant structures to be constructed in West Windsor Township, Mercer County, New Jersey. The subject site is located southeast of the proposed structures, adjacently east of the intersection of Meadow Road and the on-ramp to U.S. Route 1 north, and presently consists of agricultural fields with some wooded areas. Please refer to the Site Location Map, which is Figure 1 in Appendix A of this report.

GTA was provided with an untitled plan prepared by Bowman Consulting dated October 29, 2018. The plan indicates the existing topography, the locations of the proposed hotel and restaurant structures in the northern part of the site, proposed storm and sewer lines that will service the structure, and a proposed SWM basin located in the southern portion of the site. The plan also indicates the locations of 3 requested test pits with infiltration testing.

According to Appendix E of the NJ Stormwater BMP Manual, test pits and infiltration tests must be performed within each SWM infiltration basin location. At least two test pits and infiltration tests must be performed for basins with an infiltration area of up to 10,000 square feet, and one additional test must be performed for each additional 10,000 square feet of infiltration area. Infiltration tests must be performed at the level of infiltration or deeper if hydraulically restrictive soils are present within 8 feet of the proposed basin bottom level. Therefore, the test pits must extend at least 8 feet below the planned level of infiltration.

SITE CONDITIONS

The site is bounded by Meadow Road to the south, the on-ramp to U.S. Route 1 north to the west, and borders agricultural land to the east and north, with some wooded areas present to the

northwest. At the time of our study, the site contained agricultural land, and trees were present along Meadow Road and the U.S. Route 1 on-ramp.

Based on our visual observations and review of the ground surface topography shown on the plan provided to us, the existing surface grades in the proposed basin area generally slope gently downward from about Elevation (EL) 73.5 feet in the northwest to about EL 70 feet in the southeast.

PROPOSED SWM BASIN CONSTRUCTION

The conceptual plan provided to us indicates a proposed SWM basin will be located southeast of the proposed hotel and restaurant structures, in the portion of the site roughly bounded by Meadow Road and the on-ramp to U.S. Route 1 north. The square footage of the basin was not indicated on the plan provided to us; however, based on the scale provided we determined the area of the basin to be roughly 17,000 square feet. The plan indicates the bottom of the infiltration basin will be established at about EL 70 feet and the emergency spillway will be at about EL 72 to EL 73 feet. Cuts and fills of up to about 3 feet from the existing surface graces will be required to achieve the planned infiltration and embankment grades, respectively.

SITE GEOLOGY

The subject site is situated within the Piedmont physiographic province characterized by a low rolling plain divided by a series of higher ridges and predominantly underlain by sedimentary rocks of Triassic and Jurassic age. The site is underlain by the Stockton Formation of the Upper Triassic Period of the Mesozoic Era, as shown on the *Bedrock Geologic Map of the Princeton Quadrangle, Mercer and Middlesex Counties, New Jersey (OFM 93, 2012)* published by the New Jersey Geological and Water Survey. This formation is described as an interbedded sequence of gray, grayish-brown, or slightly reddish-brown, medium- to fine-grained, thin- to thick-bedded, conglomerate and arkosic sandstone, and reddish-brown clayey fine-grained sandstone, siltstone, and mudstone. Fining upward sequences are common, and the coarser units commonly occur as lenses. The unit is approximately 4,500 feet in thickness.

According to the *Surficial Geology of New Jersey (DGS07-2, 2013)* published as part of the Digital Geodata Series by the New Jersey Geological and Water Society, generated using data from the United States Geological Survey, the surficial geology of the site is mapped as Eolian Deposits. The soils are described as very pale brown and yellow-brown windblown fine sand and silt. The unit can be as much as 15 feet thick.

Please refer to the referenced publications for more detailed descriptions of the geologic members.

SUBSURFACE EXPLORATION

The subsurface exploration program consisted of excavating a total of 3 test pits within the potential basin location. The test pits were excavated by Heritage Contracting Company, Inc. on November 11, 2018 using a John Deere 410G backhoe, and extended to depths of approximately 10 to 12 feet below the existing surface grades. The exploration locations were selected and staked by Bowman Consulting prior to our exploration. In-situ infiltration tests were performed adjacent to each of the 3 test pits at depths ranging from about 1½ to 4½ feet below the ground surface.

The approximate locations of the explorations performed for this study are shown on the Test Pit Location Plan, which is included as Figure 2 in Appendix A. Detailed descriptions of the encountered subsurface conditions are indicated on the Logs of Test Pits, which are presented in Appendix B. The ground surface elevations indicated on the exploration logs were obtained by interpolation between topographic contours shown on the plans, and should be considered approximate.

Soil samples obtained from the test pits were brought to GTA's laboratory for visual classification by a geotechnical engineer and limited laboratory testing. The soil descriptions shown on the logs are therefore based on visual observation of the samples, supplemented by the laboratory results.

LABORATORY TESTING

Laboratory testing performed for this study included grain-size testing for classification of the soils in accordance with the Unified Soil Classification System (USCS), and natural moisture

content determinations. Detailed results of the laboratory testing performed for this study are included in Appendix C. The results of the testing are summarized in the following table:

SUMMARY OF LABORATORY TESTING

Test Pit Location	Depth (Ft)	USCS Classification	NMC (%)
TP-1	4-5	Poorly-graded SAND with silt (SP-SM)	17.2
TP-2	1.5-2.5	SILT with sand (ML)	20.4
TP-3	5-6	Poorly-graded SAND with silt (SP-SM)	11.6

Note: NMC=Natural Moisture Content

SUBSURFACE CONDITIONS

An approximately 10- to 11-inch thick layer of topsoil was encountered at the ground surface in the test pits performed for this study. The natural soils encountered below the topsoil appear to be consistent with the geologic mapping, and generally consisted of silts with sand and gravel to depths of about 3½ to 4½ feet, overlying poorly-graded sands with silt to the completion depths of the test pits.

Groundwater was encountered in the test pits at depths ranging from about 6 to 7½ feet below the ground surface, corresponding to about EL 65 feet. Long-term groundwater readings were not obtained because the test pits were backfilled upon completion for safety considerations. Fluctuations in the groundwater level typically occur due to several factors, including variations in precipitation, seasonal changes, and site development activities. Soil mottling indicative of the seasonal high groundwater level was not observed in the test pits; however, we believe the seasonal high groundwater level generally corresponds to the groundwater level encountered in the explorations.

INFILTRATION TEST RESULTS

In-situ infiltration tests were performed adjacent to each of the test pits performed for this study using a double-ring infiltrometer in accordance with the ASTM D 3385 test procedure. The tests were performed at depths of approximately 1½ to 4½ feet below the ground surface within the

natural soils. The results of the infiltration tests performed for this study are summarized in the following table:

SUMMARY OF INFILTRATION TEST RESULTS

Test Pit Location	Approximate Test Depth* (ft)	Final Water Level Drop (in)	Time Interval (min)	USCS Classification	Measured Infiltration Rate (in/hr)
TP-1	2	0	20	SILT with sand (ML)	0
TP-1	4½	1½	5	Poorly-graded SAND with silt (SP-SM)	18
TP-2	1½	¼	15	SILT with sand (ML)	1
TP-3	4	¾	5	Poorly-graded SAND with silt (SP-SM)	9

*Beneath the existing ground surface.

A factor of safety of at least 2 should be applied to the measured infiltration rates.

CONCLUSIONS AND RECOMMENDATIONS

The primary conditions that affect the capacity to infiltrate water are the soil gradation and density properties and the presence of hydraulically restrictive layers such as silt or clay (fines), rock, or groundwater, each of which would restrict the flow of water into the underlying aquifer. The soil profile generally consisted of fine-grained silts overlying poorly-graded sands. Groundwater was encountered in the test pits at depths ranging from about 6 to 7½ feet below the ground surface. In general, the fine-grained silts (ML) were not receptive to infiltration, and the coarse-grained sands (SP-SM) appeared receptive to infiltration.

We believe the infiltration test results and groundwater observations indicate that infiltration of collected stormwater is generally feasible at the basin location within the deeper poorly-graded sand layer. However, it appears that fine-grained soils will be present at the planned basin subgrade level. Therefore, it will be necessary to excavate and replace the upper silty soils to expose the more permeable granular soils. We recommend additional testing be performed at the time of construction to verify the design assumptions. This testing should be performed after the basin subgrades are properly prepared.

It appears that the excavation to remove the shallow fine-grained soils will extend top depths of about 1 to 3½ feet below the planned basin bottom level of EL 70 feet. The undercut should expose the underlying more permeable poorly-graded sand with silt soils throughout the proposed area of infiltration. The overexcavation should then be backfilled to the proposed bottom of basin elevation using granular soils, washed gravel, or sand meeting the design infiltration rate or faster.

It will be important to limit disturbance and compaction of the infiltration surface during construction. Infiltration areas should not be exposed to unstabilized runoff that may contribute to sedimentation and clogging of the subgrade, and possible system failure, prior to the completion of construction. Where possible, the operation of heavy construction equipment directly on the infiltration area subgrades should be avoided or kept to a minimum. After grubbing and rough grading, infiltration areas should be tilled with a disc or rotary tiller followed by a leveling drag, to restore the soils to a loose condition.

Construction oversight by competent engineering personnel during installation of stormwater management facilities is critical to successful functioning of the system. Ideally, construction oversight should be provided by the geotechnical engineer, or qualified representative, retained by the project owner to document construction operations and assure that project specifications and special construction requirements are met. Periodic inspection and maintenance of the infiltration system will be required to maximize the efficiency and design life of the system.

ADDITIONAL SERVICES

We recommended that GTA be retained during construction of the subject project to provide geotechnical consultation and construction observation and testing services as outlined below:

- Provide on-site observation during SWM basin construction.
- Perform infiltration testing at the time of construction after the basin subgrade has been properly prepared.

LIMITATIONS

This report, including all supporting test pit logs, field data, field notes, laboratory test data, calculations, estimates and other documents prepared by GTA in connection with this project have

been prepared for the exclusive use of Bowman Consulting (Client) pursuant to the Agreement between GTA and Client dated October 30, 2018, and in accordance with generally accepted engineering practice. All terms and conditions set forth in the Agreement and the General Provisions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein. Use and reproduction of this report by any other person without the expressed written permission of GTA and Client is unauthorized and such use is at the sole risk of the user.

The analysis and recommendations contained in this report are based on the data obtained from limited observation and testing of the encountered materials. Test pits indicate soil conditions only at specific locations and times, and only at the depths penetrated. They do not necessarily reflect strata or variations that may exist between test pit locations. Consequently, the analysis and recommendations must be considered preliminary until the subsurface conditions can be verified by direct observation at the time of construction. If variations of subsurface conditions from those described in this report are noted during construction, recommendations in this report may need to be re-evaluated.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing. GTA is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of GTA.

The scope of our services for this geotechnical exploration did not include any environmental assessment or investigation for the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the logs regarding odors or unusual or suspicious items or conditions observed are strictly for the information of our Client.

This report and the attached logs are instruments of service. The subject matter of this report is limited to the facts and matters stated herein. Absence of a reference to any other conditions or subject matter shall not be construed by the reader to imply approval by the writer.

31180596x1 **GEO-TECHNOLOGY ASSOCIATES, INC.**

Important Information about Your

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you —* should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical-Engineering Report Is Based on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical-engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical-engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold-prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical-engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold-prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your GBA-Member Geotechncial Engineer for Additional Assistance

Membership in the GEOPROFESSIONAL BUSINESS ASSOCIATION exposes geotechnical engineers to a wide array of risk confrontaton techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your GBA-member geotechnical engineer for more information.

GEOPROFESSIONAL BUSINESS ASSOCIATION

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX A

Figures

Note: Site boundary is approximate.

FIGURE 1: SITE LOCATION MAP

WEST WINDSOR HOTEL SITE

West Windsor Township,
Mercer County, New Jersey

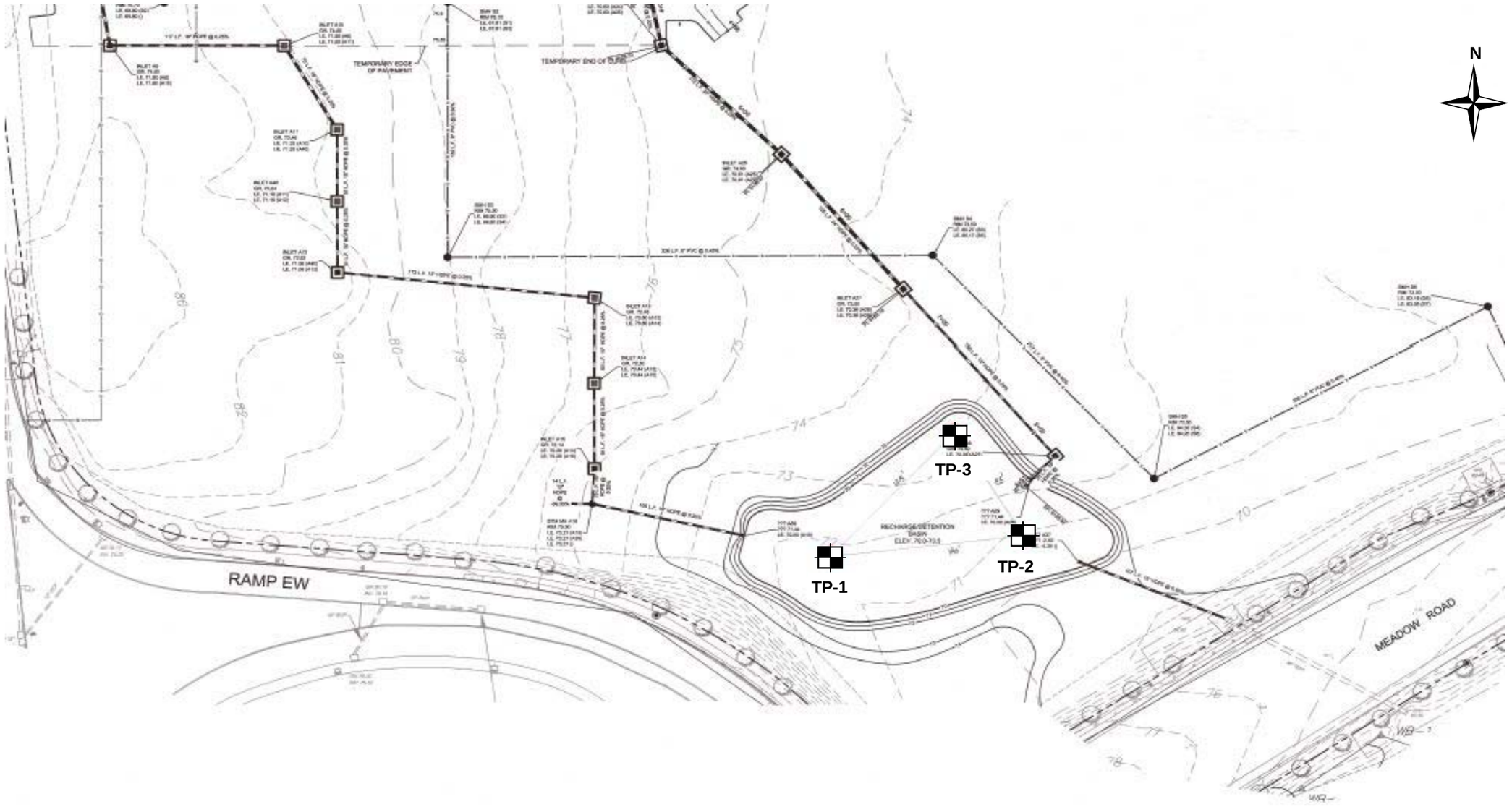
Prepared For: Bowman Consulting

14 Worlds Fair Drive, Suite B
Somerset, New Jersey 08873
(732) 271-9301
fax (732) 271-9306

GEO-TECHNOLOGY ASSOCIATES, INC.

SOURCE: Google Map

SCALE: NTS	DATE: JUN. 2018	PROJECT #: 31180596x1



*Base plan provided by Bowman Consulting dated October 29, 2018.

LEGEND:

TP-X

Indicates the numbers and approximate locations of test pits performed for this study.

TEST PIT LOCATION PLAN

GTA

14 Worlds Fair Drive, Suite B
Somerset, New Jersey 08873
(732) 271-9301
fax (732) 271-9306

GEO-TECHNOLOGY ASSOCIATES, INC.

WEST WINDSOR HOTEL SITE

West Windsor Township,
Mercer County, New Jersey

Prepared For: Bowman Consulting

DESIGN BY: *	DRAWN BY: AMT	REVIEWED BY: DCL
SCALE: NTS	DATE: NOV. 2018	PROJECT #: 31180596x1

Figure 2

APPENDIX B

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 GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 15% 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 15% 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	SILT OR CLAY (<15% RETAINED ON THE NO. 200 SIEVE) SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED ON THE NO. 200 SIEVE) SANDY OR GRAVELLY SILT OR CLAY (>30% RETAINED ON THE NO. 200 SIEVE)	SILTS AND LEAN CLAYS LIQUID LIMIT LESS THAN 50			ML
					CL
					OL
		ELASTIC SILTS AND FAT CLAYS LIQUID LIMIT GREATER THAN 50			MH
					CH
					OH
HIGHLY ORGANIC SOILS					PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS WHICH CONTAIN AN ESTIMATED 5 TO 15% FINES BASED ON VISUAL CLASSIFICATION OR BETWEEN 5 AND 12% FINES BASED ON LABORATORY TESTING; AND FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSS-HATCHED AREA. FINE-GRAINED SOILS ARE CLASSIFIED AS ORGANIC (OL OR OH) WHEN ENOUGH ORGANIC PARTICLES ARE PRESENT TO INFLUENCE ITS PROPERTIES. LABORATORY TEST RESULTS ARE USED TO SUPPLEMENT SOIL CLASSIFICATION BY THE VISUAL-MANUAL PROCEDURES OF ASTM D 2488.

ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

	DESCRIPTION		GRAPHIC SYMBOLS
ADDITIONAL DESIGNATIONS	TOPSOIL		
	MAN MADE FILL		
	GLACIAL TILL		
	COBBLES AND BOULDERS		
RESIDUAL SOIL DESIGNATIONS	DESCRIPTION	"N" VALUE	
	HIGHLY WEATHERED ROCK	50 TO 50/1"	
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR 1" OF PENETRATION OR LESS, 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 D 1586

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
SOIL SAMPLE	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 (Stake 1003)

PROJECT: **West Windsor Hotel Site**
PROJECT LOCATION: **West Windsor Township, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31180596x1**

DATE STARTED: **11/12/18**
DATE COMPLETED: **11/12/18**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **John Deere 410G Backhoe**

GROUNDWATER ENCOUNTERED: **7 Ft.**
GROUND SURFACE ELEVATION: **72 Ft.**
DATUM: **TOPO**
LOGGED BY: **AMT**
CHECKED BY: **DCL**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0				
71.2				10 In. of Topsoil	
		ML		Dark yellow-brown (10YR 4/6), moist, SILT with sand and gravel	- Infiltration rate = 0 in/hr at 2 Ft.
68.5		SP-SM		Light yellow-brown (2.5Y 6/4), moist, Poorly-graded SAND with silt	- NMC = 17.2% - Infiltration rate = 18 in/hr at 4-1/2 Ft.
	5			- wet at 7 Ft.	▼ - Rapid water seepage at 7 Ft.
				- Brown (10YR 5/3) at 8 Ft.	- Sidewall collapses at 7, 8 and 10 Ft.
62.0	10			Test pit complete at 10 Ft.	
	15				
	20				
	25				
	30				

NOTES: **Locations were staked by others.**
Backfilled on completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-1 (Stake 1003)

LOG OF TEST PIT NO. TP-2 (Stake 1004)

PROJECT: **West Windsor Hotel Site**
PROJECT LOCATION: **West Windsor Township, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31180596x1**

GROUNDWATER ENCOUNTERED: **6 Ft.**
GROUND SURFACE ELEVATION: **71 Ft.**
DATUM: **TOPO**
LOGGED BY: **AMT**
CHECKED BY: **DCL**

DATE STARTED: **11/12/18**
DATE COMPLETED: **11/12/18**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **John Deere 410G Backhoe**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			11 In. of Topsoil	
70.1		ML		Dark yellow-brown (10YR 4/6), moist, SILT with sand and gravel	- NMC = 20.4% - Infiltration rate = 1 in/hr at 1-1/2 Ft.
66.5	5	SP-SM		Light yellow-brown (2.5Y 6/4), moist, Poorly-graded SAND with silt - wet at 6 Ft.	▼ - Rapid water seepage at 6 Ft. - Sidewall collapses at 7, 8 and 9 Ft.
61.0	10			Test pit complete at 10 Ft.	
	15				
	20				
	25				
	30				

NOTES: **Locations were staked by others.**
Backfilled on completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-2 (Stake 1004)

LOG OF TEST PIT NO. TP-3 (Stake 1005)

PROJECT: **West Windsor Hotel Site**
PROJECT LOCATION: **West Windsor Township, New Jersey**
CLIENT: **Bowman Consulting**

PROJECT NO.: **31180596x1**

GROUNDWATER ENCOUNTERED: **7.5 Ft.**
GROUND SURFACE ELEVATION: **73 Ft.**
DATUM: **TOPO**
LOGGED BY: **AMT**
CHECKED BY: **DCL**

DATE STARTED: **11/12/18**
DATE COMPLETED: **11/12/18**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **John Deere 410G Backhoe**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			11 In. of Topsoil	
72.1		ML		Dark yellow-brown (10YR 4/6), moist, SILT with sand and gravel	
69.0	5	SP-SM		Light yellow-brown (2.5Y 6/4), moist, Poorly-graded SAND with silt	- Infiltration rate = 9 in/hr at 4 Ft. - NMC = 11.6%
				- wet at 7-1/2 Ft. - Yellow-brown (10YR 5/4) at 8 Ft.	- Rapid water seepage at 7-1/2 Ft. - Sidewall collapses at 7, 8, 10 and 12 Ft.
61.0	10			Test pit complete at 12 Ft.	
	15				
	20				
	25				
	30				

NOTES: **Locations were staked by others.**
Backfilled on completion.

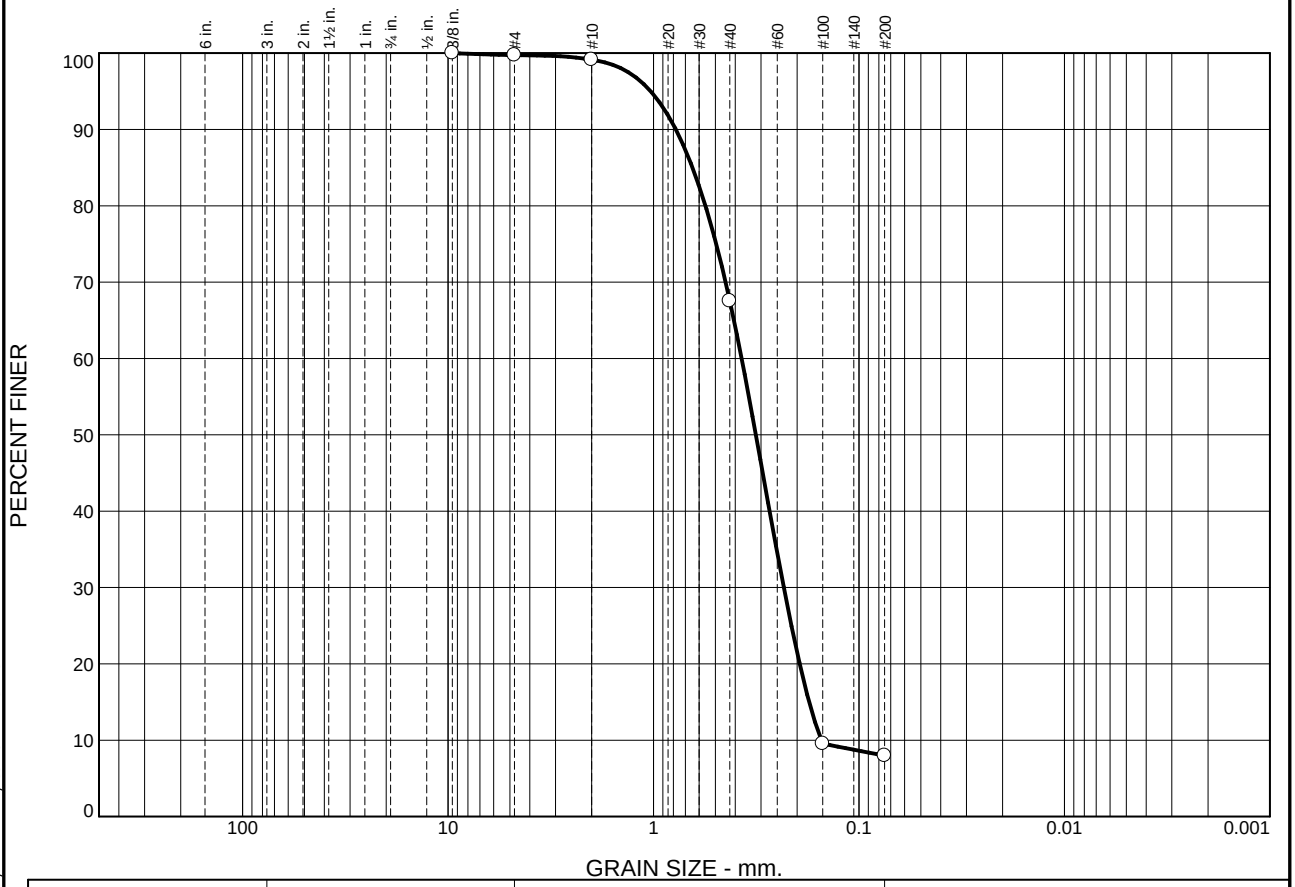
GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-3 (Stake 1005)

APPENDIX C

Laboratory Data

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.3	0.6	31.6	59.5	8.0	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NP	NP	0.6463	0.3725	0.3175	0.2321	0.1748	0.1524	0.95	2.44

Material Description	USCS	AASHTO
○ Poorly-graded SAND with silt	SP-SM	A-3

Project No. 31180596x1 **Client:** Bowman Consulting

Project: West Windsor Hotel Site

○ **Source of Sample:** TP-1 (Stake 1003) **Depth:** 4

Date: ○

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Remarks:
○NMC = 17.2%

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.1	1.4	21.3	77.2	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NP	NP	0.1248							

Material Description	USCS	AASHTO
○ SILT with sand	ML	A-4(0)

Project No. 31180596x1 **Client:** Bowman Consulting

Project: West Windsor Hotel Site

○ **Source of Sample:** TP-2 (Stake 1004) **Depth:** 1.5

Date: ○

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Remarks:
○NMC = 20.4%

Figure

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

Tested By: SB **Checked By:** AMT

Particle Size Distribution Report

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○			0.1	0.6	33.4	56.3	7.5	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NP	NP	0.7446	0.3955	0.3322	0.2374	0.1754	0.1514	0.94	2.61

Material Description	USCS	AASHTO
○ Poorly-graded SAND with silt	SP-SM	A-3

Project No. 31180596x1 **Client:** Bowman Consulting

Project: West Windsor Hotel Site

○ **Source of Sample:** TP-3 (Stake 1005) **Depth:** 5

Date: ○

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite B
Somerset, NJ 08873

Remarks:
○NMC = 11.6%

Figure

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

Tested By: SB **Checked By:** AMT

APPENDIX NO. 2
TR-55 CALCULATIONS
EXISTING CONDITIONS

JOB TITLE

Project Date: 1/15/2020
Project Engineer: JMW
Project Title: existing conditions - west windsor
Project Comments:
PHASE 1

Table of Contents

MASTER DESIGN STORM SUMMARY

Network Storm Collection: mercer

Return Event	Total Depth in	Rainfall Type	RNF ID
2	3.3100	Synthetic Curve	TypeIII 24hr
10	5.0100	Synthetic Curve	TypeIII 24hr
100	8.3300	Synthetic Curve	TypeIII 24hr
1	1.2500	Time-Depth Curve	WQ125IN

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*-TOT EXISTING	JCT	2	.263		12.9000	.94		
*-TOT EXISTING	JCT	10	.785		12.8000	3.74		
*-TOT EXISTING	JCT	100	2.196		12.7000	11.73		
*-TOT EXISTING	JCT	1	.000		.1000	.00		
EX PERV	AREA	2	.263		12.9000	.94		
EX PERV	AREA	10	.785		12.8000	3.74		
EX PERV	AREA	100	2.196		12.7000	11.73		
EX PERV	AREA	1	.000		.1000	.00		

50% = 0.47 CFS
75% = 2.80
80% = 9.38

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.1700	
Hydraulic Length	150.00	ft
2yr, 24hr P	3.3100	in
Slope	.001000	ft/ft

Avg.Velocity .05 ft/sec

Segment #1 Time: .8136 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	1265.00	ft
Slope	.013000	ft/ft

Unpaved

Avg.Velocity 1.84 ft/sec

Segment #2 Time: .1910 hrs

Total Tc: 1.0046 hrs

Tc Equations used...

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

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

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

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

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

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

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

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

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Row crops - Cont & terraced(C&T), p	62	6.900			62.00
Woods - grass combination - good	32	.700			32.00
COMPOSITE AREA & WEIGHTED CN --->		7.600			59.24 (59)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 2.0000 hrs Rain Depth = 1.2500 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - WQ125IN
Unit Hyd Type = Default Curvilinear
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - EX PERV 1
Tc = 1.0046 hrs
Drainage Area = 7.600 acres Runoff CN= 59

Computational Time Increment	=	.13395 hrs
Computed Peak Time	=	.0000 hrs
Computed Peak Flow	=	.00 cfs
Time Increment for HYG File	=	.1000 hrs
Peak Time, Interpolated Output	=	.0000 hrs
Peak Flow, Interpolated Output	=	.00 cfs

DRAINAGE AREA
ID:EX PERV
CN = 59
Area = 7.600 acres
S = 6.9492 in
0.2S = 1.3898 in

Cumulative Runoff
.0000 in
.000 ac-ft

HYG Volume... .000 ac-ft (area under HYG curve)

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

Time Concentration, Tc = 1.00462 hrs (ID: EX PERV)
Computational Incr, Tm = .13395 hrs = 0.20000 Tp

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

Unit peak, qp = 8.57 cfs
Unit peak time Tp = .66975 hrs
Unit receding limb, Tr = 2.67899 hrs
Total unit time, Tb = 3.34874 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3100 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - EX PERV 2
Tc = 1.0046 hrs
Drainage Area = 7.600 acres Runoff CN= 59

Computational Time Increment	=	.13395 hrs
Computed Peak Time	=	12.8592 hrs
Computed Peak Flow	=	.94 cfs
Time Increment for HYG File	=	.1000 hrs
Peak Time, Interpolated Output	=	12.9000 hrs
Peak Flow, Interpolated Output	=	.94 cfs

DRAINAGE AREA
ID:EX PERV
CN = 59
Area = 7.600 acres
S = 6.9492 in
0.2S = 1.3898 in

Cumulative Runoff
.4157 in
.263 ac-ft

HYG Volume... .263 ac-ft (area under HYG curve)

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

Time Concentration, Tc = 1.00462 hrs (ID: EX PERV)
Computational Incr, Tm = .13395 hrs = 0.20000 Tp

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

Unit peak,	qp =	8.57 cfs
Unit peak time	Tp =	.66975 hrs
Unit receding limb,	Tr =	2.67899 hrs
Total unit time,	Tb =	3.34874 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0100 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - EX PERV 10
Tc = 1.0046 hrs
Drainage Area = 7.600 acres Runoff CN= 59

Computational Time Increment	=	.13395 hrs
Computed Peak Time	=	12.7252 hrs
Computed Peak Flow	=	3.76 cfs
Time Increment for HYG File	=	.1000 hrs
Peak Time, Interpolated Output	=	12.8000 hrs
Peak Flow, Interpolated Output	=	3.74 cfs

DRAINAGE AREA
ID:EX PERV
CN = 59
Area = 7.600 acres
S = 6.9492 in
0.2S = 1.3898 in

Cumulative Runoff
1.2400 in
.785 ac-ft

HYG Volume... .785 ac-ft (area under HYG curve)

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

Time Concentration, Tc = 1.00462 hrs (ID: EX PERV)
Computational Incr, Tm = .13395 hrs = 0.20000 Tp

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

Unit peak,	qp =	8.57 cfs
Unit peak time	Tp =	.66975 hrs
Unit receding limb,	Tr =	2.67899 hrs
Total unit time,	Tb =	3.34874 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3300 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - EX PERV 100
Tc = 1.0046 hrs
Drainage Area = 7.600 acres Runoff CN= 59

Computational Time Increment	=	.13395 hrs
Computed Peak Time	=	12.7252 hrs
Computed Peak Flow	=	11.82 cfs
Time Increment for HYG File	=	.1000 hrs
Peak Time, Interpolated Output	=	12.7000 hrs
Peak Flow, Interpolated Output	=	11.73 cfs

DRAINAGE AREA

ID:EX PERV
CN = 59
Area = 7.600 acres
S = 6.9492 in
0.2S = 1.3898 in

Cumulative Runoff

3.4678 in
2.196 ac-ft

HYG Volume... 2.196 ac-ft (area under HYG curve)

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

Time Concentration, Tc = 1.00462 hrs (ID: EX PERV)
Computational Incr, Tm = .13395 hrs = 0.20000 Tp

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

Unit peak,	qp =	8.57 cfs
Unit peak time	Tp =	.66975 hrs
Unit receding limb,	Tr =	2.67899 hrs
Total unit time,	Tb =	3.34874 hrs

Index of Starting Page Numbers for ID Names

APPENDIX NO. 3
TR-55 CALCULATIONS
PROPOSED CONDITIONS

APPENDIX NO. 4
DRAINAGE AREA MAPS

==========
JOB TITLE
==========

Project Date: 3/12/2020
Project Engineer: JMW
Project Title: proposed conditions
Project Comments:
PHASE 1

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

MASTER DESIGN STORM SUMMARY

Network Storm Collection: mercer

Return Event	Total Depth in	Rainfall Type	RNF ID
2	3.3100	Synthetic Curve	TypeIII 24hr
10	5.0100	Synthetic Curve	TypeIII 24hr
100	8.3300	Synthetic Curve	TypeIII 24hr
1	1.2500	Time-Depth Curve	WQ125IN

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*-TOT PROPOSED	JCT	2	.278		17.9000	.29		
*-TOT PROPOSED	JCT	10	1.090		13.4000	1.86		
*-TOT PROPOSED	JCT	100	2.802		12.6000	8.93		
*-TOT PROPOSED	JCT	1	.000		.1000	.00		
BASIN PROP 1 IN	POND	2	1.411		12.1000	13.30		
BASIN PROP 1 IN	POND	10	2.223		12.1000	20.28		
BASIN PROP 1 IN	POND	100	3.934		12.1000	35.84		
BASIN PROP 1 IN	POND	1	.478		1.1000	13.00		
BASIN PROP 1 OUT	POND	2	.278		17.9000	.29	71.87	1.237
BASIN PROP 1 OUT	POND	10	1.090		13.4000	1.86	72.16	1.521
BASIN PROP 1 OUT	POND	100	2.802		12.6000	8.93	72.93	2.278
BASIN PROP 1 OUT	POND	1	.000		.4000	.00	70.96	.477

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node	ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
P-1	IMPERVIOUS	AREA	2	1.410		12.1000	13.30		
P-1	IMPERVIOUS	AREA	10	2.188		12.1000	20.28		
P-1	IMPERVIOUS	AREA	100	3.708		12.1000	33.85		
P-1	IMPERVIOUS	AREA	1	.478		1.1000	13.00		
P-1	PERVIOUS	AREA	2	.000		21.6000	.00		
P-1	PERVIOUS	AREA	10	.035		12.5000	.08		
P-1	PERVIOUS	AREA	100	.227		12.1000	1.99		
P-1	PERVIOUS	AREA	1	.000		.1000	.00		

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: User Defined

Segment #1 Time: .1000 hrs

==========
Total Tc: .1000 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .1000 hrs
==========

Tc Equations used...

==== User Defined ==

Tc = Value entered by user

Where: Tc = Time of concentration

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: User Defined

Segment #1 Time: .1000 hrs

==========
Total Tc: .1000 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .1000 hrs
==========

Tc Equations used...

==== User Defined ==

Tc = Value entered by user

Where: Tc = Time of concentration

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
impervious	98	5.500			98.00
COMPOSITE AREA & WEIGHTED CN --->		5.500			98.00 (98)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
open space	39	2.100			39.00
COMPOSITE AREA & WEIGHTED CN --->		2.100			39.00 (39)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 2.0000 hrs Rain Depth = 1.2500 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - WQ125IN
Unit Hyd File = Delmarva Unit Hydrograph
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - P-1 IMPERVIOUS 1
Tc (Min. Tc) = .1000 hrs
Drainage Area = 5.500 acres Runoff CN= 98

==========
Computational Time Increment = .01333 hrs
Computed Peak Time = 1.1067 hrs
Computed Peak Flow = 13.10 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 1.1000 hrs
Peak Flow, Interpolated Output = 13.00 cfs
==========

DRAINAGE AREA

ID:P-1 IMPERVIOUS
CN = 98
Area = 5.500 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.0346 in
.474 ac-ft

HYG Volume... .478 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .10000 hrs (ID: P-1 IMPERVIOUS)
Computational Incr, Tm = .01333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 284.057 (22.01% under rising limb)
K = 284.06/645.333, K = .4402 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 3.5437 (solved from K = .4402)

Unit peak, qp = 36.35 cfs
Unit peak time Tp = .06667 hrs
Unit receding limb, Tr = .58667 hrs
Total unit time, Tb = .65333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3100 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - TypeIII 24hr
Unit Hyd File = Delmarva Unit Hydrograph
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - P-1 IMPERVIOUS 2
Tc (Min. Tc) = .1000 hrs
Drainage Area = 5.500 acres Runoff CN= 98

==========
Computational Time Increment = .01333 hrs
Computed Peak Time = 12.1200 hrs
Computed Peak Flow = 13.46 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 13.30 cfs
==========

DRAINAGE AREA

ID:P-1 IMPERVIOUS
CN = 98
Area = 5.500 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.0771 in
1.410 ac-ft

HYG Volume... 1.410 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .10000 hrs (ID: P-1 IMPERVIOUS)
Computational Incr, Tm = .01333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 284.057 (22.01% under rising limb)
K = 284.06/645.333, K = .4402 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 3.5437 (solved from K = .4402)

Unit peak, qp = 36.35 cfs
Unit peak time Tp = .06667 hrs
Unit receding limb, Tr = .58667 hrs
Total unit time, Tb = .65333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0100 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - TypeIII 24hr
Unit Hyd File = Delmarva Unit Hydrograph
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - P-1 IMPERVIOUS 10
Tc (Min. Tc) = .1000 hrs
Drainage Area = 5.500 acres Runoff CN= 98

==========
Computational Time Increment = .01333 hrs
Computed Peak Time = 12.1200 hrs
Computed Peak Flow = 20.52 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 20.28 cfs
==========

DRAINAGE AREA

ID:P-1 IMPERVIOUS
CN = 98
Area = 5.500 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.7732 in
2.188 ac-ft

HYG Volume... 2.188 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .10000 hrs (ID: P-1 IMPERVIOUS)
Computational Incr, Tm = .01333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 284.057 (22.01% under rising limb)
K = 284.06/645.333, K = .4402 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 3.5437 (solved from K = .4402)

Unit peak, qp = 36.35 cfs
Unit peak time Tp = .06667 hrs
Unit receding limb, Tr = .58667 hrs
Total unit time, Tb = .65333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3300 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - TypeIII 24hr
Unit Hyd File = Delmarva Unit Hydrograph
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - P-1 IMPERVIOUS 100
Tc (Min. Tc) = .1000 hrs
Drainage Area = 5.500 acres Runoff CN= 98

==========
Computational Time Increment = .01333 hrs
Computed Peak Time = 12.1200 hrs
Computed Peak Flow = 34.25 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 33.85 cfs
==========

DRAINAGE AREA

ID:P-1 IMPERVIOUS
CN = 98
Area = 5.500 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

8.0900 in
3.708 ac-ft

HYG Volume... 3.708 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .10000 hrs (ID: P-1 IMPERVIOUS)
Computational Incr, Tm = .01333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 284.057 (22.01% under rising limb)
K = 284.06/645.333, K = .4402 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 3.5437 (solved from K = .4402)

Unit peak, qp = 36.35 cfs
Unit peak time Tp = .06667 hrs
Unit receding limb, Tr = .58667 hrs
Total unit time, Tb = .65333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 2.0000 hrs Rain Depth = 1.2500 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - WQ125IN
Unit Hyd Type = Default Curvilinear
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - P-1 PERVIOUS 1
Tc (Min. Tc) = .1000 hrs
Drainage Area = 2.100 acres Runoff CN= 39

==========
Computational Time Increment = .01333 hrs
Computed Peak Time = .0000 hrs
Computed Peak Flow = .00 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = .0000 hrs
Peak Flow, Interpolated Output = .00 cfs
==========

DRAINAGE AREA

ID:P-1 PERVIOUS
CN = 39
Area = 2.100 acres
S = 15.6410 in
0.2S = 3.1282 in

Cumulative Runoff

.0000 in
.000 ac-ft

HYG Volume... .000 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .10000 hrs (ID: P-1 PERVIOUS)
Computational Incr, Tm = .01333 hrs = 0.20000 Tp

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

Unit peak, qp = 23.79 cfs
Unit peak time Tp = .06667 hrs
Unit receding limb, Tr = .26667 hrs
Total unit time, Tb = .33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3100 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - P-1 PERVIOUS 2
Tc (Min. Tc) = .1000 hrs
Drainage Area = 2.100 acres Runoff CN= 39

==========
Computational Time Increment = .01333 hrs
Computed Peak Time = 24.0000 hrs
Computed Peak Flow = .00 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 24.0001 hrs
Peak Flow, Interpolated Output = .00 cfs
==========

DRAINAGE AREA

ID:P-1 PERVIOUS
CN = 39
Area = 2.100 acres
S = 15.6410 in
0.2S = 3.1282 in

Cumulative Runoff

.0021 in
.000 ac-ft

HYG Volume... .000 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .10000 hrs (ID: P-1 PERVIOUS)
Computational Incr, Tm = .01333 hrs = 0.20000 Tp

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

Unit peak, qp = 23.79 cfs
Unit peak time Tp = .06667 hrs
Unit receding limb, Tr = .26667 hrs
Total unit time, Tb = .33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0100 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - P-1 PERVIOUS 10
Tc (Min. Tc) = .1000 hrs
Drainage Area = 2.100 acres Runoff CN= 39

==========
Computational Time Increment = .01333 hrs
Computed Peak Time = 12.4400 hrs
Computed Peak Flow = .08 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.5000 hrs
Peak Flow, Interpolated Output = .08 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:P-1 PERVIOUS
CN = 39
Area = 2.100 acres
S = 15.6410 in
0.2S = 3.1282 in

Cumulative Runoff

.2021 in
.035 ac-ft

HYG Volume... .035 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .10000 hrs (ID: P-1 PERVIOUS)
Computational Incr, Tm = .01333 hrs = 0.20000 Tp

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

Unit peak, qp = 23.79 cfs
Unit peak time Tp = .06667 hrs
Unit receding limb, Tr = .26667 hrs
Total unit time, Tb = .33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3300 in
Rain Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\A
HYG File - ID = - P-1 PERVIOUS 100
Tc (Min. Tc) = .1000 hrs
Drainage Area = 2.100 acres Runoff CN= 39

==========
Computational Time Increment = .01333 hrs
Computed Peak Time = 12.1333 hrs
Computed Peak Flow = 2.18 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 1.99 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:P-1 PERVIOUS
CN = 39
Area = 2.100 acres
S = 15.6410 in
0.2S = 3.1282 in

Cumulative Runoff

1.2982 in
.227 ac-ft

HYG Volume... .227 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .10000 hrs (ID: P-1 PERVIOUS)
Computational Incr, Tm = .01333 hrs = 0.20000 Tp

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

Unit peak, qp = 23.79 cfs
Unit peak time Tp = .06667 hrs
Unit receding limb, Tr = .26667 hrs
Total unit time, Tb = .33333 hrs

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (ac-ft)	Volume Sum (ac-ft)
70.00	-----	12246	0	.000	.000
71.00	-----	33386	65852	.504	.504
72.00	-----	41688	112381	.860	1.364
73.00	-----	44262	128906	.986	2.350
73.50	-----	46893	136714	.523	2.873
74.00	-----	51696	147825	.566	3.439

POND VOLUME EQUATIONS

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

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

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

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 70.00 ft
Increment = .10 ft
Max. Elev.= 74.00 ft

****
OUTLET CONNECTIVITY
****

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

Structure	No.		Outfall	E1, ft	E2, ft
Inlet Box	R0	--->	C0	73.000	74.000
Weir-Rectangular	W0	--->	C0	71.750	74.000
Culvert-Circular	C0	--->	TW	68.500	74.000

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = R0
Structure Type = Inlet Box

# of Openings	=	1
Invert Elev.	=	73.00 ft
Orifice Area	=	12.0000 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	12.00 ft
Weir Coeff.	=	3.100
K, Reverse	=	1.000
Mannings n	=	.0000
Kev,Charged Riser	=	.000
Weir Submergence	=	No

Structure ID = W0
Structure Type = Weir-Rectangular

# of Openings	=	1
Crest Elev.	=	71.75 ft
Weir Length	=	2.25 ft
Weir Coeff.	=	3.100000

Weir TW effects (Use adjustment equation)

OUTLET STRUCTURE INPUT DATA

Structure ID = C0
Structure Type = Culvert-Circular

No. Barrels	=	1
Barrel Diameter	=	3.0000 ft
Upstream Invert	=	68.50 ft
Dnstream Invert	=	68.20 ft
Horiz. Length	=	39.00 ft
Barrel Length	=	39.00 ft
Barrel Slope	=	.00769 ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.2000	(forward entrance loss)
Kb	=	.007228	(per ft of full flow)
Kr	=	.2000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0018
Inlet Control M	=	2.5000
Inlet Control c	=	.03000
Inlet Control Y	=	.7400
T1 ratio (HW/D)	=	1.078
T2 ratio (HW/D)	=	1.216
Slope Factor	=	-.500

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

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 71.73 ft ---> Flow = 42.85 cfs
At T2 Elev = 72.15 ft ---> Flow = 48.97 cfs

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

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

Maximum Iterations	=	40
Min. TW tolerance	=	.01 ft
Max. TW tolerance	=	.01 ft
Min. HW tolerance	=	.01 ft
Max. HW tolerance	=	.01 ft
Min. Q tolerance	=	.00 cfs
Max. Q tolerance	=	.00 cfs

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
70.00	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.10	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.20	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.30	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.40	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.50	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.60	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.70	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.80	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.90	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.00	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.10	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.20	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.30	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.40	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.50	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.60	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.70	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
71.75	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
71.80	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
71.90	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.10	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.20	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.30	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.40	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.50	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.60	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.70	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.80	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
72.90	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
73.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
73.10	1.18	73.10	Free	70.10	.000	.000	Free Outfall	
		Weir: H =.10ft						
73.20	3.33	73.20	Free	70.33	.000	.000	Free Outfall	
		Weir: H =.20ft						
73.30	6.11	73.30	Free	70.58	.000	.000	Free Outfall	
		Weir: H =.30ft						
73.40	9.41	73.40	Free	70.85	.000	.000	Free Outfall	
		Weir: H =.40ft						

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
73.50	13.15	73.50	Free	71.12	.000	.000	Free Outfall	
		Weir: H =.50ft						
73.60	17.29	73.60	Free	71.41	.000	.000	Free Outfall	
		Weir: H =.60ft						
73.70	21.79	73.70	Free	71.71	.000	.000	Free Outfall	
		Weir: H =.70ft						
73.80	26.62	73.80	Free	72.01	.000	.000	Free Outfall	
		Weir: H =.80ft						
73.90	31.76	73.90	Free	72.36	.000	.000	Free Outfall	
		Weir: H =.90ft						
74.00	37.20	74.00	Free	72.73	.000	.000	Free Outfall	
		Weir: H =1.00ft						

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-Rectangular)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
70.00	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.10	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.20	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.30	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.40	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.50	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.60	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.70	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.80	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.90	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.00	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.10	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.20	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.30	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.40	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.50	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.60	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.70	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-Rectangular)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
71.75	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.80	.08	71.80	Free	68.62	.000	.000	Free Outfall	
	H=.05; Htw=.00; Qfree=.08;							
71.90	.41	71.90	Free	68.78	.000	.000	Free Outfall	
	H=.15; Htw=.00; Qfree=.41;							
72.00	.87	72.00	Free	68.91	.000	.000	Free Outfall	
	H=.25; Htw=.00; Qfree=.87;							
72.10	1.44	72.10	Free	69.03	.000	.000	Free Outfall	
	H=.35; Htw=.00; Qfree=1.44;							
72.20	2.11	72.20	Free	69.14	.000	.000	Free Outfall	
	H=.45; Htw=.00; Qfree=2.11;							
72.30	2.85	72.30	Free	69.24	.000	.000	Free Outfall	
	H=.55; Htw=.00; Qfree=2.85;							
72.40	3.66	72.40	Free	69.35	.000	.000	Free Outfall	
	H=.65; Htw=.00; Qfree=3.66;							
72.50	4.53	72.50	Free	69.45	.000	.000	Free Outfall	
	H=.75; Htw=.00; Qfree=4.53;							
72.60	5.47	72.60	Free	69.54	.000	.000	Free Outfall	
	H=.85; Htw=.00; Qfree=5.47;							
72.70	6.46	72.70	Free	69.64	.000	.000	Free Outfall	
	H=.95; Htw=.00; Qfree=6.46;							
72.80	7.50	72.80	Free	69.73	.000	.000	Free Outfall	
	H=1.05; Htw=.00; Qfree=7.50;							
72.90	8.60	72.90	Free	69.83	.000	.000	Free Outfall	
	H=1.15; Htw=.00; Qfree=8.60;							
73.00	9.75	73.00	Free	69.92	.000	.000	Free Outfall	
	H=1.25; Htw=.00; Qfree=9.75;							
73.10	10.94	73.10	Free	70.10	.000	.000	Free Outfall	
	H=1.35; Htw=.00; Qfree=10.94;							
73.20	12.18	73.20	Free	70.33	.000	.000	Free Outfall	
	H=1.45; Htw=.00; Qfree=12.18;							
73.30	13.46	73.30	Free	70.58	.000	.000	Free Outfall	
	H=1.55; Htw=.00; Qfree=13.46;							
73.40	14.78	73.40	Free	70.85	.000	.000	Free Outfall	
	H=1.65; Htw=.00; Qfree=14.78;							

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-Rectangular)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
73.50	16.15	73.50	Free	71.12	.000	.000	Free Outfall	
		H=1.75; Htw=.00; Qfree=16.15;						
73.60	17.55	73.60	Free	71.41	.000	.000	Free Outfall	
		H=1.85; Htw=.00; Qfree=17.55;						
73.70	18.99	73.70	Free	71.71	.000	.000	Free Outfall	
		H=1.95; Htw=.00; Qfree=18.99;						
73.80	20.11	73.80	72.01	72.01	.000	.000	Free Outfall	
		H=2.05; Htw=.26; Qfree=20.47;						
73.90	20.64	73.90	72.36	72.36	.000	.000	Free Outfall	
		H=2.15; Htw=.61; Qfree=21.99;						
74.00	20.68	74.00	72.73	72.73	.000	.000	Free Outfall	
		H=2.25; Htw=.98; Qfree=23.54;						

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 62.92 cfs
UPstream ID's= R0, W0
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
70.00	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.10	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.20	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.30	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.40	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.50	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.60	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.70	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.80	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
70.90	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.00	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.10	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.20	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.30	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.40	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.50	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.60	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							
71.70	.00	...	...	...	...	...	Free Outfall	
	WS below an invert; no flow.							

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 62.92 cfs
UPstream ID's= R0, W0
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
71.75	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
71.80	.08	68.62	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .029ft	Dcr= .086ft		CRIT.DEPTH Hev= .00ft	
71.90	.40	68.78	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .066ft	Dcr= .195ft		CRIT.DEPTH Hev= .00ft	
72.00	.87	68.91	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .098ft	Dcr= .288ft		CRIT.DEPTH Hev= .00ft	
72.10	1.44	69.03	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .127ft	Dcr= .372ft		CRIT.DEPTH Hev= .00ft	
72.20	2.11	69.14	Free	Free	.000	.002	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .155ft	Dcr= .451ft		CRIT.DEPTH Hev= .00ft	
72.30	2.85	69.24	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .182ft	Dcr= .526ft		CRIT.DEPTH Hev= .00ft	
72.40	3.66	69.35	Free	Free	.000	.002	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .208ft	Dcr= .597ft		CRIT.DEPTH Hev= .00ft	
72.50	4.52	69.45	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .234ft	Dcr= .665ft		CRIT.DEPTH Hev= .00ft	
72.60	5.47	69.54	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .259ft	Dcr= .733ft		CRIT.DEPTH Hev= .00ft	
72.70	6.46	69.64	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .285ft	Dcr= .798ft		CRIT.DEPTH Hev= .00ft	
72.80	7.51	69.73	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .310ft	Dcr= .863ft		CRIT.DEPTH Hev= .00ft	
72.90	8.61	69.83	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .335ft	Dcr= .926ft		CRIT.DEPTH Hev= .00ft	
73.00	9.75	69.92	Free	Free	.000	.002	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .359ft	Dcr= .987ft		CRIT.DEPTH Hev= .00ft	
73.10	12.11	70.10	Free	Free	.000	.005	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .408ft	Dcr= 1.105ft		CRIT.DEPTH Hev= .00ft	
73.20	15.50	70.33	Free	Free	.000	.002	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .474ft	Dcr= 1.256ft		CRIT.DEPTH Hev= .00ft	
73.30	19.57	70.58	Free	Free	.000	.004	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .549ft	Dcr= 1.419ft		CRIT.DEPTH Hev= .00ft	
73.40	24.18	70.85	Free	Free	.000	.010	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .633ft	Dcr= 1.585ft		CRIT.DEPTH Hev= .00ft	

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 62.92 cfs
UPstream ID's= R0, W0
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
73.50	29.31	71.12	Free	Free	.000	.009	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .725ft	Dcr= 1.753ft		CRIT.DEPTH	Hev= .00ft
73.60	34.83	71.41	Free	Free	.000	.005	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .828ft	Dcr= 1.918ft		CRIT.DEPTH	Hev= .00ft
73.70	40.74	71.71	Free	Free	.000	.036	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= .944ft	Dcr= 2.079ft		CRIT.DEPTH	Hev= .00ft
73.80	46.68	72.01	Free	Free	.000	.042	Free Outfall	
		CRIT.DEPTH CONTROL		Vh= 1.071ft	Dcr= 2.226ft		CRIT.DEPTH	Hev= .00ft
73.90	52.50	72.36	Free	Free	.000	.000	Free Outfall	
		INLET CONTROL...		Submerged:	HW =3.86			
74.00	57.98	72.73	Free	Free	.000	.000	Free Outfall	
		INLET CONTROL...		Submerged:	HW =4.23			

LEVEL POOL ROUTING DATA

HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Repor
Inflow HYG file = NONE STORED - BASIN PROP 1 IN 2
Outflow HYG file = NONE STORED - BASIN PROP 1 OUT 2

Pond Node Data = BASIN PROP 1
Pond Volume Data = BASIN PROP 1
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 70.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = .1000 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
70.00	.00	.000	12246	.00	.00	.00
70.10	.00	.030	13893	.00	.00	7.26
70.20	.00	.064	15643	.00	.00	15.46
70.30	.00	.102	17498	.00	.00	24.66
70.40	.00	.144	19456	.00	.00	34.92
70.50	.00	.191	21518	.00	.00	46.29
70.60	.00	.243	23684	.00	.00	58.84
70.70	.00	.300	25954	.00	.00	72.63
70.80	.00	.362	28327	.00	.00	87.70
70.90	.00	.430	30805	.00	.00	104.12
71.00	.00	.504	33386	.00	.00	121.95
71.10	.00	.581	34175	.00	.00	140.71
71.20	.00	.661	34973	.00	.00	159.92
71.30	.00	.742	35780	.00	.00	179.58
71.40	.00	.825	36596	.00	.00	199.68
71.50	.00	.910	37422	.00	.00	220.24
71.60	.00	.997	38257	.00	.00	241.26
71.70	.00	1.086	39101	.00	.00	262.75
71.75	.00	1.131	39526	.00	.00	273.67
71.80	.08	1.176	39954	.00	.08	284.79

LEVEL POOL ROUTING DATA

HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Repor
Inflow HYG file = NONE STORED - BASIN PROP 1 IN 2
Outflow HYG file = NONE STORED - BASIN PROP 1 OUT 2

Pond Node Data = BASIN PROP 1
Pond Volume Data = BASIN PROP 1
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	70.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
71.90	.40	1.269	40816	.00	.40	307.55
72.00	.87	1.364	41688	.00	.87	330.93
72.10	1.44	1.460	41942	.00	1.44	354.73
72.20	2.11	1.556	42197	.00	2.11	378.77
72.30	2.85	1.654	42452	.00	2.85	403.02
72.40	3.66	1.751	42708	.00	3.66	427.49
72.50	4.53	1.850	42965	.00	4.53	452.16
72.60	5.47	1.949	43223	.00	5.47	477.04
72.70	6.46	2.048	43482	.00	6.46	502.11
72.80	7.51	2.148	43741	.00	7.51	527.39
72.90	8.60	2.249	44001	.00	8.60	552.86
73.00	9.75	2.350	44262	.00	9.75	578.52
73.10	12.11	2.453	44782	.00	12.11	605.62
73.20	15.50	2.556	45305	.00	15.50	634.04
73.30	19.57	2.661	45832	.00	19.57	663.42
73.40	24.18	2.766	46361	.00	24.18	693.64
73.50	29.31	2.873	46893	.00	29.31	724.67
73.60	34.83	2.982	47835	.00	34.83	756.51
73.70	40.74	3.093	48786	.00	40.74	789.26
73.80	46.68	3.206	49747	.00	46.68	822.57

LEVEL POOL ROUTING DATA

HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Repor
Inflow HYG file = NONE STORED - BASIN PROP 1 IN 2
Outflow HYG file = NONE STORED - BASIN PROP 1 OUT 2

Pond Node Data = BASIN PROP 1
Pond Volume Data = BASIN PROP 1
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	70.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
73.90	52.40	3.321	50717	.00	52.40	856.19
74.00	57.88	3.439	51696	.00	57.88	890.12

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN PROP 1 IN

HYG Directory: P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Reports\S

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ADDLINK 10	P-1 IMPERVIOUS		P-1 IMPERVIOUS	1
ADDLINK 30	P-1 PERVIOUS		P-1 PERVIOUS	1

INFLOWS TO: BASIN PROP 1 IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	P-1 IMPERVIOUS	1	.478	1.1000	13.00
	P-1 PERVIOUS	1	.000	.1000	.00

TOTAL FLOW INTO: BASIN PROP 1 IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	BASIN PROP 1 IN	1	.478	1.1000	13.00

TOTAL NODE INFLOW...
HYG file =
HYG ID = BASIN PROP 1 IN
HYG Tag = 1

Peak Discharge = 13.00 cfs
Time to Peak = 1.1000 hrs
HYG Volume = .478 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.3000	.00	.07	.30	.67	1.02
.8000	1.49	2.93	8.18	13.00	9.80
1.3000	6.18	3.81	2.74	2.11	1.79
1.8000	1.51	.94	.70	.35	.14
2.3000	.05	.01	.00	.00	

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN PROP 1 IN

HYG Directory: P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Reports\S

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ADDLINK 10	P-1 IMPERVIOUS		P-1 IMPERVIOUS	2
ADDLINK 30	P-1 PERVIOUS		P-1 PERVIOUS	2

INFLOWS TO: BASIN PROP 1 IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	P-1 IMPERVIOUS	2	1.410	12.1000	13.30
	P-1 PERVIOUS	2	.000	21.6000	.00

TOTAL FLOW INTO: BASIN PROP 1 IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	BASIN PROP 1 IN	2	1.411	12.1000	13.30

TOTAL NODE INFLOW...
HYG file =
HYG ID = BASIN PROP 1 IN
HYG Tag = 2

Peak Discharge =	13.30 cfs
Time to Peak =	12.1000 hrs
HYG Volume =	1.411 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
1.3000	.00	.00	.01	.01	.02
1.8000	.02	.03	.03	.04	.04
2.3000	.05	.05	.06	.06	.07
2.8000	.07	.07	.08	.08	.09
3.3000	.09	.10	.10	.11	.11
3.8000	.12	.12	.13	.13	.13
4.3000	.14	.14	.15	.15	.16
4.8000	.16	.17	.17	.17	.18
5.3000	.18	.19	.19	.20	.20
5.8000	.20	.21	.21	.22	.22
6.3000	.23	.24	.25	.26	.27
6.8000	.28	.29	.30	.31	.32
7.3000	.33	.34	.35	.36	.37
7.8000	.38	.39	.40	.41	.42
8.3000	.44	.46	.48	.50	.53
8.8000	.55	.57	.59	.61	.63
9.3000	.65	.68	.70	.72	.74
9.8000	.76	.79	.81	.84	.87
10.3000	.91	.95	1.00	1.04	1.09
10.8000	1.13	1.18	1.22	1.29	1.41
11.3000	1.56	1.72	1.88	2.36	3.40
11.8000	4.76	6.29	10.51	13.30	11.16
12.3000	8.52	6.40	4.55	3.18	2.42
12.8000	2.02	1.77	1.57	1.43	1.34
13.3000	1.27	1.22	1.18	1.13	1.09
13.8000	1.04	1.00	.96	.92	.89
14.3000	.86	.84	.82	.80	.78
14.8000	.76	.74	.71	.69	.67
15.3000	.65	.63	.61	.59	.57
15.8000	.55	.53	.50	.49	.47
16.3000	.46	.45	.44	.43	.42

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
16.8000	.41	.41	.40	.39	.38
17.3000	.37	.36	.35	.34	.33
17.8000	.32	.31	.31	.30	.29
18.3000	.29	.29	.28	.28	.28
18.8000	.27	.27	.27	.27	.26
19.3000	.26	.26	.26	.25	.25
19.8000	.25	.24	.24	.24	.24
20.3000	.23	.23	.23	.23	.23
20.8000	.22	.22	.22	.22	.22
21.3000	.21	.21	.21	.21	.21
21.8000	.21	.20	.20	.20	.20
22.3000	.19	.19	.19	.19	.19
22.8000	.18	.18	.18	.18	.18
23.3000	.17	.17	.17	.17	.17
23.8000	.16	.16	.16	.09	.04
24.3000	.01	.00	.00	.00	

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN PROP 1 IN

HYG Directory: P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Reports\S

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ADDLINK 10	P-1	IMPERVIOUS	P-1 IMPERVIOUS	10
ADDLINK 30	P-1	PERVIOUS	P-1 PERVIOUS	10

INFLOWS TO: BASIN PROP 1 IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
P-1	IMPERVIOUS	10	2.188	12.1000	20.28
P-1	PERVIOUS	10	.035	12.5000	.08

TOTAL FLOW INTO: BASIN PROP 1 IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
BASIN PROP 1 IN		10	2.223	12.1000	20.28

TOTAL NODE INFLOW...
HYG file =
HYG ID = BASIN PROP 1 IN
HYG Tag = 10

Peak Discharge =	20.28 cfs
Time to Peak =	12.1000 hrs
HYG Volume =	2.223 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.8000	.00	.00	.01	.02	.03
1.3000	.04	.05	.06	.07	.08
1.8000	.09	.09	.10	.11	.12
2.3000	.12	.13	.14	.15	.15
2.8000	.16	.17	.18	.18	.19
3.3000	.20	.21	.21	.22	.23
3.8000	.23	.24	.25	.25	.26
4.3000	.27	.27	.28	.29	.29
4.8000	.30	.30	.31	.32	.32
5.3000	.33	.33	.34	.35	.35
5.8000	.36	.36	.37	.38	.39
6.3000	.40	.41	.43	.44	.46
6.8000	.47	.49	.50	.51	.53
7.3000	.54	.56	.57	.59	.60
7.8000	.62	.63	.65	.66	.69
8.3000	.72	.75	.78	.81	.85
8.8000	.88	.91	.94	.97	1.01
9.3000	1.04	1.07	1.11	1.14	1.17
9.8000	1.20	1.24	1.27	1.31	1.36
10.3000	1.42	1.49	1.56	1.62	1.69
10.8000	1.76	1.82	1.89	2.00	2.18
11.3000	2.41	2.65	2.90	3.64	5.22
11.8000	7.30	9.64	16.05	20.28	17.00
12.3000	12.99	9.81	6.99	4.89	3.74
12.8000	3.13	2.75	2.45	2.23	2.09
13.3000	1.99	1.92	1.85	1.78	1.71
13.8000	1.64	1.58	1.51	1.45	1.40
14.3000	1.37	1.33	1.30	1.27	1.23
14.8000	1.20	1.17	1.14	1.10	1.07
15.3000	1.04	1.01	.97	.94	.91
15.8000	.87	.84	.81	.78	.76

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time hrs | Time on left represents time for first value in each row.

Time hrs					
16.3000	.74	.72	.71	.70	.68
16.8000	.67	.65	.64	.62	.61
17.3000	.59	.58	.57	.55	.54
17.8000	.52	.51	.49	.48	.47
18.3000	.47	.46	.46	.45	.45
18.8000	.44	.44	.44	.43	.43
19.3000	.42	.42	.41	.41	.40
19.8000	.40	.40	.39	.39	.38
20.3000	.38	.38	.37	.37	.37
20.8000	.36	.36	.36	.35	.35
21.3000	.35	.34	.34	.34	.33
21.8000	.33	.33	.32	.32	.32
22.3000	.31	.31	.31	.31	.30
22.8000	.30	.30	.29	.29	.29
23.3000	.28	.28	.28	.27	.27
23.8000	.27	.26	.26	.14	.05
24.3000	.02	.01	.00	.00	

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN PROP 1 IN

HYG Directory: P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Reports\S

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ADDLINK 10	P-1 IMPERVIOUS		P-1 IMPERVIOUS	100
ADDLINK 30	P-1 PERVIOUS		P-1 PERVIOUS	100

INFLOWS TO: BASIN PROP 1 IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	P-1 IMPERVIOUS	100	3.708	12.1000	33.85
	P-1 PERVIOUS	100	.227	12.1000	1.99

TOTAL FLOW INTO: BASIN PROP 1 IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	BASIN PROP 1 IN	100	3.934	12.1000	35.84

TOTAL NODE INFLOW...
HYG file =
HYG ID = BASIN PROP 1 IN
HYG Tag = 100

Peak Discharge =	35.84 cfs
Time to Peak =	12.1000 hrs
HYG Volume =	3.934 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.5000	.00	.01	.03	.06	.09
1.0000	.11	.14	.16	.18	.19
1.5000	.21	.22	.24	.25	.26
2.0000	.27	.28	.29	.31	.32
2.5000	.33	.34	.36	.37	.38
3.0000	.39	.40	.41	.42	.43
3.5000	.44	.45	.46	.47	.49
4.0000	.49	.50	.51	.52	.53
4.5000	.54	.55	.56	.57	.58
5.0000	.59	.60	.61	.62	.62
5.5000	.63	.64	.65	.66	.67
6.0000	.67	.69	.70	.73	.75
6.5000	.77	.79	.82	.84	.87
7.0000	.89	.91	.94	.96	.98
7.5000	1.01	1.03	1.06	1.08	1.10
8.0000	1.13	1.16	1.20	1.25	1.30
8.5000	1.35	1.41	1.46	1.51	1.57
9.0000	1.62	1.67	1.73	1.78	1.83
9.5000	1.89	1.94	2.00	2.05	2.10
10.0000	2.16	2.22	2.31	2.41	2.52
10.5000	2.63	2.74	2.85	2.97	3.08
11.0000	3.19	3.37	3.67	4.05	4.45
11.5000	4.88	6.11	8.76	12.24	16.22
12.0000	27.70	35.84	30.12	23.08	17.43
12.5000	12.39	8.67	6.66	5.61	4.94
13.0000	4.41	4.01	3.76	3.59	3.45
13.5000	3.33	3.21	3.09	2.96	2.84
14.0000	2.72	2.61	2.53	2.47	2.40
14.5000	2.34	2.29	2.23	2.17	2.11
15.0000	2.05	1.99	1.93	1.87	1.81
15.5000	1.75	1.70	1.63	1.58	1.51

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time hrs | Time on left represents time for first value in each row.

Time hrs					
16.0000	1.46	1.40	1.36	1.34	1.31
16.5000	1.28	1.25	1.23	1.20	1.18
17.0000	1.15	1.12	1.10	1.07	1.04
17.5000	1.02	.99	.97	.94	.91
18.0000	.89	.86	.85	.84	.83
18.5000	.82	.82	.81	.80	.79
19.0000	.79	.78	.77	.76	.75
19.5000	.75	.74	.73	.72	.71
20.0000	.71	.70	.69	.69	.68
20.5000	.67	.67	.66	.66	.65
21.0000	.65	.64	.63	.63	.62
21.5000	.61	.61	.60	.60	.59
22.0000	.59	.58	.57	.57	.56
22.5000	.55	.55	.54	.54	.53
23.0000	.53	.52	.51	.51	.50
23.5000	.50	.49	.48	.48	.47
24.0000	.47	.24	.09	.03	.01
24.5000	.00	.00			

LEVEL POOL ROUTING SUMMARY

HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Repor
Inflow HYG file = NONE STORED - BASIN PROP 1 IN 1
Outflow HYG file = NONE STORED - BASIN PROP 1 OUT 1

Pond Node Data = BASIN PROP 1
Pond Volume Data = BASIN PROP 1
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	70.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	13.00 cfs	at	1.1000 hrs
Peak Outflow	=	.00 cfs	at	.4000 hrs
Peak Elevation	=	70.96 ft		
Peak Storage	=	.477 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.478
- Infiltration	=	.000
- HYG Vol OUT	=	.000
- Retained Vol	=	.477
Unrouted Vol	=	-.001 ac-ft (.141% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Repor
Inflow HYG file = NONE STORED - BASIN PROP 1 IN 2
Outflow HYG file = NONE STORED - BASIN PROP 1 OUT 2

Pond Node Data = BASIN PROP 1
Pond Volume Data = BASIN PROP 1
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	70.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	13.30 cfs	at	12.1000 hrs
Peak Outflow	=	.29 cfs	at	17.9000 hrs
Peak Elevation	=	71.87 ft		
Peak Storage	=	1.237 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	1.411
- Infiltration	=	.000
- HYG Vol OUT	=	.278
- Retained Vol	=	1.133
Unrouted Vol	=	-.000 ac-ft (.001% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Repor
Inflow HYG file = NONE STORED - BASIN PROP 1 IN 10
Outflow HYG file = NONE STORED - BASIN PROP 1 OUT 10

Pond Node Data = BASIN PROP 1
Pond Volume Data = BASIN PROP 1
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	70.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	20.28 cfs	at	12.1000 hrs
Peak Outflow	=	1.86 cfs	at	13.4000 hrs
Peak Elevation	=	72.16 ft		
Peak Storage	=	1.521 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	2.223
- Infiltration	=	.000
- HYG Vol OUT	=	1.090
- Retained Vol	=	1.133
Unrouted Vol	=	-.000 ac-ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Admin\Repor
Inflow HYG file = NONE STORED - BASIN PROP 1 IN 100
Outflow HYG file = NONE STORED - BASIN PROP 1 OUT 100

Pond Node Data = BASIN PROP 1
Pond Volume Data = BASIN PROP 1
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	70.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

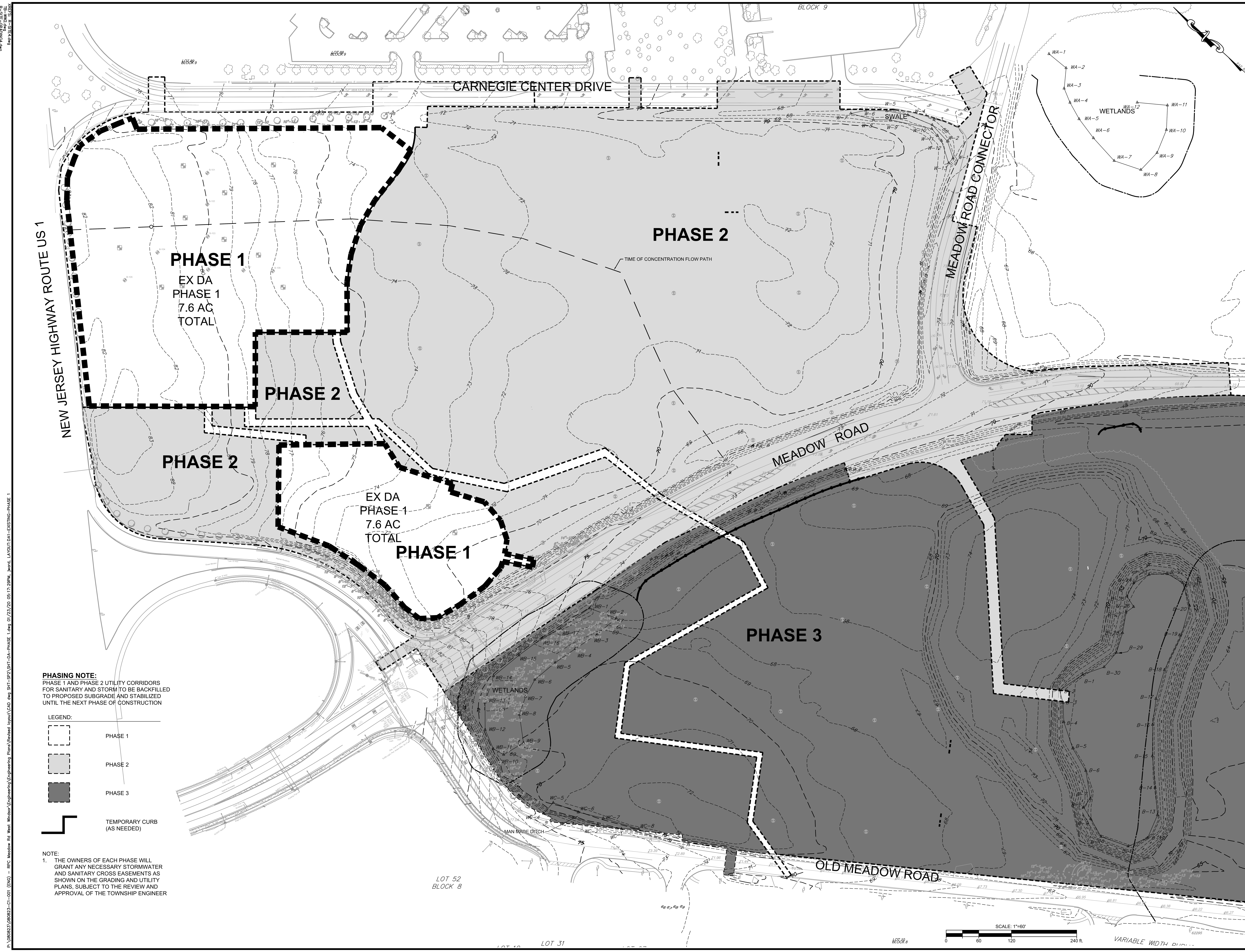
INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	35.84 cfs	at	12.1000 hrs
Peak Outflow	=	8.93 cfs	at	12.6000 hrs
Peak Elevation	=	72.93 ft		
Peak Storage	=	2.278 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	3.934
- Infiltration	=	.000
- HYG Vol OUT	=	2.802
- Retained Vol	=	1.133
Unrouted Vol	=	-.000 ac-ft (.000% of Inflow Volume)

Index of Starting Page Numbers for ID Names



PHASING NOTE:
PHASE 1 AND PHASE 2 UTILITY CORRIDORS FOR SANITARY AND STORM TO BE BACKFILLED TO PROPOSED SUBGRADE AND STABILIZED UNTIL THE NEXT PHASE OF CONSTRUCTION

LEGEND:

- PHASE 1
- PHASE 2
- PHASE 3
- TEMPORARY CURB (AS NEEDED)

NOTE:
1. THE OWNERS OF EACH PHASE WILL GRANT ANY NECESSARY STORMWATER AND SANITARY CROSS EASEMENTS AS SHOWN ON THE GRADING AND UTILITY PLANS, SUBJECT TO THE REVIEW AND APPROVAL OF THE TOWNSHIP ENGINEER

	REVISION	DATE	CHKD
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2	GENERAL REVISIONS	1/15/20	
1	ISSUED TO CLIENT FOR REVIEW AND COMMENT	1/7/20	

PROJ.: 080823-C1-001
DATE: 5/17/19
CHKD:

Bowman CONSULTING

Bowman Consulting Group, Ltd.
303 W. Main Street
Freehold, New Jersey 07728
www.bowmanconsulting.com
E-mail: NJ@BowmanConsulting.com
Phone: 732-665-5500
FAX: 732-665-5501
NJ Certificate of Authorization No. 24GA28222600

R. MICHAEL MCKENNA, N.J. Professional Engineer Lic. 24GE02590400

PRELIMINARY AND FINAL SUBDIVISION & PRELIMINARY & FINAL SITE PLAN FOR
PROPOSED HOTEL & RESTAURANT
PRELIMINARY MAJOR SITE PLAN FOR
PROPOSED RESIDENTIAL DEVELOPMENT
PRINCETON EXECUTIVE PARK

PHASE 1 EXISTING DRAINAGE AREA MAP

BLOCK 9, LOTS 12.01, and 12.02, BLOCK 9.03, LOT 12.02
TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NEW JERSEY

SHEET No.
1
OF

BLOCK 9

CARNEGIE CENTER DRIVE

NEW JERSEY HIGHWAY ROUTE US 1

MEADOW ROAD CONNECTOR

MEADOW ROAD

OLD MEADOW ROAD

PROP DA 1 -
PHASE 1
7.6 AC TOTAL

PHASE 1

PHASE 2

PHASE 2

PHASE 2

PHASE 3

PHASE 3

PROP DA 1 -
PHASE 1
7.6 AC TOTAL

PHASE 1

BASIN #1

BASIN #2

BASIN #3

BASIN #4

EXISTING BASIN

LIMIT OF RECORDED GREENBELT

LIMIT OF RECORDED GREENBELT

LIMIT OF PROPOSED GREENBELT AS PER BURGIS ASSOCIATES, INC 2018 OPEN SPACE RECREATION PLAN

LIMIT OF PROPOSED GREENBELT AS PER BURGIS ASSOCIATES, INC 2018 OPEN SPACE RECREATION PLAN

FLOOD HAZARD LIMIT LINE

VARIABLE WIDTH PUBLIC

LOT 52
BLOCK 8

LOT 31

LOT 30
BLOCK 8

PHASING NOTE:
PHASE 1 AND PHASE 2 UTILITY CORRIDORS FOR SANITARY AND STORM TO BE BACKFILLED TO PROPOSED SUBGRADE AND STABILIZED UNTIL THE NEXT PHASE OF CONSTRUCTION

PHASING NOTE:
PHASE 1 AND PHASE 2 UTILITY CORRIDORS FOR SANITARY AND STORM TO BE BACKFILLED TO PROPOSED SUBGRADE AND STABILIZED UNTIL THE NEXT PHASE OF CONSTRUCTION

LEGEND:

PHASE 1

PHASE 1

PHASE 2

PHASE 2

PHASE 3

PHASE 3

TEMPORARY CURB (AS NEEDED)

TEMPORARY CURB (AS NEEDED)

NOTE:
1. THE OWNERS OF EACH PHASE WILL GRANT ANY NECESSARY STORMWATER AND SANITARY CROSS EASEMENTS AS SHOWN ON THE APPROVED PLANS. WITH ANY NECESSARY STORMWATER AND SANITARY CROSS EASEMENTS AS SHOWN ON THE GRADING AND UTILITY PLANS, SUBJECT TO THE REVIEW AND APPROVAL OF THE TOWNSHIP ENGINEER

NOTE:
1. THE OWNERS OF EACH PHASE WILL GRANT ANY NECESSARY STORMWATER AND SANITARY CROSS EASEMENTS AS SHOWN ON THE APPROVED PLANS. WITH ANY NECESSARY STORMWATER AND SANITARY CROSS EASEMENTS AS SHOWN ON THE GRADING AND UTILITY PLANS, SUBJECT TO THE REVIEW AND APPROVAL OF THE TOWNSHIP ENGINEER

SCALE: 1"=60'
0 60 120 240 ft.

NO.	REVISION	DATE	CHKD
12			
11			
10			
9			
8			
7			
6			
5			
4			
3	GENERAL REVISIONS	11/5/20	
2	ISSUED TO CLIENT FOR REVIEW AND COMMENT	7/7/20	
1			

PROJ.: 080823-C1-001
DRWN:
DATE: 5/7/19
CHKD:

BOWMAN
CONSULTING

Bowman Consulting Group, Ltd.
Phone: 732-865-6500
FAX: 732-865-6501
NJ Certificate of Authorization No. 24GA28222600
303 W. Main Street
Freehold, New Jersey 07728
E-mail: NJ@BowmanConsulting.com

R. MICHAEL MCKENNA, N.J. Professional Engineer Lic. 24GE02958400

PRELIMINARY AND FINAL SUBDIVISION & PRELIMINARY & FINAL SITE PLAN FOR
PROPOSED HOTEL & RESTAURANT
PRELIMINARY MAJOR SITE PLAN FOR
PROPOSED RESIDENTIAL DEVELOPMENT
PRINCETON EXECUTIVE PARK
PHASE 1 PROPOSED DRAINAGE AREA MAP
BLOCK 9, LOTS 12.01, and 12.02; BLOCK 9.03, LOT 12.02
TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NEW JERSEY

SHEET No.
2
OF

PRELIMINARY AND FINAL SUBDIVISION & PRELIMINARY & FINAL SITE PLAN FOR
PROPOSED HOTEL & RESTAURANT
PRELIMINARY MAJOR SITE PLAN FOR
PROPOSED RESIDENTIAL DEVELOPMENT
PRINCETON EXECUTIVE PARK
PHASE 1 INLET DRAINAGE AREA MAP
TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NEW JERSEY
BLOCK 9, LOTS 12.01 and 12.02, BLOCK 8.02, LOT 12.02

SHEET No. 3 OF

Bowman Consulting Group, Ltd.
101 W. Main Street
Freehold, New Jersey 07728
Phone: 732-665-5500
FAX: 732-665-5501
www.bowmanconsulting.com
E-mail: NJ@bowmanconsulting.com
NJ Certificate of Authorization No. 24GA28222600

R. MICHAEL MCKENNA, N.J. Professional Engineer Lic. 24GE02590400

Bowman CONSULTING

REVISION	DATE	CHKD
1 ISSUED TO CLIENT FOR REVIEW AND COMMENT	1/7/20	
2 GENERAL REVISIONS	1/15/20	
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

PROJ.: 080823-C1-001
DATE: 5/7/19
CHKD:

MEADOW ROAD CONNECTOR
MEADOW ROAD
OLD MEADOW ROAD
CARNEGIE CENTER DRIVE
NEW JERSEY HIGHWAY ROUTE US 1
BLOCK 9
LOT 52 BLOCK 8
LOT 34
EXISTING BASIN
BASIN #1
BASIN #2
BASIN #3
BASIN #4
PHASE 1
PHASE 2
PHASE 3
LIMIT OF RECORDED GREENBELT
LIMIT OF PROPOSED GREENBELT AS PER BURGIS ASSOCIATES, DATED INC 2018 OPEN SPACE RECREATION PLAN
FLOOD HAZARD LIMIT LINE
VARIABLE WIDTH DUR...
SCALE: 1"=60'
0 60 120 240 ft.

PHASING NOTE:
PHASE 1 AND PHASE 2 UTILITY CORRIDORS FOR SANITARY AND STORM TO BE BACKFILLED TO PROPOSED SUBGRADE AND STABILIZED UNTIL THE NEXT PHASE OF CONSTRUCTION

LEGEND:
- PHASE 1
- PHASE 2
- PHASE 3
- TEMPORARY CURB (AS NEEDED)

NOTE:
1. THE OWNERS OF EACH PHASE WILL GRANT ANY NECESSARY STORMWATER AND SANITARY CROSS EASEMENTS AS SHOWN ON THE GRADING AND UTILITY PLANS, SUBJECT TO THE REVIEW AND APPROVAL OF THE TOWNSHIP ENGINEER

P:\080823\080823-C1-001 (ENG) - RPC Meadow Rd West Windsor\Engineering\Engineering Plans\Revised layout\CAD dwg SHT-SP2\SHT-DA-PHASE 1.dwg 01/23/20 05:28:58PM, jward, LAYOUT:DA3-INLET PHASE 1

XREFS: R-SITE4.dwg
TB-WW2.dwg
R-SITE-GRADING4.dwg
MBA-ENG.dwg