RJOC

Stormwater Management Report

Grove Street Residences
121 Grove Street
Franklin, Massachusetts

Prepared for:
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Date: December 18, 2023
Revised: 02/02/24, 02/12/24

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2-12-2024

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I. STORMWATER REPORT NARRATIVE

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1.0 Introduction

R.J. O'Connell & Associates, Inc. (RJOC) has prepared this stormwater report on behalf of Fairfield Residential Company, LLC (applicant) for the proposed site improvements at 121 Grove Street located in Franklin, Massachusetts (refer to Figure 1, "USGS Map"). This study uses the computer program HydroCAD, version 10.00, to model existing and proposed hydrologic site conditions based on the Natural Resources Conservation Service (NRCS) TR-20 Computer Program for Project Formulation Hydrology. The study presents a comparative analysis of pre-development hydrologic conditions to post-development hydrologic conditions and demonstrates that the proposed condition will be an improvement over the existing stormwater management condition.

2.0 Site Location and Description

The project site is comprised of two parcels of land located at 121 Grove Street and 0 Grove Street in Franklin, MA. These parcels will ultimately be consolidated into one parcel. Therefore, for the purpose of this report, the two parcels will be discussed as one "project", "site", or "property". The combined area of two parcels approximates 31.44 acres of land. The property is bounded on the north and west by Franklin State Forest, to the south by a parcel owned by New England Power with electric transformers, and east by Grove Street.

A portion of the site is developed with a three-family home and multiple shed type buildings, driveways, and walkways. The remainder of the site is undeveloped and includes open field area, woodland, and wetlands. The majority of the site is undeveloped. The residential development has two driveways onto Grove Street.

There is a significant grade change across the site from east to west. The grade change is approximately 95 feet from elevation 270 on the east side along Grove Stree to elevation 365 on the west side. There is no on-site drainage system. All stormwater runoff from the upland areas on the site sheet flow to the several on-site wetlands. Stormwater runoff from a small portion of the site, along Grove Street, sheet flows onto Grove Street and into the street drainage system.

3.0 Proposed Project

The proposed project consists of demolishing the existing structures and pavement and constructing five, multi-story, residential apartment buildings with associated parking, drive aisles, garages, and clubhouse. The redevelopment will include landscaping in the parking areas and around each building. The landscaping will be designed to provide quality, visual relief using native landscape plants.

The proposed development results in a net increase in impervious areas. The project proposes drainage systems to provide treatment of stormwater runoff as well as best management practices (BMPs) to promote infiltration to the groundwater. The stormwater design incorporates surface infiltration basins, surface detention basins, subsurface infiltration facilities, subsurface detention basins, water quality units and deep sump catchbasins. Design strategies for the proposed stormwater drainage system follows methods from the Massachusetts Stormwater Handbook as well as Franklin's Stormwater Management Bylaw to the maximum extent feasible.

4.0 Compliance with MassDEP Stormwater Handbook

This development program includes a stormwater management system that will collect, treat, and control stormwater runoff in conformance with MassDEP's Stormwater Management Policy. Stormwater Best Management Practices (BMPs) have been incorporated into the design to comply with all the Stormwater Management Standards as described below.

Standard 1 – No Untreated Discharges or Erosion to Wetlands: No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

No new stormwater conveyances discharging untreated stormwater to wetlands or waters of the Commonwealth are proposed.

Standard 2 – Peak Rate Attenuation: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

The proposed stormwater management system results in a net decrease in peak rates of runoff discharged from the site under post-development conditions compared to pre-development rates for all storms analyzed. Refer to computations and appendices for details.

Standard 3 – Stormwater Recharge: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Surface and subsurface infiltration systems have been proposed to provide the required recharge volume in areas most feasible based on groundwater elevations and boulder refusal observed in numerous test pits performed on site. Soil observations determined that the site is comprised of Hydrologic Soil Group A soils with refusal or groundwater observed in several test pits. Refer to the soil test pit logs provided for additional information and the recharge volume calculations below.

Standard 4 – Water Quality: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). The standard is met with pollution prevention plans, stormwater BMPs sized to capture required water quality volume, and pretreatment measures.

Runoff from surface paved areas will be collected in deep sump catch basins with hooded outlets prior to discharge to water quality units. This combination provides 80% pre-treatment prior to entering the subsurface infiltration systems or surface infiltration basins. Stormwater is infiltrated in the subsurface and surface infiltration systems. Outlet control structures (OCS) and/or piped overflow outlets regulates stormwater discharge to the design points (DP). The water quality volume is retained below the lowest outlets of the systems, providing 80% TSS removal.

Standard 5 – Land Uses with Higher Potential Pollutant Loads (LUHPPLs): Source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

A Stormwater Pollution Prevention Plan (SWPPP) to control erosion, sedimentation and other pollutant sources, as well as prevent erosion and sediment from moving off-site during construction and land disturbance activities will be provided prior to construction and maintained on site.

Standard 6 – Critical Areas: Stormwater discharges to critical areas require the use of the specific source control and pollution prevention measures and specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

Some of the stormwater discharge from the site will discharge to wetlands that flow to a Zone II. The stormwater management has been designed to treat required water quality volume of one inch over the impervious area. 80% TSS removal will be achieved prior to groundwater recharge and surface flow discharge. A long-term pollution prevention plan has been prepared and will be implemented.

Standard 7 - Redevelopment: A redevelopment project is required to meet Standards 1-6 only to the maximum extent practicable. Remaining standards shall be met and the project shall improve existing conditions.

This project is a mixture of new development and redevelopment and meets all of the stormwater management standards.

Standard 8 – Construction Period Controls: A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities shall be developed and implemented.

A Stormwater Pollution Prevention Plan (SWPPP) to control erosion, sedimentation and other pollutant sources, as well as prevent erosion and sediment from moving off-site during construction and land disturbance activities will be provided prior to construction and maintained on site.

Standard 9 – Long Term Maintenance: A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

An Operation and Maintenance Plan (O&M) to ensure the long term, post-construction operation of the stormwater management system is included in Appendix D.

Standard 10 – Prohibition of Illicit Discharges: Illicit discharges to the stormwater management system are prohibited.

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Discharges to the stormwater management system from the following activities or facilities are permissible: Firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents. All other illicit discharges are prohibited.

4.1 Compliance with Town of Franklin Stormwater Management Bylaw

Per the Town of Franklin Stormwater Management Bylaw, in addition to meeting the requirements of the Massachusetts Stormwater Standards all stormwater management systems shall meet the additional criteria as outlined in the bylaw. Stormwater Best Management Practices (BMPs) have been incorporated into the design to comply with these additional criteria, for new development sites, as described below.

a. Retain the volume of runoff equivalent to, or greater than, 1.0 inch multiplied by the total post-construction impervious surface area on the site; and/or

    - As outlined in Section 9.4, Stormwater Quality, below the stormwater management systems proposed will retain greater than required 1.0 inch multiplied by the total post-construction impervious area.

b. Removed 90% of the average annual load of total suspended soilds (TSS) generated from the total post-construction impervious area on the site and 60% of the annual load of total phosphorous (TP) generated from the total post-construction impervious surface area on the site.

    - As outlined in the computations in Appendix B, the proposed stormwater management systems will provide greater than 90% TSS average annual load removal and greater than 60% TP removal.

5.0 Soil Data

A total of sixty-one (61) test pits have been performed on the site. In May of 2022, Northeast Geotechnical, Inc. performed nineteen (19) onsite soil tests and in October of 2023 R.J. O'Connell & Associates, Inc (RJOC) performed forty-two (42) additional soil test pits.

The onsite soil testing performed on the soils indicated that the parent soils present belong to a Hydrologic Soil Group A in the locations of most of the test pits. Areas of shallow bedrock and high groundwater were found in some test pit locations throughout the site.

Detailed soil testing information has been provided in Appendix C from both Northeast Geotechnical, Inc (Geotechnical Consultant) and RJOC.

6.0 Hydrologic Methodology

Pre- and post-development drainage analyses were performed for the 2, 10, 25 and 100-year storm events. Rainfall events have been compiled by NOAA Atlas 14 values for extreme precipitation for the region as noted below:

County	2-year	10-year	25-year	100-year
Norfolk	3.36 in.	5.22 in.	6.39 in.	8.12 in.

The NRCS method uses several parameters based on watershed characteristics and configuration to generate a curvilinear unit hydrograph and produce a runoff hydrograph for the watershed. Basic input data required to generate a hydrograph are the watershed area, storm frequency, time of concentration, 24-hour rainfall, and the watershed's runoff curve number.

NRCS Technical Release 55 (TR-55) methodology was utilized to determine weighted runoff curve number (CN) for the pre- and post-development watershed areas. Inputs for obtaining the weighted CN were determined based on ground cover type and the Hydrological Soil Group (HSG), as described in the Soil Data section above. Time of concentration (Tc) was determined based on the most hydrologically distant point (time-wise) within the watershed.

Watershed boundaries were established based on topography, storm drainage layouts, and the location of major drainage discharge points, or Design Point (DP). The pre-development watershed boundaries can be seen in Figure 4, "Existing Watershed Plan" and the post-development boundaries can be seen on Figure 5, "Proposed Watershed Plan".

7.0 Existing Drainage Conditions

7.1 On-Site Resources

Bordering vegetated wetlands exist onsite that bisect through the property, intermittent streams existing within the bordering vegetated wetlands.

The site lies within flood Zone X per FEMA FIRM Map Number 25021 Panel 0308 Suffix C, effective date July 17, 2012.

The northern corner of the site is within a Zone II, but no work is proposed within this area as part of this project, and it will remain undisturbed preserving the natural features and vegetation.

There are no endangered species habitats located within or adjacent to the site.

7.2 Existing Hydrology

The existing site has been analyzed under current extreme precipitation values for the 2-year, 10-year, 25-year and 100-year 24-hour storm events. A total of four (4) design points (DP) have been analyzed in the pre-construction conditions, consisting of existing onsite bordering vegetated wetlands, abutting property to the south and Grove Street. Design Point-1 (DP-1) has been identified as the existing wetland series A that outlets to Franklin State Forest, Design Point-2 (DP-2) has been identified as overland flow to Grove Street, Design Point-3 (DP-3) has been identified as an existing wetland series B that outlets to the existing drainage system within Grove Street, Design Point-4 (DP-4) has been identified as the abutting property to the south owned by New England Power.

Existing Sub-Catchment Area 1 (EX-1)
This sub-catchment area consists of an existing dirt path, grassed and wooded areas. Stormwater flows overland to existing wetlands series A, or DP-1, that drains to Franklin State Forest.

Existing Sub-Catchment Area 1.1 (EX-1.1)
This sub-catchment area consists of portions of existing building roof area and associated paved drive/patio areas, portions of the gravel driveway and grassed/wooded areas. Stormwater flows overland to existing wetlands series A, or DP-1, that drains to Franklin State Forest.

Existing Sub-Catchment Area 2 (EX-2)
This sub-catchment area consists of portions of existing building roof area and associated paved drive/walk areas and grassed/wooded areas. Stormwater flows overland to Grove Street or DP-2.

Existing Sub-Catchment Area 2.1 (EX-2.1)
This sub-catchment area consists of portions of existing building roof area and associated paved drive/walk areas and grassed/wooded areas. Stormwater flows overland to Grove Street or DP-2.

Existing Sub-Catchment Area 3 (EX-3)
This sub-catchment area consists of existing grassed and wooded areas. Stormwater flows overland to existing wetlands series B, or DP-3, that drains to the existing drainage system within Grove Street.

Existing Sub-Catchment Area 3.1 (EX-3.1)
This sub-catchment area consists of portions of existing roof area and grassed/wooded areas. Stormwater flows overland to existing wetlands series B, or DP-3, that drains to the existing drainage system within Grove Street.

Existing Sub-Catchment Area 3.2 (EX-3.2)
This sub-catchment area consists of existing wooded areas. Stormwater flows overland to existing wetlands series B, or DP-3, that drains to the existing drainage system within Grove Street.

Existing Sub-Catchment Area 4 (EX-4)
This sub-catchment area consists of the existing wooded areas. Stormwater flows overland to the abutting property to the south, or DP-4.

8.0 Proposed Drainage Conditions

8.1 Proposed Hydrology

The proposed project is divided into twenty-nine (29) sub-catchment areas for analysis (see Figure 5 – “Proposed Watershed Plan”). Stormwater runoff generated over paved areas will be captured by a deep sump catch basin with hooded outlets and routed through water quality units prior to discharge to infiltration basins, detention basins or designated design points. Stormwater runoff generated from the proposed buildings will enter the proposed drainage systems via roof drains and piping. During larger storm events, runoff will discharge from the drainage systems to outlet control structures/manifolds before discharging to the designated design points.

Proposed Sub-Catchment Area 1 (PR-1)
This sub-catchment area consists of the remainder of the existing dirt path, grassed and wooded areas. Stormwater runoff from this sub-catchment will flow overland to DP-1.

Proposed Sub-Catchment Area 1.1 (PR-1.1)
This sub-catchment area consists of grassed and wooded areas. Stormwater runoff from this sub-catchment will flow overland to DP-1.

Proposed Sub-Catchment Area 1.2 (PR-1.2)
This sub-catchment area consists of grassed and wooded areas. Stormwater runoff from this sub-catchment will flow overland to DP-1.

Proposed Sub-Catchment Area 1.3 (PR-1.3)
This sub-catchment area consists of grassed and wooded areas. Stormwater runoff from this sub-catchment will flow overland to DP-1.

Proposed Sub-Catchment Area 1.4 (PR-1.4)
This sub-catchment area consists of proposed driveway area and grassed areas. Stormwater runoff from this sub-catchment will be collected via deep sump catchbasins or a trench drain and directed to a water quality unit prior to discharging to proposed subsurface infiltration system-8 (PSIS-8) and ultimately to DP-1 via a piped manifold overflow in larger storm events.

Proposed Sub-Catchment Area 1.5 (PR-1.5)
This sub-catchment area consists of proposed driveway/parking area, roof area and grassed areas. Stormwater runoff from the ground area of this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface infiltration system-3 (PSIS-3) while the roof area will be directly piped to PSIS-3. PSIS-3 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 1.6 (PR-1.6)
This sub-catchment area consists of proposed driveway/parking area and grassed areas. Stormwater runoff from this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface infiltration system-6 (PSIS-6). PSIS-6 has been designed with a piped manifold overflow that will direct stormwater to an outlet level spreader that slowly overflows to DP-1.

Proposed Sub-Catchment Area 1.7 (PR-1.7)
This sub-catchment area consists of proposed driveway area and grassed areas. Stormwater runoff from this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface infiltration system-3 (PSIS-3). PSIS-3 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 1.8 (PR-1.8)
This sub-catchment area consists of the amenity area off the rear of the clubhouse, that includes walkways, pool patio areas and grasses areas. Stormwater runoff from this sub-catchment will be collected via area drains and directed to proposed subsurface infiltration system-7 (PSIS-7). PSIS-7 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 1.8A (PR-1.8A)
This sub-catchment area consists of the parking area adjacent to the clubhouse, that includes walkways, paved parking area and grasses areas. Stormwater runoff from this sub-catchment will be collected via deep sump catchbasin and directed to a water quality unit prior to discharge to proposed subsurface infiltration system-7 (PSIS-7). PSIS-7 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 1.9 (PR-1.9)
This sub-catchment area consists of proposed driveway/parking area and grassed areas. Stormwater runoff from this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface infiltration system-3 (PSIS-3). PSIS-3 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 1.10 (PR-1.10)
This sub-catchment area consists of proposed driveway/parking area and grassed areas. Stormwater runoff from this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface infiltration system-3 (PSIS-3). PSIS-3 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 1.11 (PR-1.11)
This sub-catchment area consists of proposed driveway/parking area and grassed areas. Stormwater runoff from this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface detention system-2 (PSDS-2). PSDS-2 has been designed with a piped manifold overflow that will direct stormwater to an outlet level spreader that slowly overflows to DP-1.

Proposed Sub-Catchment Area 1.12 (PR-1.12)
This sub-catchment area consists of proposed roof area. Stormwater runoff from this sub-catchment will be collected via roof drains and directed to proposed subsurface infiltration system-2 (PSIS-2). PSIS-2 has been designed with a piped manifold overflow that will direct stormwater to an outlet level spreader that slowly overflows to DP-1.

Proposed Sub-Catchment Area 1.13 (PR-1.13)
This sub-catchment area consists of proposed driveway/parking area, roof area and grassed areas. Stormwater runoff from the ground area of this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface infiltration system-4 (PSIS-4) while the roof area will be directly piped to PSIS-4. PSIS-4 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 1.14 (PR-1.14)
This sub-catchment area consists of proposed driveway/parking area and grassed/wooded areas. Stormwater runoff from this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface infiltration system-5 (PSIS-5). PSIS-5 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 1.14A (PR-1.14A)
This sub-catchment area consists of proposed driveway/parking area, roof area and grassed areas. Stormwater runoff from the ground area of this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface detention system-3 (PSDS-3) while the roof area will be directly piped to PSDS-3. PSDS-3 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 1.15 (PR-1.15)
This sub-catchment area consists of proposed clubhouse roof area. Stormwater runoff from this sub-catchment will be collected via roof drains and directed to proposed subsurface infiltration system-7 (PSIS-7). PSIS-7 has been designed with a piped manifold overflow that will direct stormwater to DP-1 in larger storm events.

Proposed Sub-Catchment Area 2 (PR-2)
This sub-catchment area consists of portions of proposed driveway entrance and grassed areas. Stormwater flows overland to Grove Street or DP-2.
Proposed Sub-Catchment Area 2.1 (PR-2.1)

This sub-catchment area consists of grassed/wooded areas. Stormwater flows overland to Grove Street or DP-2.

Proposed Sub-Catchment Area 3 (PR-3)
This sub-catchment area consists of a proposed transformer pad and grassed/wooded areas. Stormwater flows overland to existing wetlands series B, or DP-3, that drains to the existing drainage system within Grove Street.

Proposed Sub-Catchment Area 3.1 (PR-3.1)
This sub-catchment area consists of grassed and wooded areas. Stormwater flows overland to existing wetlands series B, or DP-3, that drains to the existing drainage system within Grove Street.

Proposed Sub-Catchment Area 3.2 (PR-3.2)
This sub-catchment area consists of wooded areas. Stormwater flows overland to existing wetlands series B, or DP-3, that drains to the existing drainage system within Grove Street.

Proposed Sub-Catchment Area 3.3 (PR-3.3)
This sub-catchment area consists of grassed areas. Stormwater flows overland to existing wetlands series B, or DP-3, that drains to the existing drainage system within Grove Street.

Proposed Sub-Catchment Area 3.4 (PR-3.4)
This sub-catchment area consists of grassed areas. Stormwater flows overland to existing wetlands series B, or DP-3, that drains to the existing drainage system within Grove Street.

Proposed Sub-Catchment Area 3.5 (PR-3.5)
This sub-catchment area consists of proposed driveway/parking area and grassed areas. Stormwater runoff from this sub-catchment will be collected via deep sump catchbasins and directed to a water quality unit prior to discharging to proposed subsurface detention system-1 (PSDS-1). PSDS-1 has been designed with a piped manifold overflow that will direct stormwater to stormwater basin-1 (SWB-1) that has a weir that outlets stormwater to DP-3 in larger storm events.

Proposed Sub-Catchment Area 3.5A (PR-3.5A)
This sub-catchment area consists of proposed driveway/parking area and grassed areas. Stormwater runoff from this sub-catchment will be collected via a catchbasin water quality unit prior to discharging to proposed subsurface detention system-1 (PSDS-1). stormwater basin-1 (SWB-1) that has a weir that outlets stormwater to DP-3 in larger storm events.

Proposed Sub-Catchment Area 3.6 (PR-3.6)
This sub-catchment area consists of proposed roof area. Stormwater runoff from this sub-catchment will be collected via roof drains and directed to proposed subsurface infiltration system-1 (PSIS-1). PSIS-1 has been designed with a piped manifold overflow that will direct stormwater to proposed stormwater basin-1 (SWB-1) that has been designed with a weir that overflows to DP-3 in larger storm events.

Proposed Sub-Catchment Area 4 (PR-4)
This sub-catchment area consists of wooded areas. Stormwater flows overland to the abutting property to the south, or DP-4.

8.2 Post-development Hydrological Conditions

Under proposed conditions, deep-sump catch basins with hooded outlets, water quality units, subsurface infiltration systems and a surface infiltration basin will treat and infiltrate stormwater runoff. Surface and subsurface detention basins have been incorporated to mitigate peak rates of discharge. During larger storm events, stormwater runoff from the surface and subsurface systems will overflow and discharge to the aforementioned design points (DP). Below is a comparison summary table of the pre- and post-development peak rates of runoff at the Design Points. The peak rates of stormwater discharged from the site for the storm events analyzed will be reduced under proposed conditions as compared to existing conditions.

Detailed HydroCAD analysis of the existing and proposed sub-catchment areas, ponds and reaches is included in the Hydrologic Calculations appendix of this report. The following are summary charts for each design point of the existing and proposed peak rates and volumes:

Design Point #1

Storm Frequency	Existing Flow Rate (cfs)	Proposed Flow Rate (cfs)	Existing Volume (cf)	Proposed Volume (cf)
2-Year	3.7	3.2	24,697	20,872
10-Year	18.2	13.5	78,965	65,091
25-Year	30.1	21.4	122,155	105,168
100-Year	50.6	50.2	197,073	182,629

Design Point #2

Storm Frequency	Existing Flow Rate (cfs)	Proposed Flow Rate (cfs)	Existing Volume (cf)	Proposed Volume (cf)
2-Year	0.0	0.0	252	138
10-Year	0.3	0.1	1,609	771
25-Year	0.7	0.3	3,119	1,558
100-Year	1.5	0.7	6,313	3,219

Design Point #3

Storm Frequency	Existing Flow Rate (cfs)	Proposed Flow Rate (cfs)	Existing Volume (cf)	Proposed Volume (cf)

2-Year	0.0	0.0	0	5
10-Year	0.0	0.0	1,303	853
25-Year	0.2	0.2	5,068	2,640
100-Year	1.7	1.2	14,908	9,113

Design Point #4

Storm Frequency	Existing Flow Rate (cfs)	Proposed Flow Rate (cfs)	Existing Volume (cf)	Proposed Volume (cf)
2-Year	0.0	0.0	0	0
10-Year	0.0	0.0	27	16
25-Year	0.0	0.0	251	149
100-Year	0.1	0.0	978	580

8.3 Pipe Capacity Analysis

Pipe capacity calculations have been performed for the proposed drainage system for the 25-year storm event.

8.4 Rip-Rap Apron Design

Rip-rap apron design calculations have been performed for the proposed flared end outlets for the 25-year storm event.

9.0 Calculations to support specific Stormwater Standards

9.1 Standard 3: Stormwater Recharge

Sixty-one (61) Test pits have been performed on site. Based on a review of the test pit logs the areas of the proposed stormwater basins/systems are comprised of soils belonging to Hydrologic Soil Group A. The parent material was observed to mostly be loamy sand or sand over ledge.

The required recharge volume has been calculated below for review with drawdown times. Refer to Appendix A for additional information.

Utilizing the current regulations, the required recharge volume (Rv) is based on the following calculation:

Rv = Fx
Rv = Required Recharge Volume
F = Target Depth Factor associated with hydrologic soil groups located in table 2.3.2 in Volume 3 of the Stormwater Management Handbook
x = total onsite impervious area

F =

NRCS HYDROLOGIC SOIL TYPE	APPROX. SOIL TEXTURE	TARGET DEPTH FACTOR (F)
A	sand	**0.6-inch**
B	loam	**0.35-inch**
C	silty loam	**0.25-inch**
D	clay	**0.1-inch**

Hydrologic Soil Group A:

- x = 261,393 sf
- Rv = (1/12)(0.6)(261,393) = 13,070 cf

Hydrologic Soil Group B:

- x = 146,768 sf
- Rv = (1/12)(0.35)(146,768) = 4,281 cf

Hydrologic Soil Group D:

- x = 19,840 sf
- Rv = (1/12)(0.10)(19,840) = 165 cf

Total Rv = 17,516 cf

Volume of storage provided under the outlets of the proposed infiltration basins for recharge:

PSIS-1 = 1,613 cf
PSIS-2 = 1,674 cf
PSIS-3 = 17,053 cf
PSIS-4 = 34,610 cf
PSIS-5 = 9,707 cf
PSIS-6 = 9,257 cf
PSIS-7 = 2,139 cf
PSIS-8 = 2,653 cf
SWB-1 = 10,816 cf

Total Recharge Storage Provided = 89,522 cf

The Stormwater Handbook also requires recharge facilities be installed in soils capable of absorbing the recharge volume with the ability to drain within 72 hours. The formula for drawdown is as follows:

General Formula:

$$T_{DR} = \frac{requiredstoragevolume*}{(RawlsRate)(BottomSurfaceAreaofSystem)}$$

(*Required storage volume is equal to the larger of the calculated required recharge or treatment volumes In this case, treatment volume is greater as indicated in Standard 4).

PSIS-1:

Volume to Treat = 1,613 *cf*

$T_{DR} = \frac{\mathbf{1,613}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{1,224}\boldsymbol{sf})} = 1.9hrs$

$1.9hrs < 72hrs$

PSIS-2:

Volume to Treat = 1,674 *cf*

$T_{DR} = \frac{\mathbf{1,674}\boldsymbol{cf}}{\left(\frac{\mathbf{2.41}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{2,128}\boldsymbol{sf})} = 3.9hrs$

$3.9hrs < 72hrs$

PSIS-3:

Volume to Treat = 17,053 *cf*

$T_{DR} = \frac{\mathbf{17,053}\ \boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{5,421}\boldsymbol{sf})} = 4.6hrs$

$4.6hrs < 72hrs$

PSIS-4:

Volume to Treat = 34,610 *cf*

$T_{DR} = \frac{\mathbf{34,610}\boldsymbol{cf}}{\left(\frac{\mathbf{2.41}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{4,560}\boldsymbol{sf})} = 37.8hrs$

$37.8hrs < 72hrs$

PSIS-5:

Volume to Treat = 9,707 *cf*

$T_{DR} = \frac{\mathbf{9,707}\boldsymbol{cf}}{\left(\frac{\mathbf{2.41}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{4,320}\ \boldsymbol{sf})} = 11.2hrs$

$11.2hrs < 72hrs$

PSIS-6:

Volume to Treat = 9,257 *cf*

$T_{DR} = \frac{\mathbf{9,257}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{n/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{2,290}\boldsymbol{sf})} = 5.9hrs$

$5.9hrs < 72hrs$

PSIS-7:

Volume to Treat = 2,139 *cf*

$$T_{DR} = \frac{\mathbf{2{,}139}\boldsymbol{cf}}{\left(\frac{\mathbf{2.41}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{1{,}616}\boldsymbol{sf})} = 6.6hrs$$

6.6*hrs* < 72*hrs*

PSIS-8:

Volume to Treat = 2,984 *cf*

$$T_{DR} = \frac{\mathbf{2{,}653}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{1{,}108}\boldsymbol{sf})} = 3.5hrs$$

3.5*hrs* < 72*hrs*

SWB-1:

Volume to Treat = 10,816 *cf*

$$T_{DR} = \frac{\mathbf{10{,}816}\ \boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{2{,}201}\ \boldsymbol{sf})} = 7.1hrs$$

7.1 *hrs* < 72*hrs*

9.2 Capture Area Adjustment

A portion of the total onsite impervious area is not directed into one of the proposed infiltration facilities. In accordance with the Stormwater Handbook, a capture area adjustment calculation is required when runoff from only a portion of the impervious area on a site is directed to one or more infiltration BMPs. The following are steps of the capture area adjustment calculation to demonstrate the required minimum of 65% of the impervious area onsite is being directed to an infiltration BMP. The calculation also determines the increase in storage capacity of the infiltration BMPs to ensure they are able to capture sufficient runoff from the impervious surfaces within the contributing drainage area to infiltrate the required recharge volume.

1. Calculate Rv for the project:
   From above Rv =17,516 cf

2. Calculate the impervious area draining to recharge facilities:
   Area = 404,779 sf

3. Divide site total site impervious by the impervious area draining to recharge facilities:
   Total site impervious area = 428,001 sf
   428,001/404,779 = 1.06

4. Multiply quotient from step 3 by the original Rv to determine the adjusted minimum storage volume needed to meet the recharge requirement:
   1.06 x 17,516 = 18,567 cf

Infiltration facilities provide 89,522 cf of storage

5. Ensure minimum of 65% of the site impervious area is being directed to the infiltration facilities:
   404.779sf/428,001sf = 94.6%

In summary, the infiltration facilities onsite provide a total recharge storage volume of 91,718 cf which is greater than the adjusted minimum storage volume calculated by the capture area adjustment. The project also directs a minimum 65% of the impervious area into the recharge facility which will provide sufficient runoff to infiltrate the required recharge volume. This ensures the post development annual recharge rate will approximate the annual rate from pre development conditions.

9.3 Groundwater Recharge

The required recharge volume has been calculated below for review with drawdown times illustrated above. Refer to Appendix A for additional information.

9.4 Stormwater Quality

The proposal utilizes low impact strategies as well as conventional stormwater management techniques for treatment and recharge of stormwater. Design strategies for the stormwater systems follow methods from the MA Stormwater Handbook.

<u>Catchbasins with Deep Sumps and Hooded Outlets</u>
Catchbasins trap and remove sediments and larger particles from stormwater runoff and improve the performance of subsequent BMP's. These basins will be fitted with an outlet hood to separate floatables such as oil, grease, trash and debris. The catchbasin sumps will be a minimum of 4 feet in depth to promote settling of suspended solids. A TSS removal rate of 25% is achieved by this BMP.

<u>Contech CDS Water Quality Unit</u>
The Contech CDS is a continuous deflective separation technology which screens, separates and traps debris, sediment, oil and grease from stormwater runoff. Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber. Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where floatables and neutrally buoyant debris larger than screen apertures are trapped. Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

This BMP achieves a TSS Removal Rate of 80% based on required proprietary structure sizing calculations issued by MA DEP effective on October 15, 2013.

<u>Subsurface Infiltration Facility</u>
Subsurface infiltration facilities have been incorporated into this design to provide recharge of stormwater from impervious surfaces. Each facility consists of plastic chambers with open bottoms placed atop a stone bed. Chambers are constructed to store stormwater temporarily and let it infiltrate into the underlying soil. The facilities have been designed to recharge stormwater from the proposed roofs as well as a portion of the new paved roadway. A TSS removal rate of 80% is achieved by this BMP.

Surface Infiltration Basin
A surface infiltration basin is a stormwater runoff impoundment constructed over permeable soils which can provide storage and exfiltration of the required recharge volume. Mitigation of stormwater peak flows as well as treatment of the required water quality volume is also provided. The basin is comprised of a flat bottom and side slopes stabilized with a dense turf of water tolerant grass capable of surviving in both wet and dry conditions. This BMP achieves a TSS removal rate of 80%.

For additional information on TSS removal rates please see attachments in appendix.

Water Quality Volume:

$$V_{WQ} = D_{WQ} * A_{impervious}$$

Where:
D_{WQ} = Water Quality Depth = 1-inch
$A_{impervious}$= Impervious area = 428,001 sf

$$V_{WQ} = 1.0\ in * \left(\frac{1\ ft}{12\ in}\right) * 428{,}001\ sf\ = 35{,}667\ \boldsymbol{CF}$$

Water Quality Volume Provided:

Volume of storage provided under the outlets of the proposed infiltration basins for recharge:

PSIS-1 = 1,613 cf
PSIS-2 = 1,674 cf
PSIS-3 = 17,053 cf
PSIS-4 = 34,610 cf
PSIS-5 = 9,707 cf
PSIS-6 = 9,257 cf
PSIS-7 = 2,139 cf
PSIS-8 = 2,653 cf
SWB-1 = 10,816 cf

Total Recharge Storage Provided = 89,522 cf

Each of the infiltration basin was evaluated for individual compliance with the retention of 1-inch of stormwater, as depicted below:

PSIS-1:
Impervious Area = 17,839 sf
Required Volume for 1” Retention = 1,487 cf
Provided Volume under outlet = 1,613 cf

PSIS-2:
Impervious Area = 16,369 sf
Required Volume for 1” Retention = 1,364 cf
Provided Volume under outlet = 1,674 cf

PSIS-3:
Impervious Area = 88,832 sf

Required Volume for 1” Retention = 7,403 cf
Provided Volume under outlet = 1,674 cf

PSIS-4:
Impervious Area = 71,669 sf
Required Volume for 1” Retention = 5,972 cf
Provided Volume under outlet = 34,610 cf

PSIS-5:
Impervious Area = 85,197 sf
Required Volume for 1” Retention = 7,100 cf
Provided Volume under outlet = 9,707 cf

PSIS-6:
Impervious Area = 25,841 sf
Required Volume for 1” Retention = 2,153 cf
Provided Volume under outlet = 9,257 cf

PSIS-7:
Impervious Area = 5,632 sf
Required Volume for 1” Retention = 469 cf
Provided Volume under outlet = 2,139 cf

PSIS-8:
Impervious Area = 16,532 sf
Required Volume for 1” Retention = 1,378 cf
Provided Volume under outlet = 2,653 cf

SWB-1:
Impervious Area = 80,861 sf
Required Volume for 1” Retention = 6,738 cf
Provided Volume under outlet = 10,816 cf

10.0 Summary

This hydrologic analysis estimates peak storm runoff discharged from the site under both the existing and proposed conditions. The stormwater management system for the proposed development includes measures for collecting, controlling, and treating stormwater runoff from the site. The proposed measures comply with the Stormwater Management Standards of the MassDEP Stormwater Policy and represent an improvement over the existing conditions. The drainage improvements proposed herein will reduce stormwater runoff peak flow rates leaving the site and improve the overall water quality of stormwater runoff.

An Operation and Maintenance Manual has been included as part of this report to ensure the long-term operation of the proposed stormwater management system. As part of the proposed Operation and Maintenance Manual, a Long-Term Pollution Prevention Plan (LTPPP) has been incorporated to ensure proper spill prevention and management materials area available on site and staff are properly trained to prevent additional pollutant loading.

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II. FIGURES

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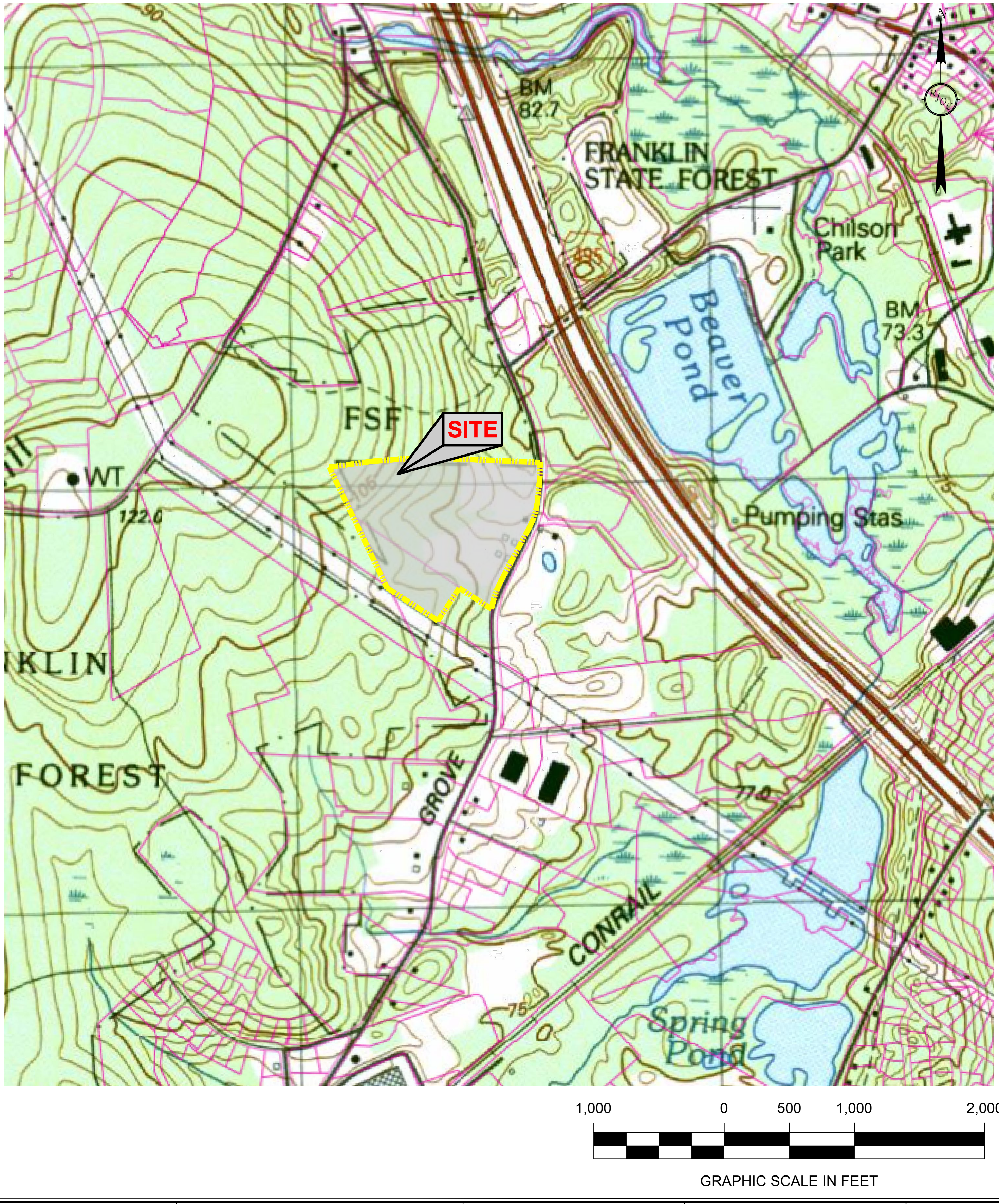

DESIGNED BY:	MAC
DRAWN BY:	MAC
REVIEWED BY:	BJM
SCALE:	1" = 1,000'
DATE:	02/12/2024
PROJECT NUMBER:	22016

PREPARED BY:

RJOC
RJO'CONNELL & ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
80 MONTVALE AVENUE, SUITE 201
STONEHAM, MA 02180
PHONE: 781.279.0180 RJOCONNELL.COM

PROJECT NAME:

121 GROVE STREET
FRANKLIN, MA

DRAWING NAME:

USGS MAP

DRAWING NO:

FIG-1

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Reports\Stormwater Report\Figures\22016_Fig.1 USGS.dwg
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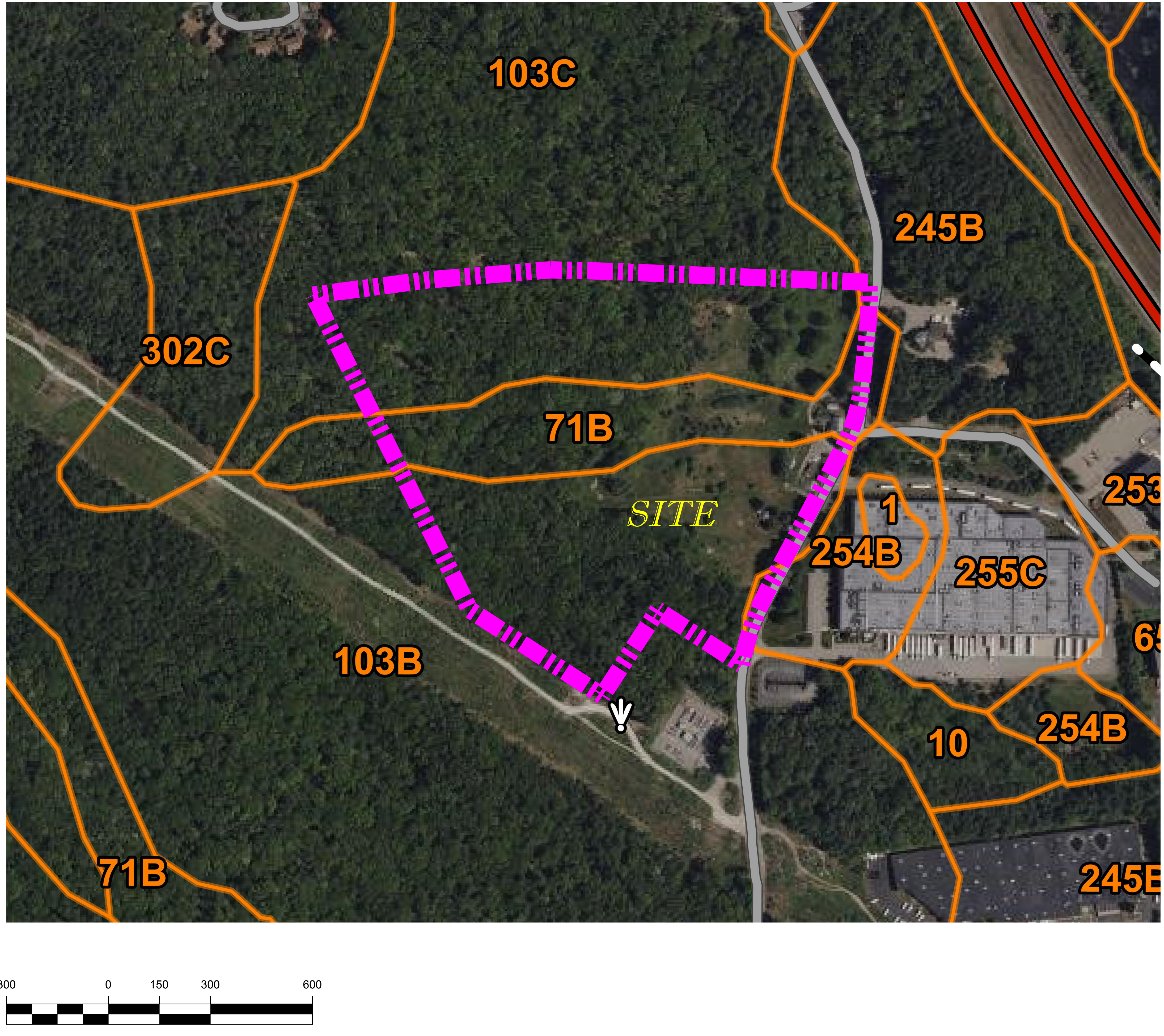

RJOC

NRCS SOIL MAP LEGEND		
MAP UNIT SYMBOL	MAP UNIT NAME	HSG
71B	RIDGEBURY FINE SANDY LOAM, 3 TO 8% SLOPES, EXTREMELY STONY	D
103B	CHARLTON-HOLLIS-ROCK OUTCROP COMPLEX, 3 TO 8% SLOPES	A
103C	CHARLTON-HOLLIS-ROCK OUTCROP COMPLEX, 0 TO 15% SLOPES	B
254B	HINCKLEY LOMAY SAND, 3 TO 8% SLOPES	A

RJO'CONNELL
& ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS

DATE: 02/12/2024 SCALE: 1" = 300'

FIGURE 3
NRCS WEB SOIL SURVEY MAP
121 GROVE STREET
FRANKLIN, MA 02038

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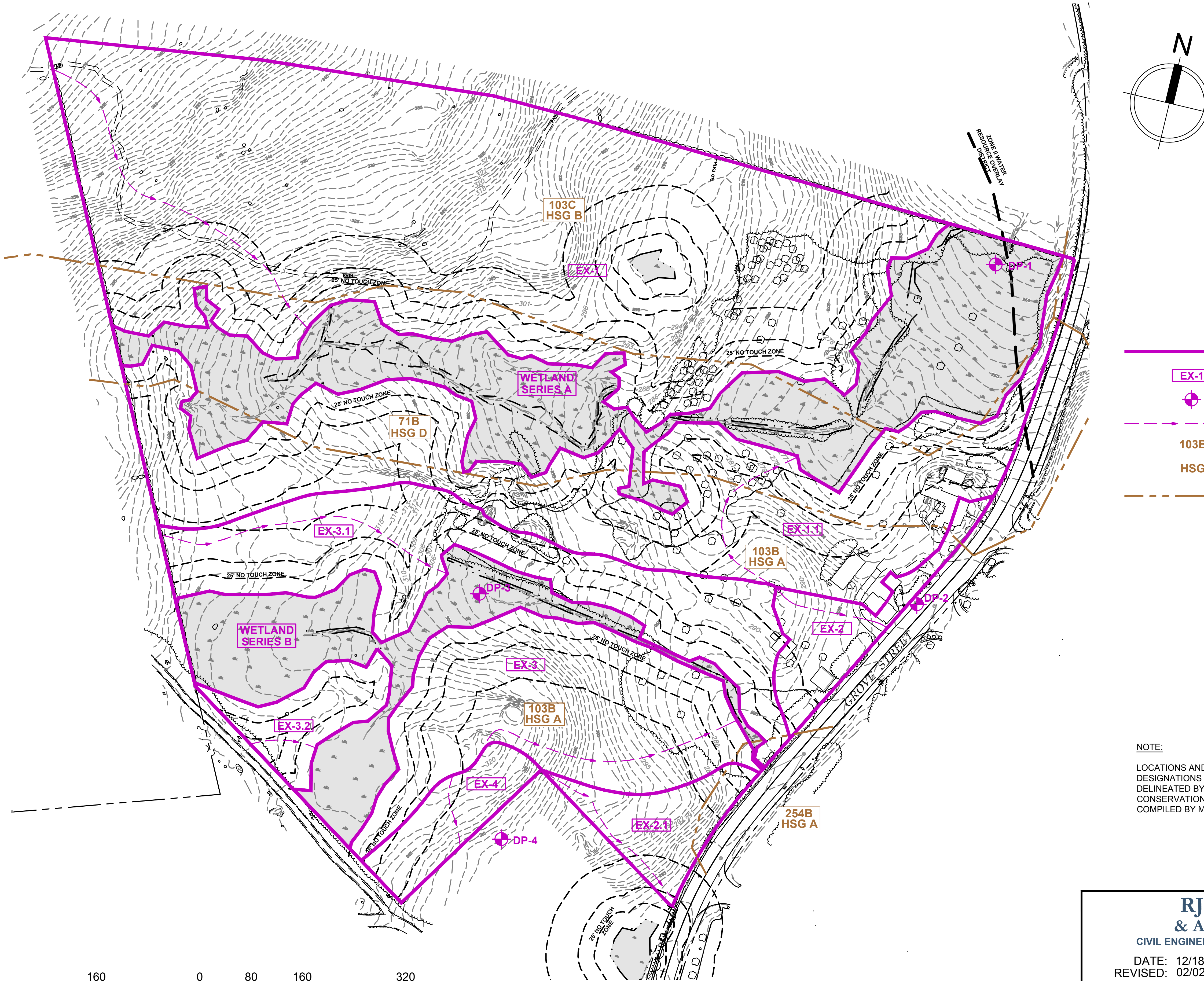


RJOC

	SUBCATCHMENT BOUNDARY
EX-1	SUBCATCHMENT LABEL
DP-1	DESIGN POINT
	FLOW PATH
103B	SOIL TYPE
HSG	HYDROLOGIC SOIL GROUP
	SOIL BOUNDARY

NOTE:

LOCATIONS AND TYPES OF SOIL DESIGNATIONS SHOWN HEREON HAVE BEEN DELINEATED BY USDA NATURAL RESOURCES CONSERVATION SERVICE (NRCS) AND COMPILED BY MA GIS

160 0 80 160 320

GRAPHIC SCALE IN FEET

RJO'CONNELL
& ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS

DATE: 12/18/2023 SCALE: 1"=160'
REVISED: 02/02/24, 02/12/24

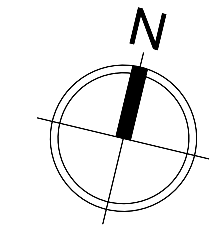
FIGURE 4

EXISTING WATERSHED PLAN

---

121 GROVE STREET
FRANKLIN, MA

Dwg: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Engineer\Drainage\Watershed\22016_Pre-Watershed.dwg



RJOC

(line)	SUBCATCHMENT BOUNDARY
PR-1	SUBCATCHMENT LABEL
DP-1	DESIGN POINT
(dashed line)	FLOW PATH
103B	SOIL TYPE
HSG	HYDROLOGIC SOIL GROUP
(dash-dot line)	SOIL BOUNDARY

NOTE:

LOCATIONS AND TYPES OF SOIL DESIGNATIONS SHOWN HEREON HAVE BEEN DELINEATED BY USDA NATURAL RESOURCES CONSERVATION SERVICE (NRCS) AND COMPILED BY MA GIS

160 0 80 160 320

GRAPHIC SCALE IN FEET

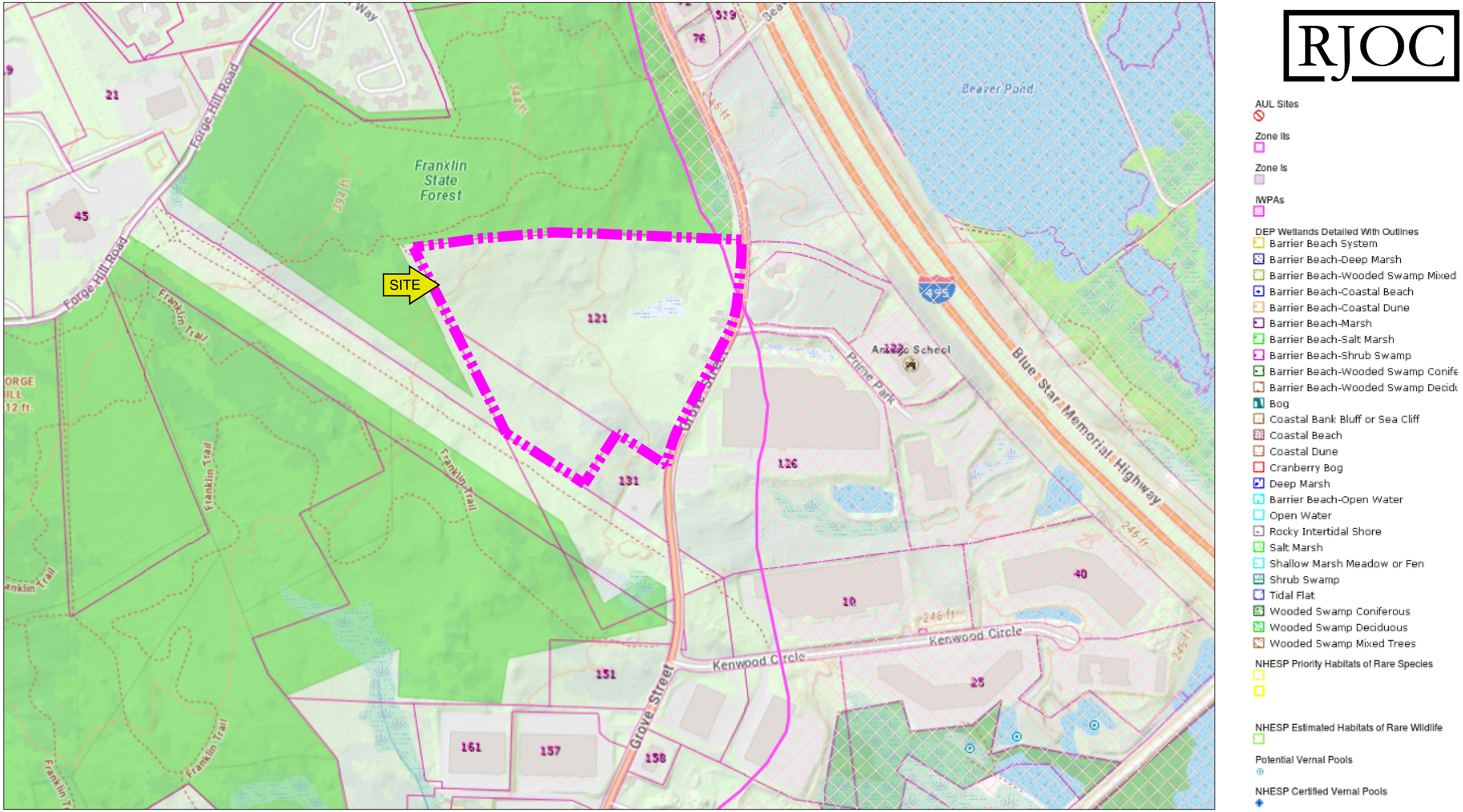
RJO'CONNELL
& ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS

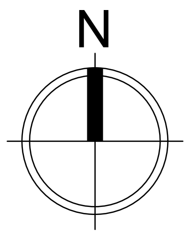
DATE: 12/18/2023 SCALE: 1"=160'
REVISED: 02/02/24, 02/12/24
FIGURE 5

PROPOSED WATERSHED PLAN

---

121 GROVE STREET
FRANKLIN, MA





RJOC

500 0 250 500 1,000

GRAPHIC SCALE IN FEET

RJO'CONNELL & ASSOCIATES, INC.

CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS

DATE: 02/12/2024 SCALE: 1"=500'

FIGURE 6
MassGIS RESOURCE AREA MAP
121 GROVE STREET
FRANKLIN, MA 02038

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Reports\Stormwater Report\Figures\22016_FIG-6 Resource Area Map.dwg
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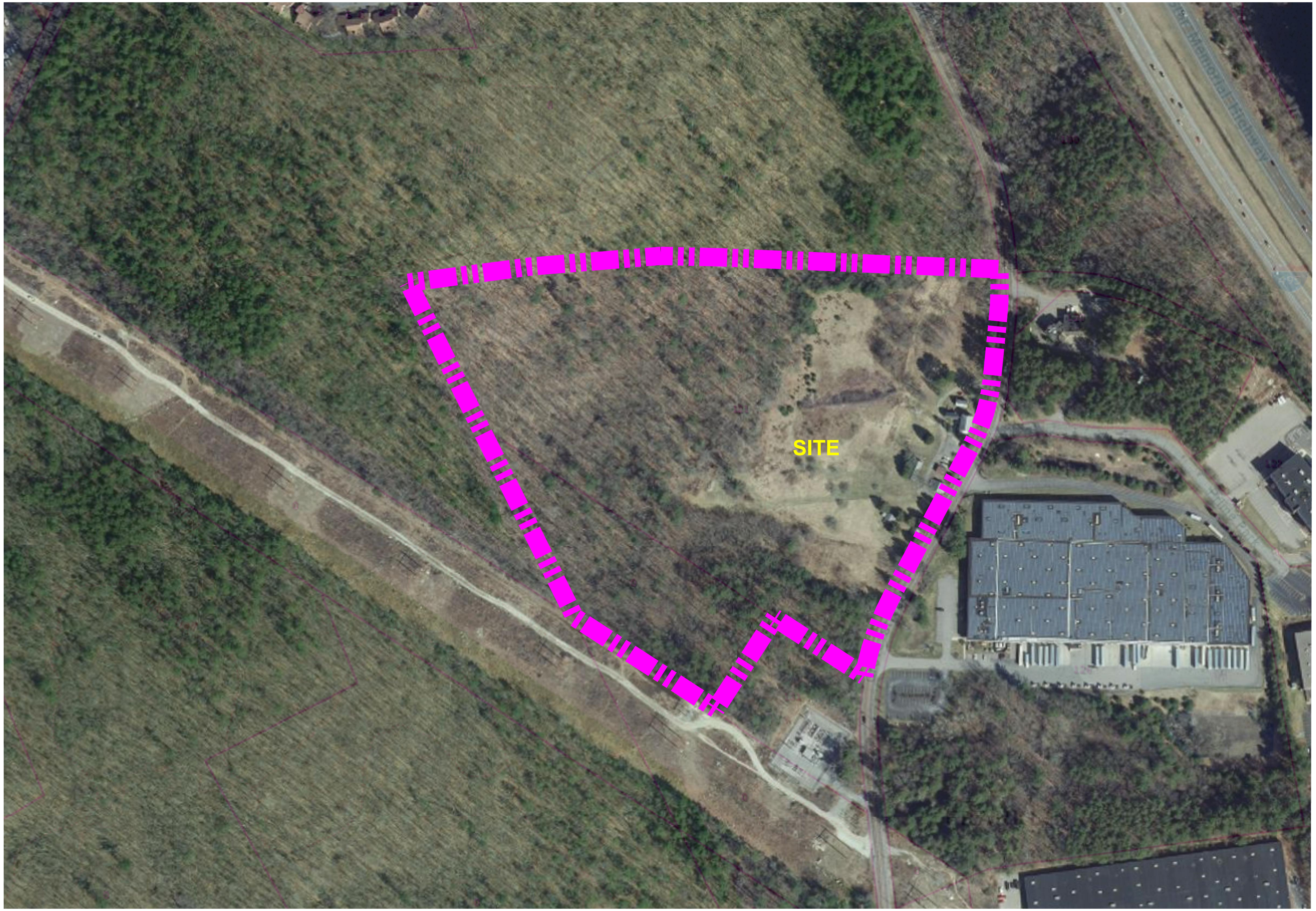

RJOC

N

300 0 150 300 600

GRAPHIC SCALE IN FEET

RJO'CONNELL
& ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS

DATE: 02/05/2024 SCALE: 1"=300'

FIGURE 7
MassGIS ORTHOIMAGE SITE MAP
121 GROVE STREET
FRANKLIN, MA 02038

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Reports\Stormwater Report\Figures\22016_FIG-7 MassGIS Ortho Map.dwg
Feb 12, 2024 - 16:51pm

III.APPENDICIES

APPENDIX A
MassDEP Checklist for Stormwater Reports

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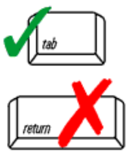
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

---

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
BRIAN P. DUNDON
CIVIL
No. 41505
REGISTERED
PROFESSIONAL ENGINEER

Bri Dundon 2-12-2024
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): ______________________________

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

---

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☒ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☒ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - ☐ Limited Project
  - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - ☐ Bike Path and/or Foot Path
  - ☐ Redevelopment Project
  - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

- ☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

APPENDIX B
Computations

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Pre-Development Hydrological Computations

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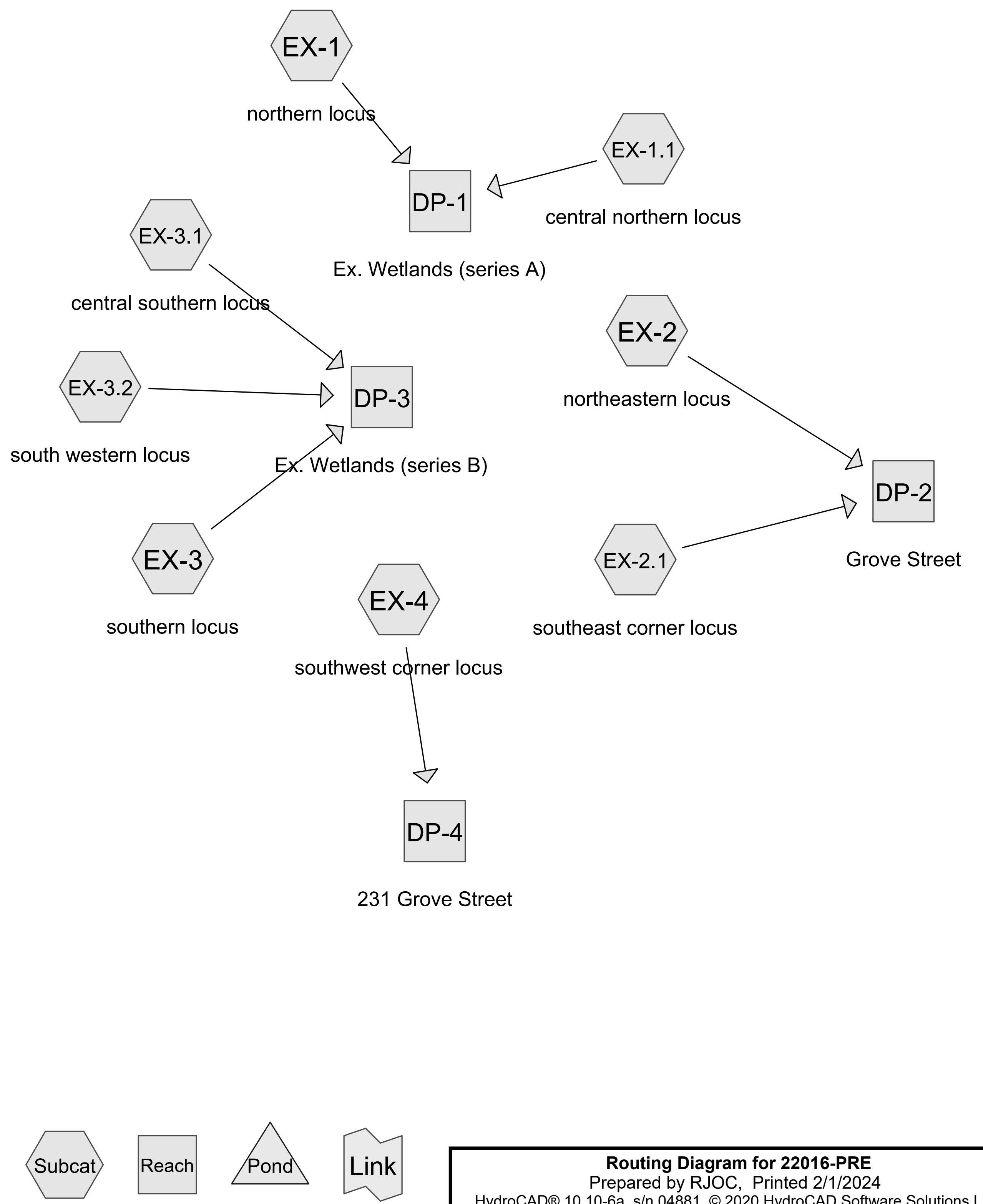

Routing Diagram for 22016-PRE
Prepared by RJOC, Printed 2/1/2024
HydroCAD® 10.10-6a s/n 04881 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr 24 Hr	Type III 24-hr		Default	24.00	1	3.36	2
2	10-Yr 24 Hr	Type III 24-hr		Default	24.00	1	5.22	2
3	25-Yr 24 Hr	Type III 24-hr		Default	24.00	1	6.39	2
4	100-Yr 24 Hr	Type III 24-hr		Default	24.00	1	8.18	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
147,122	39	>75% Grass cover, Good, HSG A (EX-1.1, EX-2, EX-2.1, EX-3, EX-3.1)
43,817	61	>75% Grass cover, Good, HSG B (EX-1)
52,807	80	>75% Grass cover, Good, HSG D (EX-1, EX-1.1, EX-2)
7,032	72	Dirt Path (EX-1)
7,912	98	Drive/Patios (EX-1.1)
6,805	96	Gravel surface, HSG A (EX-1.1)
6,807	98	Roof Area (EX-1.1, EX-2, EX-3.1)
1,289	98	Walk/Driveway (EX-2)
320,012	30	Woods, Good, HSG A (EX-1.1, EX-2, EX-2.1, EX-3, EX-3.1, EX-3.2, EX-4)
369,499	55	Woods, Good, HSG B (EX-1)
111,526	77	Woods, Good, HSG D (EX-1, EX-1.1)
1,074,628	**50**	**TOTAL AREA**

Summary for Subcatchment EX-1: northern locus

Runoff = 2.7 cfs @ 12.26 hrs, Volume= 17,484 cf, Depth> 0.43"
Routed to Reach DP-1 : Ex. Wetlands (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
	55,486	77	Woods, Good, HSG D
	43,817	61	>75% Grass cover, Good, HSG B
	8,664	80	>75% Grass cover, Good, HSG D
	369,499	55	Woods, Good, HSG B
*	7,032	72	Dirt Path
	484,498	59	Weighted Average
	484,498		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.7	155	0.0940	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	9	0.1000	6.4		**Shallow Concentrated Flow, overland (path)** Paved Kv= 20.3 fps
2.6	256	0.1110	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	10	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
1.2	113	0.0970	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
12.5	593	Total			

Summary for Subcatchment EX-1.1: central northern locus

Runoff = 1.1 cfs @ 12.16 hrs, Volume= 7,213 cf, Depth> 0.36"
Routed to Reach DP-1 : Ex. Wetlands (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
	56,040	77	Woods, Good, HSG D
*	3,720	98	Roof Area
	49,482	39	>75% Grass cover, Good, HSG A
	42,567	80	>75% Grass cover, Good, HSG D
	71,430	30	Woods, Good, HSG A
*	7,912	98	Drive/Patios
	6,805	96	Gravel surface, HSG A
	237,956	57	Weighted Average
	226,324		95.11% Pervious Area
	11,632		4.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0500	0.2		**Sheet Flow, overland (grass)** Grass: Short n= 0.150 P2= 3.32"
0.2	52	0.0770	4.5		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
2.9	199	0.0530	1.2		**Shallow Concentrated Flow, overland (woods) to Wetland Series** Woodland Kv= 5.0 fps
6.9	301	Total			

Summary for Subcatchment EX-2: northeastern locus

Runoff = 0.0 cfs @ 13.78 hrs, Volume= 252 cf, Depth> 0.10"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
	6,698	30	Woods, Good, HSG A
*	2,560	98	Roof Area
*	1,289	98	Walk/Driveway
	18,653	39	>75% Grass cover, Good, HSG A
	1,576	80	>75% Grass cover, Good, HSG D
	30,776	47	Weighted Average
	26,927		87.49% Pervious Area
	3,849		12.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment EX-2.1: southeast corner locus

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
1,034	39	>75% Grass cover, Good, HSG A
27,489	30	Woods, Good, HSG A
28,523	30	Weighted Average
28,523		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.2000	0.2		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.3	237	0.1200	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
7.1	287	Total			

Summary for Subcatchment EX-3: southern locus

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
23,107	39	>75% Grass cover, Good, HSG A
96,598	30	Woods, Good, HSG A
119,705	32	Weighted Average
119,705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.5	250	0.1080	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.5	114	0.0600	3.9		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
9.4	414	Total			

Summary for Subcatchment EX-3.1: central southern locus

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
	54,846	39	>75% Grass cover, Good, HSG A
	65,861	30	Woods, Good, HSG A
*	527	98	Roof Area
	121,234	34	Weighted Average
	120,707		99.57% Pervious Area
	527		0.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
7.0	422	0.0400	1.0		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
14.8	472	Total			

Summary for Subcatchment EX-3.2: south western locus

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
26,302	30	Woods, Good, HSG A
26,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.32"
0.9	53	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	103	Total			

Summary for Subcatchment EX-4: southwest corner locus

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-4 : 231 Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
25,634	30	Woods, Good, HSG A
25,634		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
0.6	61	0.1100	1.7		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
8.4	111	Total			

Summary for Reach DP-1: Ex. Wetlands (series A)

Inflow Area = 722,454 sf, 1.61% Impervious, Inflow Depth > 0.41" for 2-Yr 24 Hr event
Inflow = 3.7 cfs @ 12.26 hrs, Volume= 24,697 cf
Outflow = 3.7 cfs @ 12.26 hrs, Volume= 24,697 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Grove Street

Inflow Area = 59,299 sf, 6.49% Impervious, Inflow Depth > 0.05" for 2-Yr 24 Hr event
Inflow = 0.0 cfs @ 13.78 hrs, Volume= 252 cf
Outflow = 0.0 cfs @ 13.78 hrs, Volume= 252 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Ex. Wetlands (series B)

Inflow Area = 267,241 sf, 0.20% Impervious, Inflow Depth = 0.00" for 2-Yr 24 Hr event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: 231 Grove Street

Inflow Area = 25,634 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Yr 24 Hr event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment EX-1: northern locus

Runoff = 12.7 cfs @ 12.19 hrs, Volume= 54,748 cf, Depth> 1.36"
Routed to Reach DP-1 : Ex. Wetlands (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
	55,486	77	Woods, Good, HSG D
	43,817	61	>75% Grass cover, Good, HSG B
	8,664	80	>75% Grass cover, Good, HSG D
	369,499	55	Woods, Good, HSG B
*	7,032	72	Dirt Path
	484,498	59	Weighted Average
	484,498		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.7	155	0.0940	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	9	0.1000	6.4		**Shallow Concentrated Flow, overland (path)** Paved Kv= 20.3 fps
2.6	256	0.1110	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	10	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
1.2	113	0.0970	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
12.5	593	Total			

Summary for Subcatchment EX-1.1: central northern locus

Runoff = 6.6 cfs @ 12.11 hrs, Volume= 24,217 cf, Depth> 1.22"
Routed to Reach DP-1 : Ex. Wetlands (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
	56,040	77	Woods, Good, HSG D
*	3,720	98	Roof Area
	49,482	39	>75% Grass cover, Good, HSG A
	42,567	80	>75% Grass cover, Good, HSG D
	71,430	30	Woods, Good, HSG A
*	7,912	98	Drive/Patios
	6,805	96	Gravel surface, HSG A
	237,956	57	Weighted Average
	226,324		95.11% Pervious Area
	11,632		4.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0500	0.2		**Sheet Flow, overland (grass)** Grass: Short n= 0.150 P2= 3.32"
0.2	52	0.0770	4.5		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
2.9	199	0.0530	1.2		**Shallow Concentrated Flow, overland (woods) to Wetland Series** Woodland Kv= 5.0 fps
6.9	301	Total			

Summary for Subcatchment EX-2: northeastern locus

Runoff = 0.3 cfs @ 12.13 hrs, Volume= 1,579 cf, Depth> 0.62"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
	6,698	30	Woods, Good, HSG A
*	2,560	98	Roof Area
*	1,289	98	Walk/Driveway
	18,653	39	>75% Grass cover, Good, HSG A
	1,576	80	>75% Grass cover, Good, HSG D
	30,776	47	Weighted Average
	26,927		87.49% Pervious Area
	3,849		12.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment EX-2.1: southeast corner locus

Runoff = 0.0 cfs @ 22.57 hrs, Volume= 30 cf, Depth> 0.01"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
1,034	39	>75% Grass cover, Good, HSG A
27,489	30	Woods, Good, HSG A
28,523	30	Weighted Average
28,523		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.2000	0.2		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.3	237	0.1200	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
7.1	287	Total			

Summary for Subcatchment EX-3: southern locus

Runoff = 0.0 cfs @ 16.97 hrs, Volume= 417 cf, Depth> 0.04"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
23,107	39	>75% Grass cover, Good, HSG A
96,598	30	Woods, Good, HSG A
119,705	32	Weighted Average
119,705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.5	250	0.1080	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.5	114	0.0600	3.9		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
9.4	414	Total			

Summary for Subcatchment EX-3.1: central southern locus

Runoff = 0.0 cfs @ 15.31 hrs, Volume= 859 cf, Depth> 0.08"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
	54,846	39	>75% Grass cover, Good, HSG A
	65,861	30	Woods, Good, HSG A
*	527	98	Roof Area
	121,234	34	Weighted Average
	120,707		99.57% Pervious Area
	527		0.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
7.0	422	0.0400	1.0		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
14.8	472	Total			

Summary for Subcatchment EX-3.2: south western locus

Runoff = 0.0 cfs @ 22.55 hrs, Volume= 27 cf, Depth> 0.01"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
26,302	30	Woods, Good, HSG A
26,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.32"
0.9	53	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	103	Total			

Summary for Subcatchment EX-4: southwest corner locus

Runoff = 0.0 cfs @ 22.54 hrs, Volume= 27 cf, Depth> 0.01"
Routed to Reach DP-4 : 231 Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
25,634	30	Woods, Good, HSG A
25,634		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
0.6	61	0.1100	1.7		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
8.4	111	Total			

Summary for Reach DP-1: Ex. Wetlands (series A)

Inflow Area = 722,454 sf, 1.61% Impervious, Inflow Depth > 1.31" for 10-Yr 24 Hr event
Inflow = 18.2 cfs @ 12.16 hrs, Volume= 78,965 cf
Outflow = 18.2 cfs @ 12.16 hrs, Volume= 78,965 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Grove Street

Inflow Area = 59,299 sf, 6.49% Impervious, Inflow Depth > 0.33" for 10-Yr 24 Hr event
Inflow = 0.3 cfs @ 12.13 hrs, Volume= 1,609 cf
Outflow = 0.3 cfs @ 12.13 hrs, Volume= 1,609 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Ex. Wetlands (series B)

Inflow Area = 267,241 sf, 0.20% Impervious, Inflow Depth > 0.06" for 10-Yr 24 Hr event
Inflow = 0.0 cfs @ 15.57 hrs, Volume= 1,303 cf
Outflow = 0.0 cfs @ 15.57 hrs, Volume= 1,303 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: 231 Grove Street

Inflow Area =	25,634 sf,	0.00% Impervious,	Inflow Depth > 0.01"	for 10-Yr 24 Hr event	
Inflow =	0.0 cfs @	22.54 hrs,	Volume=	27 cf	
Outflow =	0.0 cfs @	22.54 hrs,	Volume=	27 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment EX-1: northern locus

Runoff = 20.8 cfs @ 12.18 hrs, Volume= 84,199 cf, Depth> 2.09"
Routed to Reach DP-1 : Ex. Wetlands (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
	55,486	77	Woods, Good, HSG D
	43,817	61	>75% Grass cover, Good, HSG B
	8,664	80	>75% Grass cover, Good, HSG D
	369,499	55	Woods, Good, HSG B
*	7,032	72	Dirt Path
	484,498	59	Weighted Average
	484,498		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.7	155	0.0940	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	9	0.1000	6.4		**Shallow Concentrated Flow, overland (path)** Paved Kv= 20.3 fps
2.6	256	0.1110	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	10	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
1.2	113	0.0970	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
12.5	593	Total			

Summary for Subcatchment EX-1.1: central northern locus

Runoff = 11.1 cfs @ 12.11 hrs, Volume= 37,956 cf, Depth> 1.91"
Routed to Reach DP-1 : Ex. Wetlands (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
	56,040	77	Woods, Good, HSG D
*	3,720	98	Roof Area
	49,482	39	>75% Grass cover, Good, HSG A
	42,567	80	>75% Grass cover, Good, HSG D
	71,430	30	Woods, Good, HSG A
*	7,912	98	Drive/Patios
	6,805	96	Gravel surface, HSG A
	237,956	57	Weighted Average
	226,324		95.11% Pervious Area
	11,632		4.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0500	0.2		**Sheet Flow, overland (grass)** Grass: Short n= 0.150 P2= 3.32"
0.2	52	0.0770	4.5		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
2.9	199	0.0530	1.2		**Shallow Concentrated Flow, overland (woods) to Wetland Series** Woodland Kv= 5.0 fps
6.9	301	Total			

Summary for Subcatchment EX-2: northeastern locus

Runoff = 0.7 cfs @ 12.11 hrs, Volume= 2,839 cf, Depth> 1.11"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
	6,698	30	Woods, Good, HSG A
*	2,560	98	Roof Area
*	1,289	98	Walk/Driveway
	18,653	39	>75% Grass cover, Good, HSG A
	1,576	80	>75% Grass cover, Good, HSG D
	30,776	47	Weighted Average
	26,927		87.49% Pervious Area
	3,849		12.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment EX-2.1: southeast corner locus

Runoff = 0.0 cfs @ 15.06 hrs, Volume= 280 cf, Depth> 0.12"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
1,034	39	>75% Grass cover, Good, HSG A
27,489	30	Woods, Good, HSG A
28,523	30	Weighted Average
28,523		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.2000	0.2		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.3	237	0.1200	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
7.1	287	Total			

Summary for Subcatchment EX-3: southern locus

Runoff = 0.1 cfs @ 13.82 hrs, Volume= 1,940 cf, Depth> 0.19"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
23,107	39	>75% Grass cover, Good, HSG A
96,598	30	Woods, Good, HSG A
119,705	32	Weighted Average
119,705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.5	250	0.1080	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.5	114	0.0600	3.9		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
9.4	414	Total			

Summary for Subcatchment EX-3.1: central southern locus

Runoff = 0.2 cfs @ 12.58 hrs, Volume= 2,871 cf, Depth> 0.28"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
	54,846	39	>75% Grass cover, Good, HSG A
	65,861	30	Woods, Good, HSG A
*	527	98	Roof Area
	121,234	34	Weighted Average
	120,707		99.57% Pervious Area
	527		0.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
7.0	422	0.0400	1.0		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
14.8	472	Total			

Summary for Subcatchment EX-3.2: south western locus

Runoff = 0.0 cfs @ 15.15 hrs, Volume= 257 cf, Depth> 0.12"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
26,302	30	Woods, Good, HSG A
26,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.32"
0.9	53	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	103	Total			

Summary for Subcatchment EX-4: southwest corner locus

Runoff = 0.0 cfs @ 15.09 hrs, Volume= 251 cf, Depth> 0.12"
Routed to Reach DP-4 : 231 Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
25,634	30	Woods, Good, HSG A
25,634		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
0.6	61	0.1100	1.7		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
8.4	111	Total			

Summary for Reach DP-1: Ex. Wetlands (series A)

Inflow Area = 722,454 sf, 1.61% Impervious, Inflow Depth > 2.03" for 25-Yr 24 Hr event
Inflow = 30.1 cfs @ 12.15 hrs, Volume= 122,155 cf
Outflow = 30.1 cfs @ 12.15 hrs, Volume= 122,155 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Grove Street

Inflow Area = 59,299 sf, 6.49% Impervious, Inflow Depth > 0.63" for 25-Yr 24 Hr event
Inflow = 0.7 cfs @ 12.11 hrs, Volume= 3,119 cf
Outflow = 0.7 cfs @ 12.11 hrs, Volume= 3,119 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Ex. Wetlands (series B)

Inflow Area = 267,241 sf, 0.20% Impervious, Inflow Depth > 0.23" for 25-Yr 24 Hr event
Inflow = 0.2 cfs @ 12.61 hrs, Volume= 5,068 cf
Outflow = 0.2 cfs @ 12.61 hrs, Volume= 5,068 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: 231 Grove Street

Inflow Area = 25,634 sf, 0.00% Impervious, Inflow Depth > 0.12" for 25-Yr 24 Hr event
Inflow = 0.0 cfs @ 15.09 hrs, Volume= 251 cf
Outflow = 0.0 cfs @ 15.09 hrs, Volume= 251 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment EX-1: northern locus

Runoff = 34.7 cfs @ 12.18 hrs, Volume= 135,091 cf, Depth> 3.35"
Routed to Reach DP-1 : Ex. Wetlands (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
	55,486	77	Woods, Good, HSG D
	43,817	61	>75% Grass cover, Good, HSG B
	8,664	80	>75% Grass cover, Good, HSG D
	369,499	55	Woods, Good, HSG B
*	7,032	72	Dirt Path
	484,498	59	Weighted Average
	484,498		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.7	155	0.0940	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	9	0.1000	6.4		**Shallow Concentrated Flow, overland (path)** Paved Kv= 20.3 fps
2.6	256	0.1110	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	10	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
1.2	113	0.0970	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
12.5	593	Total			

Summary for Subcatchment EX-1.1: central northern locus

Runoff = 18.9 cfs @ 12.11 hrs, Volume= 61,982 cf, Depth> 3.13"
Routed to Reach DP-1 : Ex. Wetlands (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
	56,040	77	Woods, Good, HSG D
*	3,720	98	Roof Area
	49,482	39	>75% Grass cover, Good, HSG A
	42,567	80	>75% Grass cover, Good, HSG D
	71,430	30	Woods, Good, HSG A
*	7,912	98	Drive/Patios
	6,805	96	Gravel surface, HSG A
	237,956	57	Weighted Average
	226,324		95.11% Pervious Area
	11,632		4.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0500	0.2		**Sheet Flow, overland (grass)** Grass: Short n= 0.150 P2= 3.32"
0.2	52	0.0770	4.5		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
2.9	199	0.0530	1.2		**Shallow Concentrated Flow, overland (woods) to Wetland Series** Woodland Kv= 5.0 fps
6.9	301	Total			

Summary for Subcatchment EX-2: northeastern locus

Runoff = 1.5 cfs @ 12.10 hrs, Volume= 5,225 cf, Depth> 2.04"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
	6,698	30	Woods, Good, HSG A
*	2,560	98	Roof Area
*	1,289	98	Walk/Driveway
	18,653	39	>75% Grass cover, Good, HSG A
	1,576	80	>75% Grass cover, Good, HSG D
	30,776	47	Weighted Average
	26,927		87.49% Pervious Area
	3,849		12.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment EX-2.1: southeast corner locus

Runoff = 0.1 cfs @ 12.42 hrs, Volume= 1,089 cf, Depth> 0.46"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
1,034	39	>75% Grass cover, Good, HSG A
27,489	30	Woods, Good, HSG A
28,523	30	Weighted Average
28,523		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.2000	0.2		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.3	237	0.1200	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
7.1	287	Total			

Summary for Subcatchment EX-3: southern locus

Runoff = 0.7 cfs @ 12.40 hrs, Volume= 6,090 cf, Depth> 0.61"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
23,107	39	>75% Grass cover, Good, HSG A
96,598	30	Woods, Good, HSG A
119,705	32	Weighted Average
119,705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.5	250	0.1080	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.5	114	0.0600	3.9		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
9.4	414	Total			

Summary for Subcatchment EX-3.1: central southern locus

Runoff = 0.9 cfs @ 12.42 hrs, Volume= 7,817 cf, Depth> 0.77"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
	54,846	39	>75% Grass cover, Good, HSG A
	65,861	30	Woods, Good, HSG A
*	527	98	Roof Area
	121,234	34	Weighted Average
	120,707		99.57% Pervious Area
	527		0.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
7.0	422	0.0400	1.0		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
14.8	472	Total			

Summary for Subcatchment EX-3.2: south western locus

Runoff = 0.1 cfs @ 12.51 hrs, Volume= 1,000 cf, Depth> 0.46"
Routed to Reach DP-3 : Ex. Wetlands (series B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
26,302	30	Woods, Good, HSG A
26,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.32"
0.9	53	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	103	Total			

Summary for Subcatchment EX-4: southwest corner locus

Runoff = 0.1 cfs @ 12.44 hrs, Volume= 978 cf, Depth> 0.46"
Routed to Reach DP-4 : 231 Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
25,634	30	Woods, Good, HSG A
25,634		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
0.6	61	0.1100	1.7		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
8.4	111	Total			

Summary for Reach DP-1: Ex. Wetlands (series A)

Inflow Area = 722,454 sf, 1.61% Impervious, Inflow Depth > 3.27" for 100-Yr 24 Hr event
Inflow = 50.6 cfs @ 12.15 hrs, Volume= 197,073 cf
Outflow = 50.6 cfs @ 12.15 hrs, Volume= 197,073 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Grove Street

Inflow Area = 59,299 sf, 6.49% Impervious, Inflow Depth > 1.28" for 100-Yr 24 Hr event
Inflow = 1.5 cfs @ 12.10 hrs, Volume= 6,313 cf
Outflow = 1.5 cfs @ 12.10 hrs, Volume= 6,313 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Ex. Wetlands (series B)

Inflow Area = 267,241 sf, 0.20% Impervious, Inflow Depth > 0.67" for 100-Yr 24 Hr event
Inflow = 1.7 cfs @ 12.42 hrs, Volume= 14,908 cf
Outflow = 1.7 cfs @ 12.42 hrs, Volume= 14,908 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: 231 Grove Street

Inflow Area =	25,634 sf,	0.00% Impervious,	Inflow Depth > 0.46"	for 100-Yr 24 Hr event
Inflow =	0.1 cfs @	12.44 hrs, Volume=	978 cf	
Outflow =	0.1 cfs @	12.44 hrs, Volume=	978 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

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Post-Development Hydrologic Computations

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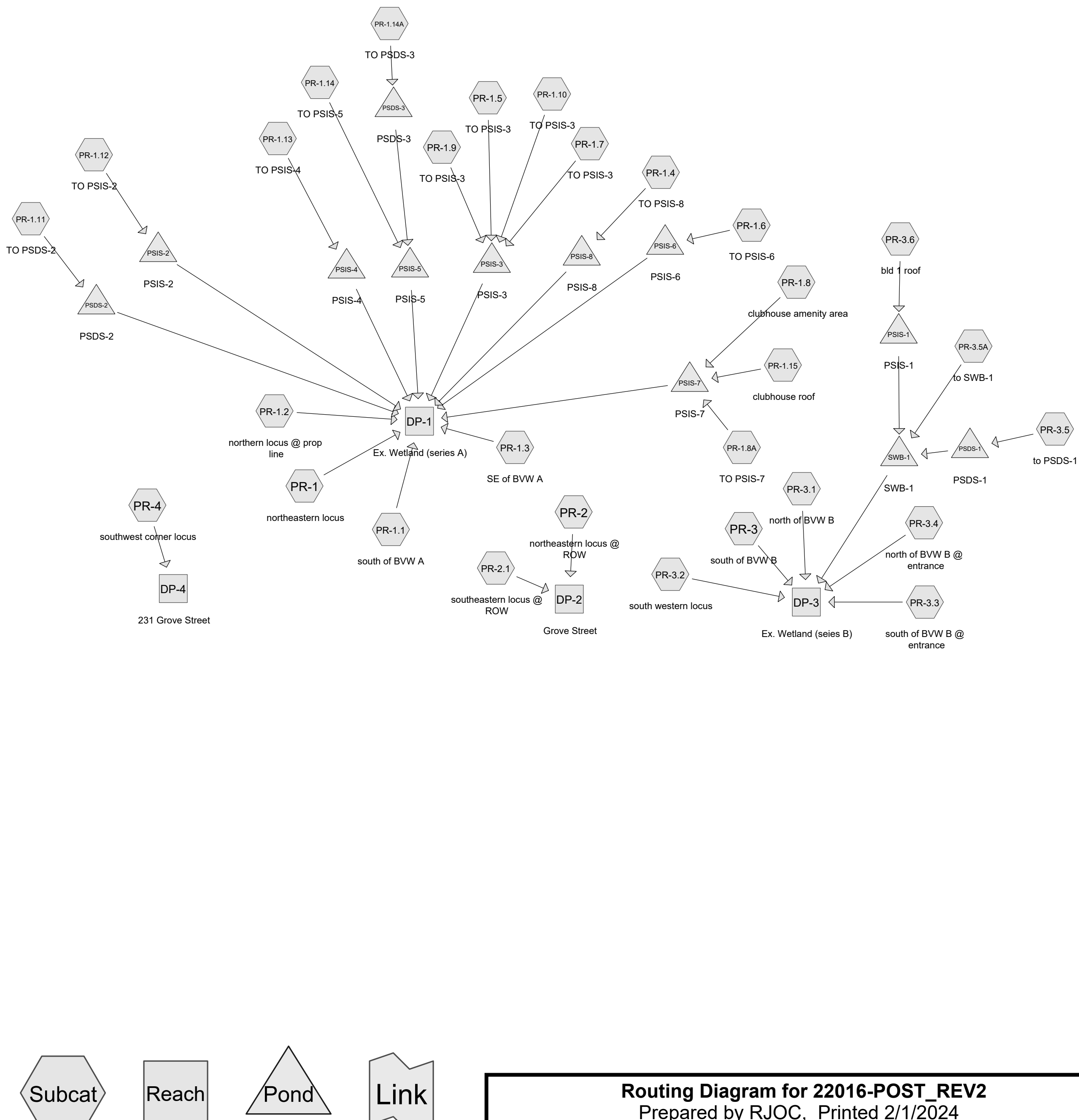

Routing Diagram for 22016-POST_REV2
Prepared by RJOC, Printed 2/1/2024
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr 24 Hr	Type III 24-hr		Default	24.00	1	3.36	2
2	10-Yr 24 Hr	Type III 24-hr		Default	24.00	1	5.22	2
3	25-Yr 24 Hr	Type III 24-hr		Default	24.00	1	6.39	2
4	100-Yr 24 Hr	Type III 24-hr		Default	24.00	1	8.18	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
127,669	39	>75% Grass cover, Good, HSG A (PR-1.1, PR-1.11, PR-1.4, PR-1.5, PR-1.6, PR-1.7, PR-1.8, PR-1.8A, PR-1.9, PR-2, PR-2.1, PR-3, PR-3.1, PR-3.3, PR-3.4, PR-3.5, PR-3.5A)
107,211	61	>75% Grass cover, Good, HSG B (PR-1.10, PR-1.13, PR-1.14, PR-1.14A, PR-1.2, PR-1.3)
48,020	80	>75% Grass cover, Good, HSG D (PR-1, PR-1.1, PR-1.11, PR-1.14, PR-1.2, PR-1.3, PR-1.4, PR-1.6, PR-1.8, PR-1.9, PR-2)
4,295	72	Dirt Path (PR-1)
337,378	98	Impervious Area (PR-1.10, PR-1.11, PR-1.13, PR-1.14, PR-1.14A, PR-1.4, PR-1.5, PR-1.6, PR-1.7, PR-1.8, PR-1.8A, PR-1.9, PR-2, PR-3, PR-3.5, PR-3.5A)
94,183	98	Roof Area (PR-1.12, PR-1.13, PR-1.14A, PR-1.15, PR-1.5, PR-3.6)
109,996	30	Woods, Good, HSG A (PR-1.1, PR-2.1, PR-3, PR-3.1, PR-3.2, PR-4)
171,609	55	Woods, Good, HSG B (PR-1, PR-1.14, PR-1.2)
74,267	77	Woods, Good, HSG D (PR-1, PR-1.1, PR-1.3)
1,074,628	**71**	**TOTAL AREA**

Summary for Subcatchment PR-1: northeastern locus

Runoff = 1.6 cfs @ 12.23 hrs, Volume= 9,306 cf, Depth> 0.51"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
	51,817	77	Woods, Good, HSG D
	813	80	>75% Grass cover, Good, HSG D
	162,557	55	Woods, Good, HSG B
*	4,295	72	Dirt Path
	219,482	61	Weighted Average
	219,482		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.8	165	0.0940	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	9	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
2.6	256	0.1110	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	10	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
1.2	113	0.0970	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
12.6	603	Total			

Summary for Subcatchment PR-1.1: south of BVW A

Runoff = 0.3 cfs @ 12.13 hrs, Volume= 1,698 cf, Depth> 0.40"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
21,801	77	Woods, Good, HSG D
603	39	>75% Grass cover, Good, HSG A
8,166	80	>75% Grass cover, Good, HSG D
20,582	30	Woods, Good, HSG A
51,152	58	Weighted Average
51,152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1.10: TO PSIS-3

Runoff = 1.2 cfs @ 12.09 hrs, Volume= 3,854 cf, Depth> 2.23"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	15,866	98	Impervious Area
	4,914	61	>75% Grass cover, Good, HSG B
	20,780	89	Weighted Average
	4,914		23.65% Pervious Area
	15,866		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.11: TO PSDS-2

Runoff = 1.5 cfs @ 12.09 hrs, Volume= 4,675 cf, Depth> 1.97"
Routed to Pond PSDS-2 : PSDS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	22,222	98	Impervious Area
	5,404	39	>75% Grass cover, Good, HSG A
	812	80	>75% Grass cover, Good, HSG D
	28,438	86	Weighted Average
	6,216		21.86% Pervious Area
	22,222		78.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.12: TO PSIS-2

Runoff = 1.2 cfs @ 12.08 hrs, Volume= 4,262 cf, Depth> 3.12"
Routed to Pond PSIS-2 : PSIS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	16,369	98	Roof Area
	16,369		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.13: TO PSIS-4

Runoff = 5.5 cfs @ 12.09 hrs, Volume= 17,355 cf, Depth> 2.31"
Routed to Pond PSIS-4 : PSIS-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	53,830	98	Impervious Area
	18,296	61	>75% Grass cover, Good, HSG B
*	17,839	98	Roof Area
	89,965	90	Weighted Average
	18,296		20.34% Pervious Area
	71,669		79.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.14: TO PSIS-5

Runoff = 2.6 cfs @ 12.09 hrs, Volume= 7,979 cf, Depth> 1.52"
Routed to Pond PSIS-5 : PSIS-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
	24,456	61	>75% Grass cover, Good, HSG B
	240	80	>75% Grass cover, Good, HSG D
	5,400	55	Woods, Good, HSG B
*	32,724	98	Impervious Area
	62,820	80	Weighted Average
	30,096		47.91% Pervious Area
	32,724		52.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.14A: TO PSDS-3

Runoff = 4.2 cfs @ 12.09 hrs, Volume= 13,158 cf, Depth> 2.41"
Routed to Pond PSDS-3 : PSDS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
	13,139	61	>75% Grass cover, Good, HSG B
*	17,839	98	Roof Area
*	34,634	98	Impervious Area
	65,612	91	Weighted Average
	13,139		20.03% Pervious Area
	52,473		79.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.15: clubhouse roof

Runoff = 0.6 cfs @ 12.08 hrs, Volume= 2,062 cf, Depth> 3.12"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	7,918	98	Roof Area
	7,918		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.2: northern locus @ prop line

Runoff = 0.5 cfs @ 12.12 hrs, Volume= 2,034 cf, Depth> 0.55"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
37,239	61	>75% Grass cover, Good, HSG B
3,652	55	Woods, Good, HSG B
3,492	80	>75% Grass cover, Good, HSG D
44,383	62	Weighted Average
44,383		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.32"
2.6	769	0.0930	4.9		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
6.4	819	Total			

Summary for Subcatchment PR-1.3: SE of BVW A

Runoff = 1.0 cfs @ 12.09 hrs, Volume= 3,222 cf, Depth> 1.20"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
9,167	61	>75% Grass cover, Good, HSG B
22,355	80	>75% Grass cover, Good, HSG D
649	77	Woods, Good, HSG D
32,171	75	Weighted Average
32,171		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1.4: TO PSIS-8

Runoff = 1.5 cfs @ 12.09 hrs, Volume= 4,760 cf, Depth> 2.41"
Routed to Pond PSIS-8 : PSIS-8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	16,532	98	Impervious Area
	6,483	80	>75% Grass cover, Good, HSG D
	723	39	>75% Grass cover, Good, HSG A
	23,738	91	Weighted Average
	7,206		30.36% Pervious Area
	16,532		69.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.5: TO PSIS-3

Runoff = 3.5 cfs @ 12.09 hrs, Volume= 10,821 cf, Depth> 2.23"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	32,702	98	Impervious Area
	9,258	39	>75% Grass cover, Good, HSG A
*	16,379	98	Roof Area
	58,339	89	Weighted Average
	9,258		15.87% Pervious Area
	49,081		84.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.6: TO PSIS-6

Runoff = 1.7 cfs @ 12.09 hrs, Volume= 5,375 cf, Depth> 1.59"
Routed to Pond PSIS-6 : PSIS-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	25,841	98	Impervious Area
	4,090	80	>75% Grass cover, Good, HSG D
	10,533	39	>75% Grass cover, Good, HSG A
	40,464	81	Weighted Average
	14,623		36.14% Pervious Area
	25,841		63.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.7: TO PSIS-3

Runoff = 1.2 cfs @ 12.09 hrs, Volume= 3,683 cf, Depth> 2.14"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	17,270	98	Impervious Area
	3,388	39	>75% Grass cover, Good, HSG A
	20,658	88	Weighted Average
	3,388		16.40% Pervious Area
	17,270		83.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.8: clubhouse amenity area

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 704 cf, Depth> 0.55"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	5,928	98	Impervious Area
	124	80	>75% Grass cover, Good, HSG D
	9,311	39	>75% Grass cover, Good, HSG A
	15,363	62	Weighted Average
	9,435		61.41% Pervious Area
	5,928		38.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.8A: TO PSIS-7

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,034 cf, Depth> 1.52"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	5,632	98	Impervious Area
	2,508	39	>75% Grass cover, Good, HSG A
	8,140	80	Weighted Average
	2,508		30.81% Pervious Area
	5,632		69.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.9: TO PSIS-3

Runoff = 0.5 cfs @ 12.09 hrs, Volume= 1,645 cf, Depth> 2.60"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	6,615	98	Impervious Area
	568	39	>75% Grass cover, Good, HSG A
	419	80	>75% Grass cover, Good, HSG D
	7,602	93	Weighted Average
	987		12.98% Pervious Area
	6,615		87.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-2: northeastern locus @ ROW

Runoff = 0.0 cfs @ 12.35 hrs, Volume= 138 cf, Depth> 0.24"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	936	98	Impervious Area
	4,916	39	>75% Grass cover, Good, HSG A
	1,026	80	>75% Grass cover, Good, HSG D
	6,878	53	Weighted Average
	5,942		86.39% Pervious Area
	936		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment PR-2.1: southeastern locus @ ROW

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
10,498	30	Woods, Good, HSG A
12,872	39	>75% Grass cover, Good, HSG A
23,370	35	Weighted Average
23,370		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment PR-3: south of BVW B

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
	19,666	30	Woods, Good, HSG A
	6,445	39	>75% Grass cover, Good, HSG A
*	64	98	Impervious Area
	26,175	32	Weighted Average
	26,111		99.76% Pervious Area
	64		0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.1: north of BVW B

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
17,728	30	Woods, Good, HSG A
24,872	39	>75% Grass cover, Good, HSG A
42,600	35	Weighted Average
42,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.2: south western locus

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
26,302	30	Woods, Good, HSG A
26,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.32"
0.9	53	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	103	Total			

Summary for Subcatchment PR-3.3: south of BVW B @ entrance

Runoff = 0.0 cfs @ 23.86 hrs, Volume= 1 cf, Depth> 0.00"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
4,917	39	>75% Grass cover, Good, HSG A
4,917		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.4: north of BVW B @ entrance

Runoff = 0.0 cfs @ 23.86 hrs, Volume= 3 cf, Depth> 0.00"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
11,446	39	>75% Grass cover, Good, HSG A
11,446		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.5: to PSDS-1

Runoff = 3.5 cfs @ 12.09 hrs, Volume= 10,843 cf, Depth> 2.14"
Routed to Pond PSDS-1 : PSDS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	50,865	98	Impervious Area
	9,963	39	>75% Grass cover, Good, HSG A
	60,828	88	Weighted Average
	9,963		16.38% Pervious Area
	50,865		83.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-3.5A: to SWB-1

Runoff = 0.8 cfs @ 12.09 hrs, Volume= 2,570 cf, Depth> 1.20"
Routed to Pond SWB-1 : SWB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
	9,942	39	>75% Grass cover, Good, HSG A
*	15,717	98	Impervious Area
	25,659	75	Weighted Average
	9,942		38.75% Pervious Area
	15,717		61.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-3.6: bld 1 roof

Runoff = 1.3 cfs @ 12.08 hrs, Volume= 4,645 cf, Depth> 3.12"
Routed to Pond PSIS-1 : PSIS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

	Area (sf)	CN	Description
*	17,839	98	Roof Area
	17,839		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-4: southwest corner locus

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach DP-4 : 231 Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
15,220	30	Woods, Good, HSG A
15,220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
0.6	61	0.1100	1.7		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
8.4	111	Total			

Summary for Reach DP-1: Ex. Wetland (series A)

Inflow Area = 813,394 sf, 42.56% Impervious, Inflow Depth > 0.31" for 2-Yr 24 Hr event
Inflow = 3.2 cfs @ 12.26 hrs, Volume= 20,872 cf
Outflow = 3.2 cfs @ 12.26 hrs, Volume= 20,872 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Grove Street

Inflow Area = 30,248 sf, 3.09% Impervious, Inflow Depth > 0.05" for 2-Yr 24 Hr event
Inflow = 0.0 cfs @ 12.35 hrs, Volume= 138 cf
Outflow = 0.0 cfs @ 12.35 hrs, Volume= 138 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Ex. Wetland (seies B)

Inflow Area = 215,766 sf, 39.16% Impervious, Inflow Depth > 0.00" for 2-Yr 24 Hr event
Inflow = 0.0 cfs @ 23.86 hrs, Volume= 5 cf
Outflow = 0.0 cfs @ 23.86 hrs, Volume= 5 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: 231 Grove Street

Inflow Area = 15,220 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Yr 24 Hr event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Pond PSDS-1: PSDS-1

Inflow Area = 60,828 sf, 83.62% Impervious, Inflow Depth > 2.14" for 2-Yr 24 Hr event
Inflow = 3.5 cfs @ 12.09 hrs, Volume= 10,843 cf
Outflow = 0.1 cfs @ 17.47 hrs, Volume= 3,844 cf, Atten= 98%, Lag= 322.7 min
Primary = 0.1 cfs @ 17.47 hrs, Volume= 3,844 cf
Routed to Pond SWB-1 : SWB-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 290.42' @ 17.47 hrs Surf.Area= 4,481 sf Storage= 7,627 cf

Plug-Flow detention time= 350.6 min calculated for 3,842 cf (35% of inflow)
Center-of-Mass det. time= 224.9 min (1,037.3 - 812.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	288.00'	7,255 cf	**46.67'W x 96.02'L x 6.75'H Field A** 30,245 cf Overall - 12,109 cf Embedded = 18,136 cf x 40.0% Voids
#2A	288.75'	12,109 cf	**ADS_StormTech MC-4500 b +Cap** x 110 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.02'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 110 Chambers in 5 Rows Cap Storage= 39.5 cf x 2 x 5 rows = 395.0 cf
		19,363 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	292.75'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	292.75'	**24.0" Round Culvert** L= 21.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 292.75' / 292.00' S= 0.0347 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	288.00'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	288.00'	**2.0" Round Culvert** L= 90.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 288.00' / 286.00' S= 0.0222 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=0.1 cfs @ 17.47 hrs HW=290.42' TW=286.00' (Dynamic Tailwater)
2=Culvert (Controls 0.0 cfs)
1=Orifice/Grate (Controls 0.0 cfs)
4=Culvert (Barrel Controls 0.1 cfs @ 3.7 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSDS-2: PSDS-2

Inflow Area = 28,438 sf, 78.14% Impervious, Inflow Depth > 1.97" for 2-Yr 24 Hr event
Inflow = 1.5 cfs @ 12.09 hrs, Volume= 4,675 cf
Outflow = 0.6 cfs @ 12.33 hrs, Volume= 4,612 cf, Atten= 60%, Lag= 14.4 min
Primary = 0.6 cfs @ 12.33 hrs, Volume= 4,612 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 310.83' @ 12.33 hrs Surf.Area= 1,111 sf Storage= 1,620 cf

Plug-Flow detention time= 137.0 min calculated for 4,612 cf (99% of inflow)
Center-of-Mass det. time= 129.0 min (948.7 - 819.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	308.50'	1,114 cf	**17.75'W x 62.58'L x 3.50'H Field A** 3,888 cf Overall - 1,103 cf Embedded = 2,785 cf x 40.0% Voids
#2A	309.00'	1,103 cf	**ADS_StormTech SC-740 +Cap** x 24 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 24 Chambers in 3 Rows
		2,217 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	310.50'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	310.50'	**24.0" Round Culvert** L= 4.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 310.50' / 310.40' S= 0.0213 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	308.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	308.50'	**2.0" Round Culvert** L= 66.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 308.50' / 306.00' S= 0.0379 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=0.6 cfs @ 12.33 hrs HW=310.83' TW=0.00' (Dynamic Tailwater)
2=Culvert (Inlet Controls 0.5 cfs @ 1.5 fps)
1=Orifice/Grate (Passes 0.5 cfs of 0.9 cfs potential flow)
4=Culvert (Barrel Controls 0.1 cfs @ 4.5 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSDS-3: PSDS-3

Inflow Area = 65,612 sf, 79.97% Impervious, Inflow Depth > 2.41" for 2-Yr 24 Hr event
Inflow = 4.2 cfs @ 12.09 hrs, Volume= 13,158 cf
Outflow = 0.2 cfs @ 15.10 hrs, Volume= 5,920 cf, Atten= 96%, Lag= 181.1 min
Primary = 0.2 cfs @ 15.10 hrs, Volume= 5,920 cf
Routed to Pond PSIS-5 : PSIS-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 307.11' @ 15.10 hrs Surf.Area= 2,572 sf Storage= 8,705 cf

Plug-Flow detention time= 342.9 min calculated for 5,917 cf (45% of inflow)
Center-of-Mass det. time= 226.1 min (1,026.1 - 800.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	302.25'	4,337 cf	**64.83'W x 39.67'L x 6.75'H Field A** 17,359 cf Overall - 6,516 cf Embedded = 10,843 cf x 40.0% Voids
#2A	303.00'	6,516 cf	**ADS_StormTech MC-4500 b +Cap** x 56 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 56 Chambers in 7 Rows Cap Storage= 39.5 cf x 2 x 7 rows = 553.0 cf
		10,854 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	307.00'	**12.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	307.00'	**24.0" Round Culvert** L= 28.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.00' / 306.00' S= 0.0352 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	302.25'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	302.25'	**2.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 302.25' / 302.10' S= 0.0037 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=0.2 cfs @ 15.10 hrs HW=307.11' TW=286.64' (Dynamic Tailwater)
├─**2=Culvert** (Inlet Controls 0.1 cfs @ 0.9 fps)
│ └─**1=Orifice/Grate** (Passes 0.1 cfs of 0.1 cfs potential flow)
└─**4=Culvert** (Barrel Controls 0.1 cfs @ 5.6 fps)
  └─**3=Orifice/Grate** (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSIS-1: PSIS-1

Inflow Area = 17,839 sf,100.00% Impervious, Inflow Depth > 3.12" for 2-Yr 24 Hr event
Inflow = 1.3 cfs @ 12.08 hrs, Volume= 4,645 cf
Outflow = 0.2 cfs @ 11.75 hrs, Volume= 4,647 cf, Atten= 82%, Lag= 0.0 min
Discarded = 0.2 cfs @ 11.75 hrs, Volume= 4,647 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond SWB-1 : SWB-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 294.47' @ 12.54 hrs Surf.Area= 1,224 sf Storage= 1,154 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 25.5 min (780.3 - 754.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	293.00'	1,162 cf	**49.00'W x 24.98'L x 3.50'H Field A** 4,283 cf Overall - 1,378 cf Embedded = 2,905 cf x 40.0% Voids
#2A	293.50'	1,378 cf	**ADS_StormTech SC-740 +Cap** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 30 Chambers in 10 Rows
		2,540 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	293.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	295.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	295.00'	**12.0" Round Culvert** L= 3.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 295.00' / 294.80' S= 0.0541 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.75 hrs HW=293.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=293.00' TW=286.00' (Dynamic Tailwater)
└─**3=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-2: PSIS-2

Inflow Area = 16,369 sf,100.00% Impervious, Inflow Depth > 3.12" for 2-Yr 24 Hr event
Inflow = 1.2 cfs @ 12.08 hrs, Volume= 4,262 cf
Outflow = 0.1 cfs @ 11.64 hrs, Volume= 4,263 cf, Atten= 90%, Lag= 0.0 min
Discarded = 0.1 cfs @ 11.64 hrs, Volume= 4,263 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 308.63' @ 12.87 hrs Surf.Area= 2,128 sf Storage= 1,425 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 80.2 min (835.1 - 754.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	307.50'	1,514 cf	**54.83'W x 38.80'L x 2.33'H Field A** 4,964 cf Overall - 1,179 cf Embedded = 3,785 cf x 40.0% Voids
#2A	308.00'	1,179 cf	**ADS_StormTech SC-310 +Cap** x 80 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 80 Chambers in 16 Rows
		2,693 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	308.83'	**6.0" Vert. Orifice/Grate X 8.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	308.83'	**18.0" Round Culvert** L= 13.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 308.83' / 307.00' S= 0.1356 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=0.1 cfs @ 11.64 hrs HW=307.53' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=307.50' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Controls 0.0 cfs)
  └**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-3: PSIS-3

Inflow Area = 107,379 sf, 82.73% Impervious, Inflow Depth > 2.24" for 2-Yr 24 Hr event
Inflow = 6.4 cfs @ 12.09 hrs, Volume= 20,003 cf
Outflow = 1.0 cfs @ 11.80 hrs, Volume= 20,014 cf, Atten= 84%, Lag= 0.0 min
Discarded = 1.0 cfs @ 11.80 hrs, Volume= 20,014 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 279.31' @ 12.57 hrs Surf.Area= 5,421 sf Storage= 5,693 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 33.9 min (841.6 - 807.7)

Volume	Invert	Avail.Storage	Storage Description
#1	277.50'	7,335 cf	**37.00'W x 146.50'L x 6.00'H Prismatoid** 32,523 cf Overall - 14,186 cf Embedded = 18,337 cf x 40.0% Voids
#2	278.00'	14,186 cf	**60.0" Round Pipe Storage** x 5 Inside #1 L= 144.5'
		21,521 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	282.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	282.00'	**18.0" Round Culvert** L= 92.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 282.00' / 276.00' S= 0.0652 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=1.0 cfs @ 11.80 hrs HW=277.57' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.50' TW=0.00' (Dynamic Tailwater)
↑—**3=Culvert** (Controls 0.0 cfs)
  ↑—**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-4: PSIS-4

Inflow Area = 89,965 sf, 79.66% Impervious, Inflow Depth > 2.31" for 2-Yr 24 Hr event
Inflow = 5.5 cfs @ 12.09 hrs, Volume= 17,355 cf
Outflow = 0.3 cfs @ 11.49 hrs, Volume= 13,456 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.3 cfs @ 11.49 hrs, Volume= 13,456 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 279.99' @ 14.88 hrs Surf.Area= 4,560 sf Storage= 8,696 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 192.0 min (996.3 - 804.4)

Volume	Invert	Avail.Storage	Storage Description
#1	277.50'	27,803 cf	**120.0" Round Pipe Storage** x 3 Inside #2 L= 118.0'
#2	277.00'	10,767 cf	**38.00'W x 120.00'L x 12.00'H Prismatoid** 54,720 cf Overall - 27,803 cf Embedded = 26,917 cf x 40.0% Voids
		38,570 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	287.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	287.00'	**6.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 287.00' / 286.80' S= 0.0400 '/' Cc= 0.900
n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.3 cfs @ 11.49 hrs HW=277.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.00' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-5: PSIS-5

Inflow Area = 128,432 sf, 66.34% Impervious, Inflow Depth > 1.30" for 2-Yr 24 Hr event
Inflow = 2.6 cfs @ 12.09 hrs, Volume= 13,898 cf
Outflow = 0.2 cfs @ 11.78 hrs, Volume= 11,693 cf, Atten= 91%, Lag= 0.0 min
Discarded = 0.2 cfs @ 11.78 hrs, Volume= 11,693 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 286.69' @ 16.11 hrs Surf.Area= 4,320 sf Storage= 4,178 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 114.2 min (1,033.2 - 919.0)

Volume	Invert	Avail.Storage	Storage Description
#1	285.50'	11,585 cf	**60.0" Round Pipe Storage** x 5 Inside #2 L= 118.0'
#2	285.00'	5,734 cf	**36.00'W x 120.00'L x 6.00'H Prismatoid** 25,920 cf Overall - 11,585 cf Embedded = 14,335 cf x 40.0% Voids
		17,319 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	285.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	288.50'	**24.0" Vert. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	288.50'	**30.0" Round Culvert** L= 19.1' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 288.50' / 287.50' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 4.91 sf

Discarded OutFlow Max=0.2 cfs @ 11.78 hrs HW=285.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=285.00' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-6: PSIS-6

Inflow Area = 40,464 sf, 63.86% Impervious, Inflow Depth > 1.59" for 2-Yr 24 Hr event
Inflow = 1.7 cfs @ 12.09 hrs, Volume= 5,375 cf
Outflow = 0.4 cfs @ 11.95 hrs, Volume= 5,378 cf, Atten= 77%, Lag= 0.0 min
Discarded = 0.4 cfs @ 11.95 hrs, Volume= 5,378 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 278.62' @ 12.52 hrs Surf.Area= 2,039 sf Storage= 1,220 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 17.3 min (853.6 - 836.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	277.50'	3,550 cf	**73.92'W x 27.59'L x 6.75'H Field A** 13,767 cf Overall - 4,892 cf Embedded = 8,875 cf x 40.0% Voids
#2A	278.25'	4,892 cf	**ADS_StormTech MC-4500 b +Cap** x 40 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 40 Chambers in 8 Rows Cap Storage= 39.5 cf x 2 x 8 rows = 632.0 cf
		8,442 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	284.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	284.00'	**12.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 284.00' / 283.50' S= 0.0256 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.4 cfs @ 11.95 hrs HW=277.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.50' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-7: PSIS-7

Inflow Area = 31,421 sf, 61.99% Impervious, Inflow Depth > 1.45" for 2-Yr 24 Hr event
Inflow = 1.1 cfs @ 12.09 hrs, Volume= 3,800 cf
Outflow = 0.1 cfs @ 11.72 hrs, Volume= 3,801 cf, Atten= 92%, Lag= 0.0 min
Discarded = 0.1 cfs @ 11.72 hrs, Volume= 3,801 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 289.33' @ 13.57 hrs Surf.Area= 1,616 sf Storage= 1,359 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 124.8 min (930.1 - 805.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	288.00'	1,528 cf	**26.25'W x 61.58'L x 3.50'H Field A** 5,657 cf Overall - 1,838 cf Embedded = 3,820 cf x 40.0% Voids
#2A	288.50'	1,838 cf	**ADS_StormTech SC-740 +Cap** x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 40 Chambers in 5 Rows
		3,366 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	288.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	290.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	290.00'	**12.0" Round Culvert** L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 290.00' / 288.00' S= 0.0690 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.1 cfs @ 11.72 hrs HW=288.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=288.00' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Controls 0.0 cfs)
  └**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-8: PSIS-8

Inflow Area = 23,738 sf, 69.64% Impervious, Inflow Depth > 2.41" for 2-Yr 24 Hr event
Inflow = 1.5 cfs @ 12.09 hrs, Volume= 4,760 cf
Outflow = 0.2 cfs @ 11.75 hrs, Volume= 4,761 cf, Atten= 86%, Lag= 0.0 min
Discarded = 0.2 cfs @ 11.75 hrs, Volume= 4,761 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 274.00' @ 12.61 hrs Surf.Area= 1,108 sf Storage= 1,455 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 44.5 min (844.5 - 800.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	272.00'	1,611 cf	**22.75'W x 48.72'L x 5.50'H Field A** 6,096 cf Overall - 2,069 cf Embedded = 4,028 cf x 40.0% Voids
#2A	272.75'	2,069 cf	**ADS_StormTech MC-3500 d +Cap** x 18 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 18 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		3,680 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	272.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	276.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	276.00'	**12.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 276.00' / 275.30' S= 0.1400 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.75 hrs HW=272.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=272.00' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond SWB-1: SWB-1

Inflow Area = 104,326 sf, 80.92% Impervious, Inflow Depth > 0.74" for 2-Yr 24 Hr event
Inflow = 0.9 cfs @ 12.09 hrs, Volume= 6,414 cf
Outflow = 0.4 cfs @ 12.34 hrs, Volume= 6,413 cf, Atten= 51%, Lag= 14.8 min
Discarded = 0.4 cfs @ 12.34 hrs, Volume= 6,413 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-3 : Ex. Wetland (seies B)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 286.11' @ 12.34 hrs Surf.Area= 2,246 sf Storage= 254 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.1 min (965.4 - 964.3)

Volume	Invert	Avail.Storage	Storage Description
#1	286.00'	12,428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
286.00	2,201	207.0	0	0	2,201
288.00	3,066	254.0	5,243	5,243	3,986
290.00	4,146	345.0	7,185	12,428	8,365

Device	Routing	Invert	Outlet Devices
#1	Discarded	286.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	289.60'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.4 cfs @ 12.34 hrs HW=286.11' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=286.00' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Subcatchment PR-1: northeastern locus

Runoff = 6.6 cfs @ 12.19 hrs, Volume= 27,395 cf, Depth> 1.50"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
	51,817	77	Woods, Good, HSG D
	813	80	>75% Grass cover, Good, HSG D
	162,557	55	Woods, Good, HSG B
*	4,295	72	Dirt Path
	219,482	61	Weighted Average
	219,482		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.8	165	0.0940	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	9	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
2.6	256	0.1110	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	10	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
1.2	113	0.0970	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
12.6	603	Total			

Summary for Subcatchment PR-1.1: south of BVW A

Runoff = 1.6 cfs @ 12.10 hrs, Volume= 5,497 cf, Depth> 1.29"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
21,801	77	Woods, Good, HSG D
603	39	>75% Grass cover, Good, HSG A
8,166	80	>75% Grass cover, Good, HSG D
20,582	30	Woods, Good, HSG A
51,152	58	Weighted Average
51,152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1.10: TO PSIS-3

Runoff = 2.2 cfs @ 12.09 hrs, Volume= 6,891 cf, Depth> 3.98"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	15,866	98	Impervious Area
	4,914	61	>75% Grass cover, Good, HSG B
	20,780	89	Weighted Average
	4,914		23.65% Pervious Area
	15,866		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.11: TO PSDS-2

Runoff = 2.8 cfs @ 12.09 hrs, Volume= 8,695 cf, Depth> 3.67"
Routed to Pond PSDS-2 : PSDS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	22,222	98	Impervious Area
	5,404	39	>75% Grass cover, Good, HSG A
	812	80	>75% Grass cover, Good, HSG D
	28,438	86	Weighted Average
	6,216		21.86% Pervious Area
	22,222		78.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.12: TO PSIS-2

Runoff = 1.9 cfs @ 12.08 hrs, Volume= 6,792 cf, Depth> 4.98"
Routed to Pond PSIS-2 : PSIS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	16,369	98	Roof Area
	16,369		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.13: TO PSIS-4

Runoff = 9.5 cfs @ 12.08 hrs, Volume= 30,625 cf, Depth> 4.08"
Routed to Pond PSIS-4 : PSIS-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	53,830	98	Impervious Area
	18,296	61	>75% Grass cover, Good, HSG B
*	17,839	98	Roof Area
	89,965	90	Weighted Average
	18,296		20.34% Pervious Area
	71,669		79.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.14: TO PSIS-5

Runoff = 5.2 cfs @ 12.09 hrs, Volume= 16,135 cf, Depth> 3.08"
Routed to Pond PSIS-5 : PSIS-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
	24,456	61	>75% Grass cover, Good, HSG B
	240	80	>75% Grass cover, Good, HSG D
	5,400	55	Woods, Good, HSG B
*	32,724	98	Impervious Area
	62,820	80	Weighted Average
	30,096		47.91% Pervious Area
	32,724		52.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.14A: TO PSDS-3

Runoff = 7.1 cfs @ 12.08 hrs, Volume= 22,921 cf, Depth> 4.19"
Routed to Pond PSDS-3 : PSDS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
	13,139	61	>75% Grass cover, Good, HSG B
*	17,839	98	Roof Area
*	34,634	98	Impervious Area
	65,612	91	Weighted Average
	13,139		20.03% Pervious Area
	52,473		79.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.15: clubhouse roof

Runoff = 0.9 cfs @ 12.08 hrs, Volume= 3,285 cf, Depth> 4.98"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	7,918	98	Roof Area
	7,918		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.2: northern locus @ prop line

Runoff = 1.7 cfs @ 12.10 hrs, Volume= 5,819 cf, Depth> 1.57"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
37,239	61	>75% Grass cover, Good, HSG B
3,652	55	Woods, Good, HSG B
3,492	80	>75% Grass cover, Good, HSG D
44,383	62	Weighted Average
44,383		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.32"
2.6	769	0.0930	4.9		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
6.4	819	Total			

Summary for Subcatchment PR-1.3: SE of BVW A

Runoff = 2.3 cfs @ 12.09 hrs, Volume= 7,039 cf, Depth> 2.63"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
9,167	61	>75% Grass cover, Good, HSG B
22,355	80	>75% Grass cover, Good, HSG D
649	77	Woods, Good, HSG D
32,171	75	Weighted Average
32,171		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1.4: TO PSIS-8

Runoff = 2.6 cfs @ 12.08 hrs, Volume= 8,293 cf, Depth> 4.19"
Routed to Pond PSIS-8 : PSIS-8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	16,532	98	Impervious Area
	6,483	80	>75% Grass cover, Good, HSG D
	723	39	>75% Grass cover, Good, HSG A
	23,738	91	Weighted Average
	7,206		30.36% Pervious Area
	16,532		69.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.5: TO PSIS-3

Runoff = 6.1 cfs @ 12.09 hrs, Volume= 19,345 cf, Depth> 3.98"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	32,702	98	Impervious Area
	9,258	39	>75% Grass cover, Good, HSG A
*	16,379	98	Roof Area
	58,339	89	Weighted Average
	9,258		15.87% Pervious Area
	49,081		84.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.6: TO PSIS-6

Runoff = 3.5 cfs @ 12.09 hrs, Volume= 10,713 cf, Depth> 3.18"
Routed to Pond PSIS-6 : PSIS-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	25,841	98	Impervious Area
	4,090	80	>75% Grass cover, Good, HSG D
	10,533	39	>75% Grass cover, Good, HSG A
	40,464	81	Weighted Average
	14,623		36.14% Pervious Area
	25,841		63.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.7: TO PSIS-3

Runoff = 2.1 cfs @ 12.09 hrs, Volume= 6,670 cf, Depth> 3.87"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	17,270	98	Impervious Area
	3,388	39	>75% Grass cover, Good, HSG A
	20,658	88	Weighted Average
	3,388		16.40% Pervious Area
	17,270		83.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.8: clubhouse amenity area

Runoff = 0.6 cfs @ 12.10 hrs, Volume= 2,014 cf, Depth> 1.57"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	5,928	98	Impervious Area
	124	80	>75% Grass cover, Good, HSG D
	9,311	39	>75% Grass cover, Good, HSG A
	15,363	62	Weighted Average
	9,435		61.41% Pervious Area
	5,928		38.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.8A: TO PSIS-7

Runoff = 0.7 cfs @ 12.09 hrs, Volume= 2,091 cf, Depth> 3.08"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	5,632	98	Impervious Area
	2,508	39	>75% Grass cover, Good, HSG A
	8,140	80	Weighted Average
	2,508		30.81% Pervious Area
	5,632		69.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.9: TO PSIS-3

Runoff = 0.8 cfs @ 12.08 hrs, Volume= 2,794 cf, Depth> 4.41"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	6,615	98	Impervious Area
	568	39	>75% Grass cover, Good, HSG A
	419	80	>75% Grass cover, Good, HSG D
	7,602	93	Weighted Average
	987		12.98% Pervious Area
	6,615		87.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-2: northeastern locus @ ROW

Runoff = 0.1 cfs @ 12.11 hrs, Volume= 552 cf, Depth> 0.96"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	936	98	Impervious Area
	4,916	39	>75% Grass cover, Good, HSG A
	1,026	80	>75% Grass cover, Good, HSG D
	6,878	53	Weighted Average
	5,942		86.39% Pervious Area
	936		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment PR-2.1: southeastern locus @ ROW

Runoff = 0.0 cfs @ 14.86 hrs, Volume= 219 cf, Depth> 0.11"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
10,498	30	Woods, Good, HSG A
12,872	39	>75% Grass cover, Good, HSG A
23,370	35	Weighted Average
23,370		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment PR-3: south of BVW B

Runoff = 0.0 cfs @ 16.94 hrs, Volume= 92 cf, Depth> 0.04"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
	19,666	30	Woods, Good, HSG A
	6,445	39	>75% Grass cover, Good, HSG A
*	64	98	Impervious Area
	26,175	32	Weighted Average
	26,111		99.76% Pervious Area
	64		0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.1: north of BVW B

Runoff = 0.0 cfs @ 14.86 hrs, Volume= 399 cf, Depth> 0.11"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
17,728	30	Woods, Good, HSG A
24,872	39	>75% Grass cover, Good, HSG A
42,600	35	Weighted Average
42,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.2: south western locus

Runoff = 0.0 cfs @ 22.55 hrs, Volume= 27 cf, Depth> 0.01"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
26,302	30	Woods, Good, HSG A
26,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.32"
0.9	53	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	103	Total			

Summary for Subcatchment PR-3.3: south of BVW B @ entrance

Runoff = 0.0 cfs @ 12.44 hrs, Volume= 101 cf, Depth> 0.25"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
4,917	39	>75% Grass cover, Good, HSG A
4,917		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.4: north of BVW B @ entrance

Runoff = 0.0 cfs @ 12.44 hrs, Volume= 235 cf, Depth> 0.25"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
11,446	39	>75% Grass cover, Good, HSG A
11,446		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.5: to PSDS-1

Runoff = 6.2 cfs @ 12.09 hrs, Volume= 19,640 cf, Depth> 3.87"
Routed to Pond PSDS-1 : PSDS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	50,865	98	Impervious Area
	9,963	39	>75% Grass cover, Good, HSG A
	60,828	88	Weighted Average
	9,963		16.38% Pervious Area
	50,865		83.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-3.5A: to SWB-1

Runoff = 1.8 cfs @ 12.09 hrs, Volume= 5,614 cf, Depth> 2.63"
Routed to Pond SWB-1 : SWB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
	9,942	39	>75% Grass cover, Good, HSG A
*	15,717	98	Impervious Area
	25,659	75	Weighted Average
	9,942		38.75% Pervious Area
	15,717		61.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-3.6: bld 1 roof

Runoff = 2.1 cfs @ 12.08 hrs, Volume= 7,402 cf, Depth> 4.98"
Routed to Pond PSIS-1 : PSIS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

	Area (sf)	CN	Description
*	17,839	98	Roof Area
	17,839		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-4: southwest corner locus

Runoff = 0.0 cfs @ 22.54 hrs, Volume= 16 cf, Depth> 0.01"
Routed to Reach DP-4 : 231 Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
15,220	30	Woods, Good, HSG A
15,220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
0.6	61	0.1100	1.7		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
8.4	111	Total			

Summary for Reach DP-1: Ex. Wetland (series A)

Inflow Area = 813,394 sf, 42.56% Impervious, Inflow Depth > 0.96" for 10-Yr 24 Hr event
Inflow = 13.5 cfs @ 12.13 hrs, Volume= 65,091 cf
Outflow = 13.5 cfs @ 12.13 hrs, Volume= 65,091 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Grove Street

Inflow Area = 30,248 sf, 3.09% Impervious, Inflow Depth > 0.31" for 10-Yr 24 Hr event
Inflow = 0.1 cfs @ 12.11 hrs, Volume= 771 cf
Outflow = 0.1 cfs @ 12.11 hrs, Volume= 771 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Ex. Wetland (seies B)

Inflow Area = 215,766 sf, 39.16% Impervious, Inflow Depth > 0.05" for 10-Yr 24 Hr event
Inflow = 0.0 cfs @ 14.90 hrs, Volume= 853 cf
Outflow = 0.0 cfs @ 14.90 hrs, Volume= 853 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: 231 Grove Street

Inflow Area = 15,220 sf, 0.00% Impervious, Inflow Depth > 0.01" for 10-Yr 24 Hr event
Inflow = 0.0 cfs @ 22.54 hrs, Volume= 16 cf
Outflow = 0.0 cfs @ 22.54 hrs, Volume= 16 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Pond PSDS-1: PSDS-1

Inflow Area = 60,828 sf, 83.62% Impervious, Inflow Depth > 3.87" for 10-Yr 24 Hr event
Inflow = 6.2 cfs @ 12.09 hrs, Volume= 19,640 cf
Outflow = 0.1 cfs @ 19.22 hrs, Volume= 4,986 cf, Atten= 98%, Lag= 427.9 min
Primary = 0.1 cfs @ 19.22 hrs, Volume= 4,986 cf
Routed to Pond SWB-1 : SWB-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 292.64' @ 19.22 hrs Surf.Area= 4,481 sf Storage= 15,004 cf

Plug-Flow detention time= 368.2 min calculated for 4,984 cf (25% of inflow)
Center-of-Mass det. time= 215.7 min (1,011.4 - 795.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	288.00'	7,255 cf	**46.67'W x 96.02'L x 6.75'H Field A** 30,245 cf Overall - 12,109 cf Embedded = 18,136 cf x 40.0% Voids
#2A	288.75'	12,109 cf	**ADS_StormTech MC-4500 b +Cap** x 110 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.02'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 110 Chambers in 5 Rows Cap Storage= 39.5 cf x 2 x 5 rows = 395.0 cf
		19,363 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	292.75'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	292.75'	**24.0" Round Culvert** L= 21.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 292.75' / 292.00' S= 0.0347 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	288.00'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	288.00'	**2.0" Round Culvert** L= 90.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 288.00' / 286.00' S= 0.0222 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=0.1 cfs @ 19.22 hrs HW=292.64' TW=286.00' (Dynamic Tailwater)
2=Culvert (Controls 0.0 cfs)
1=Orifice/Grate (Controls 0.0 cfs)
4=Culvert (Barrel Controls 0.1 cfs @ 4.6 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSDS-2: PSDS-2

Inflow Area = 28,438 sf, 78.14% Impervious, Inflow Depth > 3.67" for 10-Yr 24 Hr event
Inflow = 2.8 cfs @ 12.09 hrs, Volume= 8,695 cf
Outflow = 2.6 cfs @ 12.12 hrs, Volume= 8,411 cf, Atten= 7%, Lag= 1.9 min
Primary = 2.6 cfs @ 12.12 hrs, Volume= 8,411 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 311.30' @ 12.12 hrs Surf.Area= 1,111 sf Storage= 1,900 cf

Plug-Flow detention time= 100.8 min calculated for 8,411 cf (97% of inflow)
Center-of-Mass det. time= 81.9 min (884.0 - 802.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	308.50'	1,114 cf	**17.75'W x 62.58'L x 3.50'H Field A** 3,888 cf Overall - 1,103 cf Embedded = 2,785 cf x 40.0% Voids
#2A	309.00'	1,103 cf	**ADS_StormTech SC-740 +Cap** x 24 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 24 Chambers in 3 Rows
		2,217 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	310.50'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	310.50'	**24.0" Round Culvert** L= 4.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 310.50' / 310.40' S= 0.0213 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	308.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	308.50'	**2.0" Round Culvert** L= 66.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 308.50' / 306.00' S= 0.0379 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=2.6 cfs @ 12.12 hrs HW=311.30' TW=0.00' (Dynamic Tailwater)
2=Culvert (Barrel Controls 2.5 cfs @ 3.1 fps)
1=Orifice/Grate (Passes 2.5 cfs of 4.1 cfs potential flow)
4=Culvert (Barrel Controls 0.1 cfs @ 4.7 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSDS-3: PSDS-3

Inflow Area = 65,612 sf, 79.97% Impervious, Inflow Depth > 4.19" for 10-Yr 24 Hr event
Inflow = 7.1 cfs @ 12.08 hrs, Volume= 22,921 cf
Outflow = 3.8 cfs @ 12.21 hrs, Volume= 14,888 cf, Atten= 46%, Lag= 7.6 min
Primary = 3.8 cfs @ 12.21 hrs, Volume= 14,888 cf
Routed to Pond PSIS-5 : PSIS-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 307.92' @ 12.21 hrs Surf.Area= 2,572 sf Storage= 9,746 cf

Plug-Flow detention time= 191.5 min calculated for 14,888 cf (65% of inflow)
Center-of-Mass det. time= 94.0 min (878.8 - 784.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	302.25'	4,337 cf	**64.83'W x 39.67'L x 6.75'H Field A** 17,359 cf Overall - 6,516 cf Embedded = 10,843 cf x 40.0% Voids
#2A	303.00'	6,516 cf	**ADS_StormTech MC-4500 b +Cap**x 56 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 56 Chambers in 7 Rows Cap Storage= 39.5 cf x 2 x 7 rows = 553.0 cf
		10,854 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	307.00'	**12.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	307.00'	**24.0" Round Culvert** L= 28.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.00' / 306.00' S= 0.0352 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	302.25'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	302.25'	**2.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 302.25' / 302.10' S= 0.0037 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=3.8 cfs @ 12.21 hrs HW=307.92' TW=287.27' (Dynamic Tailwater)
- **2=Culvert** (Inlet Controls 3.7 cfs @ 2.6 fps)
  - **1=Orifice/Grate** (Passes 3.7 cfs of 7.4 cfs potential flow)
- **4=Culvert** (Barrel Controls 0.1 cfs @ 6.0 fps)
  - **3=Orifice/Grate** (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSIS-1: PSIS-1

Inflow Area = 17,839 sf,100.00% Impervious, Inflow Depth > 4.98" for 10-Yr 24 Hr event
Inflow = 2.1 cfs @ 12.08 hrs, Volume= 7,402 cf
Outflow = 0.7 cfs @ 12.38 hrs, Volume= 7,403 cf, Atten= 68%, Lag= 17.5 min
Discarded = 0.2 cfs @ 11.64 hrs, Volume= 6,823 cf
Primary = 0.4 cfs @ 12.38 hrs, Volume= 580 cf
Routed to Pond SWB-1 : SWB-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 295.37' @ 12.38 hrs Surf.Area= 1,224 sf Storage= 1,905 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 39.8 min (786.6 - 746.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	293.00'	1,162 cf	**49.00'W x 24.98'L x 3.50'H Field A** 4,283 cf Overall - 1,378 cf Embedded = 2,905 cf x 40.0% Voids
#2A	293.50'	1,378 cf	**ADS_StormTech SC-740 +Cap** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 30 Chambers in 10 Rows
		2,540 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	293.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	295.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	295.00'	**12.0" Round Culvert** L= 3.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 295.00' / 294.80' S= 0.0541 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.64 hrs HW=293.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.4 cfs @ 12.38 hrs HW=295.37' TW=286.64' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.4 cfs @ 1.6 fps)
  └─**2=Orifice/Grate** (Passes 0.4 cfs of 0.5 cfs potential flow)

Summary for Pond PSIS-2: PSIS-2

Inflow Area = 16,369 sf,100.00% Impervious, Inflow Depth > 4.98" for 10-Yr 24 Hr event
Inflow = 1.9 cfs @ 12.08 hrs, Volume= 6,792 cf
Outflow = 0.6 cfs @ 12.39 hrs, Volume= 6,791 cf, Atten= 69%, Lag= 18.3 min
Discarded = 0.1 cfs @ 11.14 hrs, Volume= 5,854 cf
Primary = 0.5 cfs @ 12.39 hrs, Volume= 937 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 309.17' @ 12.39 hrs Surf.Area= 2,128 sf Storage= 2,119 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 96.9 min (843.7 - 746.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	307.50'	1,514 cf	**54.83'W x 38.80'L x 2.33'H Field A** 4,964 cf Overall - 1,179 cf Embedded = 3,785 cf x 40.0% Voids
#2A	308.00'	1,179 cf	**ADS_StormTech SC-310 +Cap** x 80 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 80 Chambers in 16 Rows
		2,693 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	308.83'	**6.0" Vert. Orifice/Grate X 8.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	308.83'	**18.0" Round Culvert** L= 13.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 308.83' / 307.00' S= 0.1356 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=0.1 cfs @ 11.14 hrs HW=307.53' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.5 cfs @ 12.39 hrs HW=309.17' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.5 cfs @ 1.6 fps)
  └─**2=Orifice/Grate** (Passes 0.5 cfs of 2.3 cfs potential flow)

Summary for Pond PSIS-3: PSIS-3

Inflow Area = 107,379 sf, 82.73% Impervious, Inflow Depth > 3.99" for 10-Yr 24 Hr event
Inflow = 11.2 cfs @ 12.09 hrs, Volume= 35,699 cf
Outflow = 1.0 cfs @ 11.65 hrs, Volume= 35,703 cf, Atten= 91%, Lag= 0.0 min
Discarded = 1.0 cfs @ 11.65 hrs, Volume= 35,703 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 281.02' @ 12.96 hrs Surf.Area= 5,421 sf Storage= 13,014 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 94.4 min (886.1 - 791.7)

Volume	Invert	Avail.Storage	Storage Description
#1	277.50'	7,335 cf	**37.00'W x 146.50'L x 6.00'H Prismatoid**
			32,523 cf Overall - 14,186 cf Embedded = 18,337 cf x 40.0% Voids
#2	278.00'	14,186 cf	**60.0" Round Pipe Storage** x 5 Inside #1
			L= 144.5'
		21,521 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	282.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
			Limited to weir flow at low heads
#3	Primary	282.00'	**18.0" Round Culvert**
			L= 92.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 282.00' / 276.00' S= 0.0652 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=1.0 cfs @ 11.65 hrs HW=277.57' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.50' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-4: PSIS-4

Inflow Area = 89,965 sf, 79.66% Impervious, Inflow Depth > 4.08" for 10-Yr 24 Hr event
Inflow = 9.5 cfs @ 12.08 hrs, Volume= 30,625 cf
Outflow = 0.3 cfs @ 10.34 hrs, Volume= 14,959 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.3 cfs @ 10.34 hrs, Volume= 14,959 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 282.57' @ 16.42 hrs Surf.Area= 4,560 sf Storage= 18,653 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 158.0 min (946.7 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	277.50'	27,803 cf	**120.0" Round Pipe Storage** x 3 Inside #2
			L= 118.0'
#2	277.00'	10,767 cf	**38.00'W x 120.00'L x 12.00'H Prismatoid**
			54,720 cf Overall - 27,803 cf Embedded = 26,917 cf x 40.0% Voids
		38,570 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	287.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	287.00'	**6.0" Round Culvert**
			L= 5.0' CPP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 287.00' / 286.80' S= 0.0400 '/' Cc= 0.900
n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.3 cfs @ 10.34 hrs HW=277.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.00' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-5: PSIS-5

Inflow Area = 128,432 sf, 66.34% Impervious, Inflow Depth > 2.90" for 10-Yr 24 Hr event
Inflow = 6.9 cfs @ 12.18 hrs, Volume= 31,024 cf
Outflow = 1.4 cfs @ 12.87 hrs, Volume= 21,274 cf, Atten= 80%, Lag= 41.4 min
Discarded = 0.2 cfs @ 11.26 hrs, Volume= 12,942 cf
Primary = 1.1 cfs @ 12.87 hrs, Volume= 8,333 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 288.96' @ 12.87 hrs Surf.Area= 4,320 sf Storage= 11,977 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 88.9 min (936.7 - 847.8)

Volume	Invert	Avail.Storage	Storage Description
#1	285.50'	11,585 cf	**60.0" Round Pipe Storage** x 5 Inside #2 L= 118.0'
#2	285.00'	5,734 cf	**36.00'W x 120.00'L x 6.00'H Prismatoid** 25,920 cf Overall - 11,585 cf Embedded = 14,335 cf x 40.0% Voids
		17,319 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	285.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	288.50'	**24.0" Vert. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	288.50'	**30.0" Round Culvert** L= 19.1' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 288.50' / 287.50' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 4.91 sf

Discarded OutFlow Max=0.2 cfs @ 11.26 hrs HW=285.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=1.1 cfs @ 12.87 hrs HW=288.96' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 1.1 cfs @ 1.8 fps)
  └─**2=Orifice/Grate** (Passes 1.1 cfs of 6.3 cfs potential flow)

Summary for Pond PSIS-6: PSIS-6

Inflow Area = 40,464 sf, 63.86% Impervious, Inflow Depth > 3.18" for 10-Yr 24 Hr event
Inflow = 3.5 cfs @ 12.09 hrs, Volume= 10,713 cf
Outflow = 0.4 cfs @ 11.74 hrs, Volume= 10,717 cf, Atten= 89%, Lag= 0.0 min
Discarded = 0.4 cfs @ 11.74 hrs, Volume= 10,717 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 280.16' @ 12.84 hrs Surf.Area= 2,039 sf Storage= 3,685 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 71.4 min (887.9 - 816.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	277.50'	3,550 cf	**73.92'W x 27.59'L x 6.75'H Field A** 13,767 cf Overall - 4,892 cf Embedded = 8,875 cf x 40.0% Voids
#2A	278.25'	4,892 cf	**ADS_StormTech MC-4500 b +Cap** x 40 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 40 Chambers in 8 Rows Cap Storage= 39.5 cf x 2 x 8 rows = 632.0 cf
		8,442 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	284.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	284.00'	**12.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 284.00' / 283.50' S= 0.0256 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.4 cfs @ 11.74 hrs HW=277.58' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.50' TW=0.00' (Dynamic Tailwater)
↑—**3=Culvert** (Controls 0.0 cfs)
↑—**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-7: PSIS-7

Inflow Area = 31,421 sf, 61.99% Impervious, Inflow Depth > 2.82" for 10-Yr 24 Hr event
Inflow = 2.2 cfs @ 12.09 hrs, Volume= 7,390 cf
Outflow = 0.6 cfs @ 12.46 hrs, Volume= 6,581 cf, Atten= 72%, Lag= 22.3 min
Discarded = 0.1 cfs @ 11.28 hrs, Volume= 5,039 cf
Primary = 0.5 cfs @ 12.46 hrs, Volume= 1,542 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 290.41' @ 12.46 hrs Surf.Area= 1,616 sf Storage= 2,565 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 122.2 min (921.8 - 799.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	288.00'	1,528 cf	**26.25'W x 61.58'L x 3.50'H Field A** 5,657 cf Overall - 1,838 cf Embedded = 3,820 cf x 40.0% Voids
#2A	288.50'	1,838 cf	**ADS_StormTech SC-740 +Cap** x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 40 Chambers in 5 Rows
		3,366 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	288.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	290.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	290.00'	**12.0" Round Culvert** L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 290.00' / 288.00' S= 0.0690 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.1 cfs @ 11.28 hrs HW=288.04' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.5 cfs @ 12.46 hrs HW=290.41' TW=0.00' (Dynamic Tailwater)
└—**3=Culvert** (Inlet Controls 0.5 cfs @ 1.7 fps)
  └—**2=Orifice/Grate** (Passes 0.5 cfs of 0.7 cfs potential flow)

Summary for Pond PSIS-8: PSIS-8

Inflow Area = 23,738 sf, 69.64% Impervious, Inflow Depth > 4.19" for 10-Yr 24 Hr event
Inflow = 2.6 cfs @ 12.08 hrs, Volume= 8,293 cf
Outflow = 0.3 cfs @ 12.76 hrs, Volume= 8,293 cf, Atten= 89%, Lag= 40.5 min
Discarded = 0.2 cfs @ 11.55 hrs, Volume= 8,173 cf
Primary = 0.1 cfs @ 12.76 hrs, Volume= 119 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 276.14' @ 12.76 hrs Surf.Area= 1,108 sf Storage= 3,066 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 107.8 min (892.6 - 784.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	272.00'	1,611 cf	**22.75'W x 48.72'L x 5.50'H Field A** 6,096 cf Overall - 2,069 cf Embedded = 4,028 cf x 40.0% Voids
#2A	272.75'	2,069 cf	**ADS_StormTech MC-3500 d +Cap**x 18 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 18 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		3,680 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	272.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	276.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	276.00'	**12.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 276.00' / 275.30' S= 0.1400 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.55 hrs HW=272.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.1 cfs @ 12.76 hrs HW=276.14' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.1 cfs @ 1.0 fps)
  └─**2=Orifice/Grate** (Passes 0.1 cfs of 0.1 cfs potential flow)

Summary for Pond SWB-1: SWB-1

Inflow Area = 104,326 sf, 80.92% Impervious, Inflow Depth > 1.29" for 10-Yr 24 Hr event
Inflow = 1.9 cfs @ 12.09 hrs, Volume= 11,180 cf
Outflow = 0.5 cfs @ 12.67 hrs, Volume= 11,180 cf, Atten= 74%, Lag= 34.6 min
Discarded = 0.5 cfs @ 12.67 hrs, Volume= 11,180 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-3 : Ex. Wetland (seies B)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 286.78' @ 12.67 hrs Surf.Area= 2,520 sf Storage= 1,833 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 17.3 min (925.0 - 907.7)

Volume	Invert	Avail.Storage	Storage Description
#1	286.00'	12,428 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
286.00	2,201	207.0	0	0	2,201
288.00	3,066	254.0	5,243	5,243	3,986
290.00	4,146	345.0	7,185	12,428	8,365

Device	Routing	Invert	Outlet Devices
#1	Discarded	286.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	289.60'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.5 cfs @ 12.67 hrs HW=286.78' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=286.00' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Subcatchment PR-1: northeastern locus

Runoff = 10.4 cfs @ 12.19 hrs, Volume= 41,402 cf, Depth> 2.26"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
	51,817	77	Woods, Good, HSG D
	813	80	>75% Grass cover, Good, HSG D
	162,557	55	Woods, Good, HSG B
*	4,295	72	Dirt Path
	219,482	61	Weighted Average
	219,482		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.8	165	0.0940	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	9	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
2.6	256	0.1110	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	10	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
1.2	113	0.0970	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
12.6	603	Total			

Summary for Subcatchment PR-1.1: south of BVW A

Runoff = 2.6 cfs @ 12.10 hrs, Volume= 8,531 cf, Depth> 2.00"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
21,801	77	Woods, Good, HSG D
603	39	>75% Grass cover, Good, HSG A
8,166	80	>75% Grass cover, Good, HSG D
20,582	30	Woods, Good, HSG A
51,152	58	Weighted Average
51,152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1.10: TO PSIS-3

Runoff = 2.7 cfs @ 12.08 hrs, Volume= 8,847 cf, Depth> 5.11"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	15,866	98	Impervious Area
	4,914	61	>75% Grass cover, Good, HSG B
	20,780	89	Weighted Average
	4,914		23.65% Pervious Area
	15,866		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.11: TO PSDS-2

Runoff = 3.6 cfs @ 12.09 hrs, Volume= 11,319 cf, Depth> 4.78"
Routed to Pond PSDS-2 : PSDS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	22,222	98	Impervious Area
	5,404	39	>75% Grass cover, Good, HSG A
	812	80	>75% Grass cover, Good, HSG D
	28,438	86	Weighted Average
	6,216		21.86% Pervious Area
	22,222		78.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.12: TO PSIS-2

Runoff = 2.4 cfs @ 12.08 hrs, Volume= 8,385 cf, Depth> 6.15"
Routed to Pond PSIS-2 : PSIS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	16,369	98	Roof Area
	16,369		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.13: TO PSIS-4

Runoff = 12.0 cfs @ 12.08 hrs, Volume= 39,147 cf, Depth> 5.22"
Routed to Pond PSIS-4 : PSIS-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	53,830	98	Impervious Area
	18,296	61	>75% Grass cover, Good, HSG B
*	17,839	98	Roof Area
	89,965	90	Weighted Average
	18,296		20.34% Pervious Area
	71,669		79.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.14: TO PSIS-5

Runoff = 7.0 cfs @ 12.09 hrs, Volume= 21,623 cf, Depth> 4.13"
Routed to Pond PSIS-5 : PSIS-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
	24,456	61	>75% Grass cover, Good, HSG B
	240	80	>75% Grass cover, Good, HSG D
	5,400	55	Woods, Good, HSG B
*	32,724	98	Impervious Area
	62,820	80	Weighted Average
	30,096		47.91% Pervious Area
	32,724		52.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.14A: TO PSDS-3

Runoff = 8.9 cfs @ 12.08 hrs, Volume= 29,168 cf, Depth> 5.33"
Routed to Pond PSDS-3 : PSDS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
	13,139	61	>75% Grass cover, Good, HSG B
*	17,839	98	Roof Area
*	34,634	98	Impervious Area
	65,612	91	Weighted Average
	13,139		20.03% Pervious Area
	52,473		79.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.15: clubhouse roof

Runoff = 1.1 cfs @ 12.08 hrs, Volume= 4,056 cf, Depth> 6.15"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	7,918	98	Roof Area
	7,918		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.2: northern locus @ prop line

Runoff = 2.7 cfs @ 12.10 hrs, Volume= 8,721 cf, Depth> 2.36"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
37,239	61	>75% Grass cover, Good, HSG B
3,652	55	Woods, Good, HSG B
3,492	80	>75% Grass cover, Good, HSG D
44,383	62	Weighted Average
44,383		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.32"
2.6	769	0.0930	4.9		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
6.4	819	Total			

Summary for Subcatchment PR-1.3: SE of BVW A

Runoff = 3.1 cfs @ 12.09 hrs, Volume= 9,685 cf, Depth> 3.61"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
9,167	61	>75% Grass cover, Good, HSG B
22,355	80	>75% Grass cover, Good, HSG D
649	77	Woods, Good, HSG D
32,171	75	Weighted Average
32,171		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1.4: TO PSIS-8

Runoff = 3.2 cfs @ 12.08 hrs, Volume= 10,553 cf, Depth> 5.33"
Routed to Pond PSIS-8 : PSIS-8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	16,532	98	Impervious Area
	6,483	80	>75% Grass cover, Good, HSG D
	723	39	>75% Grass cover, Good, HSG A
	23,738	91	Weighted Average
	7,206		30.36% Pervious Area
	16,532		69.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.5: TO PSIS-3

Runoff = 7.7 cfs @ 12.08 hrs, Volume= 24,839 cf, Depth> 5.11"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	32,702	98	Impervious Area
	9,258	39	>75% Grass cover, Good, HSG A
*	16,379	98	Roof Area
	58,339	89	Weighted Average
	9,258		15.87% Pervious Area
	49,081		84.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.6: TO PSIS-6

Runoff = 4.6 cfs @ 12.09 hrs, Volume= 14,285 cf, Depth> 4.24"
Routed to Pond PSIS-6 : PSIS-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	25,841	98	Impervious Area
	4,090	80	>75% Grass cover, Good, HSG D
	10,533	39	>75% Grass cover, Good, HSG A
	40,464	81	Weighted Average
	14,623		36.14% Pervious Area
	25,841		63.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.7: TO PSIS-3

Runoff = 2.7 cfs @ 12.08 hrs, Volume= 8,603 cf, Depth> 5.00"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	17,270	98	Impervious Area
	3,388	39	>75% Grass cover, Good, HSG A
	20,658	88	Weighted Average
	3,388		16.40% Pervious Area
	17,270		83.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.8: clubhouse amenity area

Runoff = 0.9 cfs @ 12.09 hrs, Volume= 3,019 cf, Depth> 2.36"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	5,928	98	Impervious Area
	124	80	>75% Grass cover, Good, HSG D
	9,311	39	>75% Grass cover, Good, HSG A
	15,363	62	Weighted Average
	9,435		61.41% Pervious Area
	5,928		38.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.8A: TO PSIS-7

Runoff = 0.9 cfs @ 12.09 hrs, Volume= 2,802 cf, Depth> 4.13"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	5,632	98	Impervious Area
	2,508	39	>75% Grass cover, Good, HSG A
	8,140	80	Weighted Average
	2,508		30.81% Pervious Area
	5,632		69.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.9: TO PSIS-3

Runoff = 1.1 cfs @ 12.08 hrs, Volume= 3,524 cf, Depth> 5.56"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	6,615	98	Impervious Area
	568	39	>75% Grass cover, Good, HSG A
	419	80	>75% Grass cover, Good, HSG D
	7,602	93	Weighted Average
	987		12.98% Pervious Area
	6,615		87.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-2: northeastern locus @ ROW

Runoff = 0.3 cfs @ 12.10 hrs, Volume= 904 cf, Depth> 1.58"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	936	98	Impervious Area
	4,916	39	>75% Grass cover, Good, HSG A
	1,026	80	>75% Grass cover, Good, HSG D
	6,878	53	Weighted Average
	5,942		86.39% Pervious Area
	936		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment PR-2.1: southeastern locus @ ROW

Runoff = 0.1 cfs @ 12.42 hrs, Volume= 654 cf, Depth> 0.34"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
10,498	30	Woods, Good, HSG A
12,872	39	>75% Grass cover, Good, HSG A
23,370	35	Weighted Average
23,370		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment PR-3: south of BVW B

Runoff = 0.0 cfs @ 13.74 hrs, Volume= 425 cf, Depth> 0.19"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
	19,666	30	Woods, Good, HSG A
	6,445	39	>75% Grass cover, Good, HSG A
*	64	98	Impervious Area
	26,175	32	Weighted Average
	26,111		99.76% Pervious Area
	64		0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.1: north of BVW B

Runoff = 0.1 cfs @ 12.42 hrs, Volume= 1,192 cf, Depth> 0.34"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
17,728	30	Woods, Good, HSG A
24,872	39	>75% Grass cover, Good, HSG A
42,600	35	Weighted Average
42,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.2: south western locus

Runoff = 0.0 cfs @ 15.15 hrs, Volume= 257 cf, Depth> 0.12"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
26,302	30	Woods, Good, HSG A
26,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.32"
0.9	53	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	103	Total			

Summary for Subcatchment PR-3.3: south of BVW B @ entrance

Runoff = 0.0 cfs @ 12.30 hrs, Volume= 230 cf, Depth> 0.56"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
4,917	39	>75% Grass cover, Good, HSG A
4,917		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.4: north of BVW B @ entrance

Runoff = 0.1 cfs @ 12.30 hrs, Volume= 535 cf, Depth> 0.56"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
11,446	39	>75% Grass cover, Good, HSG A
11,446		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.5: to PSDS-1

Runoff = 7.9 cfs @ 12.08 hrs, Volume= 25,333 cf, Depth> 5.00"
Routed to Pond PSDS-1 : PSDS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	50,865	98	Impervious Area
	9,963	39	>75% Grass cover, Good, HSG A
	60,828	88	Weighted Average
	9,963		16.38% Pervious Area
	50,865		83.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-3.5A: to SWB-1

Runoff = 2.5 cfs @ 12.09 hrs, Volume= 7,725 cf, Depth> 3.61"
Routed to Pond SWB-1 : SWB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
	9,942	39	>75% Grass cover, Good, HSG A
*	15,717	98	Impervious Area
	25,659	75	Weighted Average
	9,942		38.75% Pervious Area
	15,717		61.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-3.6: bld 1 roof

Runoff = 2.6 cfs @ 12.08 hrs, Volume= 9,138 cf, Depth> 6.15"
Routed to Pond PSIS-1 : PSIS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

	Area (sf)	CN	Description
*	17,839	98	Roof Area
	17,839		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-4: southwest corner locus

Runoff = 0.0 cfs @ 15.09 hrs, Volume= 149 cf, Depth> 0.12"
Routed to Reach DP-4 : 231 Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr 24 Hr Rainfall=6.39"

Area (sf)	CN	Description
15,220	30	Woods, Good, HSG A
15,220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
0.6	61	0.1100	1.7		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
8.4	111	Total			

Summary for Reach DP-1: Ex. Wetland (series A)

Inflow Area = 813,394 sf, 42.56% Impervious, Inflow Depth > 1.55" for 25-Yr 24 Hr event
Inflow = 21.4 cfs @ 12.15 hrs, Volume= 105,168 cf
Outflow = 21.4 cfs @ 12.15 hrs, Volume= 105,168 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Grove Street

Inflow Area = 30,248 sf, 3.09% Impervious, Inflow Depth > 0.62" for 25-Yr 24 Hr event
Inflow = 0.3 cfs @ 12.10 hrs, Volume= 1,558 cf
Outflow = 0.3 cfs @ 12.10 hrs, Volume= 1,558 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Ex. Wetland (seies B)

Inflow Area = 215,766 sf, 39.16% Impervious, Inflow Depth > 0.15" for 25-Yr 24 Hr event
Inflow = 0.2 cfs @ 12.39 hrs, Volume= 2,640 cf
Outflow = 0.2 cfs @ 12.39 hrs, Volume= 2,640 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: 231 Grove Street

Inflow Area = 15,220 sf, 0.00% Impervious, Inflow Depth > 0.12" for 25-Yr 24 Hr event
Inflow = 0.0 cfs @ 15.09 hrs, Volume= 149 cf
Outflow = 0.0 cfs @ 15.09 hrs, Volume= 149 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Pond PSDS-1: PSDS-1

Inflow Area = 60,828 sf, 83.62% Impervious, Inflow Depth > 5.00" for 25-Yr 24 Hr event
Inflow = 7.9 cfs @ 12.08 hrs, Volume= 25,333 cf
Outflow = 0.5 cfs @ 13.47 hrs, Volume= 10,051 cf, Atten= 93%, Lag= 83.2 min
Primary = 0.5 cfs @ 13.47 hrs, Volume= 10,051 cf
Routed to Pond SWB-1 : SWB-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 293.06' @ 13.47 hrs Surf.Area= 4,481 sf Storage= 16,123 cf

Plug-Flow detention time= 290.7 min calculated for 10,051 cf (40% of inflow)
Center-of-Mass det. time= 163.9 min (952.6 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	288.00'	7,255 cf	**46.67'W x 96.02'L x 6.75'H Field A** 30,245 cf Overall - 12,109 cf Embedded = 18,136 cf x 40.0% Voids
#2A	288.75'	12,109 cf	**ADS_StormTech MC-4500 b +Cap** x 110 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.02'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 110 Chambers in 5 Rows Cap Storage= 39.5 cf x 2 x 5 rows = 395.0 cf
		19,363 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	292.75'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	292.75'	**24.0" Round Culvert** L= 21.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 292.75' / 292.00' S= 0.0347 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	288.00'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	288.00'	**2.0" Round Culvert** L= 90.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 288.00' / 286.00' S= 0.0222 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=0.5 cfs @ 13.47 hrs HW=293.06' TW=287.53' (Dynamic Tailwater)
2=Culvert (Inlet Controls 0.5 cfs @ 1.5 fps)
1=Orifice/Grate (Passes 0.5 cfs of 0.8 cfs potential flow)
4=Culvert (Outlet Controls 0.1 cfs @ 4.2 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSDS-2: PSDS-2

Inflow Area = 28,438 sf, 78.14% Impervious, Inflow Depth > 4.78" for 25-Yr 24 Hr event
Inflow = 3.6 cfs @ 12.09 hrs, Volume= 11,319 cf
Outflow = 3.4 cfs @ 12.11 hrs, Volume= 10,812 cf, Atten= 3%, Lag= 1.3 min
Primary = 3.4 cfs @ 12.11 hrs, Volume= 10,812 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 311.45' @ 12.11 hrs Surf.Area= 1,111 sf Storage= 1,970 cf

Plug-Flow detention time= 86.8 min calculated for 10,812 cf (96% of inflow)
Center-of-Mass det. time= 61.5 min (856.4 - 794.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	308.50'	1,114 cf	**17.75'W x 62.58'L x 3.50'H Field A** 3,888 cf Overall - 1,103 cf Embedded = 2,785 cf x 40.0% Voids
#2A	309.00'	1,103 cf	**ADS_StormTech SC-740 +Cap** x 24 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 24 Chambers in 3 Rows
		2,217 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	310.50'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	310.50'	**24.0" Round Culvert** L= 4.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 310.50' / 310.40' S= 0.0213 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	308.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	308.50'	**2.0" Round Culvert** L= 66.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 308.50' / 306.00' S= 0.0379 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=3.4 cfs @ 12.11 hrs HW=311.45' TW=0.00' (Dynamic Tailwater)
2=Culvert (Barrel Controls 3.3 cfs @ 3.3 fps)
1=Orifice/Grate (Passes 3.3 cfs of 5.1 cfs potential flow)
4=Culvert (Barrel Controls 0.1 cfs @ 4.8 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSDS-3: PSDS-3

Inflow Area = 65,612 sf, 79.97% Impervious, Inflow Depth > 5.33" for 25-Yr 24 Hr event
Inflow = 8.9 cfs @ 12.08 hrs, Volume= 29,168 cf
Outflow = 7.8 cfs @ 12.13 hrs, Volume= 20,825 cf, Atten= 12%, Lag= 2.6 min
Primary = 7.8 cfs @ 12.13 hrs, Volume= 20,825 cf
Routed to Pond PSIS-5 : PSIS-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 308.42' @ 12.13 hrs Surf.Area= 2,572 sf Storage= 10,261 cf

Plug-Flow detention time= 159.1 min calculated for 20,825 cf (71% of inflow)
Center-of-Mass det. time= 69.5 min (848.1 - 778.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	302.25'	4,337 cf	**64.83'W x 39.67'L x 6.75'H Field A** 17,359 cf Overall - 6,516 cf Embedded = 10,843 cf x 40.0% Voids
#2A	303.00'	6,516 cf	**ADS_StormTech MC-4500 b +Cap**x 56 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 56 Chambers in 7 Rows Cap Storage= 39.5 cf x 2 x 7 rows = 553.0 cf
		10,854 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	307.00'	**12.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	307.00'	**24.0" Round Culvert** L= 28.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.00' / 306.00' S= 0.0352 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	302.25'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	302.25'	**2.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 302.25' / 302.10' S= 0.0037 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=7.8 cfs @ 12.13 hrs HW=308.42' TW=287.84' (Dynamic Tailwater)
2=Culvert (Inlet Controls 7.7 cfs @ 3.2 fps)
1=Orifice/Grate (Passes 7.7 cfs of 10.9 cfs potential flow)
4=Culvert (Barrel Controls 0.1 cfs @ 6.3 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.3 cfs potential flow)

Summary for Pond PSIS-1: PSIS-1

Inflow Area = 17,839 sf,100.00% Impervious, Inflow Depth > 6.15" for 25-Yr 24 Hr event
Inflow = 2.6 cfs @ 12.08 hrs, Volume= 9,138 cf
Outflow = 1.2 cfs @ 12.23 hrs, Volume= 9,139 cf, Atten= 52%, Lag= 9.0 min
Discarded = 0.2 cfs @ 11.48 hrs, Volume= 7,761 cf
Primary = 1.0 cfs @ 12.23 hrs, Volume= 1,378 cf
Routed to Pond SWB-1 : SWB-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 295.59' @ 12.23 hrs Surf.Area= 1,224 sf Storage= 2,063 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 37.8 min (781.5 - 743.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	293.00'	1,162 cf	**49.00'W x 24.98'L x 3.50'H Field A** 4,283 cf Overall - 1,378 cf Embedded = 2,905 cf x 40.0% Voids
#2A	293.50'	1,378 cf	**ADS_StormTech SC-740 +Cap** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 30 Chambers in 10 Rows
		2,540 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	293.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	295.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	295.00'	**12.0" Round Culvert** L= 3.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 295.00' / 294.80' S= 0.0541 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.48 hrs HW=293.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=1.0 cfs @ 12.23 hrs HW=295.59' TW=286.87' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 1.0 cfs @ 2.1 fps)
  └─**2=Orifice/Grate** (Passes 1.0 cfs of 1.3 cfs potential flow)

Summary for Pond PSIS-2: PSIS-2

Inflow Area = 16,369 sf,100.00% Impervious, Inflow Depth > 6.15" for 25-Yr 24 Hr event
Inflow = 2.4 cfs @ 12.08 hrs, Volume= 8,385 cf
Outflow = 1.2 cfs @ 12.22 hrs, Volume= 8,385 cf, Atten= 50%, Lag= 8.4 min
Discarded = 0.1 cfs @ 10.62 hrs, Volume= 6,484 cf
Primary = 1.1 cfs @ 12.22 hrs, Volume= 1,901 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 309.35' @ 12.22 hrs Surf.Area= 2,128 sf Storage= 2,284 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 90.0 min (833.6 - 743.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	307.50'	1,514 cf	**54.83'W x 38.80'L x 2.33'H Field A** 4,964 cf Overall - 1,179 cf Embedded = 3,785 cf x 40.0% Voids
#2A	308.00'	1,179 cf	**ADS_StormTech SC-310 +Cap** x 80 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 80 Chambers in 16 Rows
		2,693 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	308.83'	**6.0" Vert. Orifice/Grate X 8.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	308.83'	**18.0" Round Culvert** L= 13.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 308.83' / 307.00' S= 0.1356 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=0.1 cfs @ 10.62 hrs HW=307.53' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=1.1 cfs @ 12.22 hrs HW=309.35' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 1.1 cfs @ 1.9 fps)
  └─**2=Orifice/Grate** (Passes 1.1 cfs of 3.9 cfs potential flow)

Summary for Pond PSIS-3: PSIS-3

Inflow Area = 107,379 sf, 82.73% Impervious, Inflow Depth > 5.12" for 25-Yr 24 Hr event
Inflow = 14.1 cfs @ 12.08 hrs, Volume= 45,814 cf
Outflow = 1.3 cfs @ 12.98 hrs, Volume= 45,824 cf, Atten= 91%, Lag= 53.6 min
Discarded = 1.0 cfs @ 11.45 hrs, Volume= 45,153 cf
Primary = 0.2 cfs @ 12.98 hrs, Volume= 671 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 282.23' @ 12.98 hrs Surf.Area= 5,421 sf Storage= 17,949 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 134.1 min (919.1 - 785.0)

Volume	Invert	Avail.Storage	Storage Description
#1	277.50'	7,335 cf	**37.00'W x 146.50'L x 6.00'H Prismatoid** 32,523 cf Overall - 14,186 cf Embedded = 18,337 cf x 40.0% Voids
#2	278.00'	14,186 cf	**60.0" Round Pipe Storage** x 5 Inside #1 L= 144.5'
		21,521 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	282.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	282.00'	**18.0" Round Culvert** L= 92.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 282.00' / 276.00' S= 0.0652 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=1.0 cfs @ 11.45 hrs HW=277.56' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.0 cfs)

Primary OutFlow Max=0.2 cfs @ 12.98 hrs HW=282.23' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.2 cfs @ 1.3 fps)
  └─**2=Orifice/Grate** (Passes 0.2 cfs of 0.5 cfs potential flow)

Summary for Pond PSIS-4: PSIS-4

Inflow Area = 89,965 sf, 79.66% Impervious, Inflow Depth > 5.22" for 25-Yr 24 Hr event
Inflow = 12.0 cfs @ 12.08 hrs, Volume= 39,147 cf
Outflow = 0.3 cfs @ 9.60 hrs, Volume= 15,684 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.3 cfs @ 9.60 hrs, Volume= 15,684 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 284.36' @ 17.36 hrs Surf.Area= 4,560 sf Storage= 25,611 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 140.7 min (922.8 - 782.1)

Volume	Invert	Avail.Storage	Storage Description
#1	277.50'	27,803 cf	**120.0" Round Pipe Storage** x 3 Inside #2 L= 118.0'
#2	277.00'	10,767 cf	**38.00'W x 120.00'L x 12.00'H Prismatoid** 54,720 cf Overall - 27,803 cf Embedded = 26,917 cf x 40.0% Voids
		38,570 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	287.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	287.00'	**6.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 287.00' / 286.80' S= 0.0400 '/' Cc= 0.900
n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.3 cfs @ 9.60 hrs HW=277.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.00' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-5: PSIS-5

Inflow Area = 128,432 sf, 66.34% Impervious, Inflow Depth > 3.97" for 25-Yr 24 Hr event
Inflow = 14.3 cfs @ 12.11 hrs, Volume= 42,449 cf
Outflow = 5.3 cfs @ 12.40 hrs, Volume= 32,272 cf, Atten= 63%, Lag= 17.5 min
Discarded = 0.2 cfs @ 10.67 hrs, Volume= 13,606 cf
Primary = 5.0 cfs @ 12.40 hrs, Volume= 18,666 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 289.51' @ 12.40 hrs Surf.Area= 4,320 sf Storage= 13,776 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 55.1 min (884.2 - 829.1)

Volume	Invert	Avail.Storage	Storage Description
#1	285.50'	11,585 cf	**60.0" Round Pipe Storage** x 5 Inside #2 L= 118.0'
#2	285.00'	5,734 cf	**36.00'W x 120.00'L x 6.00'H Prismatoid** 25,920 cf Overall - 11,585 cf Embedded = 14,335 cf x 40.0% Voids
		17,319 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	285.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	288.50'	**24.0" Vert. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	288.50'	**30.0" Round Culvert** L= 19.1' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 288.50' / 287.50' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 4.91 sf

Discarded OutFlow Max=0.2 cfs @ 10.67 hrs HW=285.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=5.0 cfs @ 12.40 hrs HW=289.51' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 5.0 cfs @ 2.7 fps)
  └─**2=Orifice/Grate** (Passes 5.0 cfs of 27.3 cfs potential flow)

Summary for Pond PSIS-6: PSIS-6

Inflow Area = 40,464 sf, 63.86% Impervious, Inflow Depth > 4.24" for 25-Yr 24 Hr event
Inflow = 4.6 cfs @ 12.09 hrs, Volume= 14,285 cf
Outflow = 0.4 cfs @ 11.67 hrs, Volume= 14,288 cf, Atten= 91%, Lag= 0.0 min
Discarded = 0.4 cfs @ 11.67 hrs, Volume= 14,288 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 281.40' @ 13.09 hrs Surf.Area= 2,039 sf Storage= 5,513 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 115.8 min (924.2 - 808.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	277.50'	3,550 cf	**73.92'W x 27.59'L x 6.75'H Field A** 13,767 cf Overall - 4,892 cf Embedded = 8,875 cf x 40.0% Voids
#2A	278.25'	4,892 cf	**ADS_StormTech MC-4500 b +Cap** x 40 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 40 Chambers in 8 Rows Cap Storage= 39.5 cf x 2 x 8 rows = 632.0 cf
		8,442 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	284.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	284.00'	**12.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 284.00' / 283.50' S= 0.0256 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.4 cfs @ 11.67 hrs HW=277.59' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.50' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Controls 0.0 cfs)
  └**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-7: PSIS-7

Inflow Area = 31,421 sf, 61.99% Impervious, Inflow Depth > 3.77" for 25-Yr 24 Hr event
Inflow = 3.0 cfs @ 12.09 hrs, Volume= 9,877 cf
Outflow = 1.4 cfs @ 12.26 hrs, Volume= 8,711 cf, Atten= 52%, Lag= 10.2 min
Discarded = 0.1 cfs @ 10.73 hrs, Volume= 5,274 cf
Primary = 1.3 cfs @ 12.26 hrs, Volume= 3,437 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 290.71' @ 12.26 hrs Surf.Area= 1,616 sf Storage= 2,834 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 81.5 min (877.7 - 796.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	288.00'	1,528 cf	**26.25'W x 61.58'L x 3.50'H Field A** 5,657 cf Overall - 1,838 cf Embedded = 3,820 cf x 40.0% Voids
#2A	288.50'	1,838 cf	**ADS_StormTech SC-740 +Cap** x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 40 Chambers in 5 Rows
		3,366 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	288.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	290.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	290.00'	**12.0" Round Culvert** L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 290.00' / 288.00' S= 0.0690 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.1 cfs @ 10.73 hrs HW=288.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=1.3 cfs @ 12.26 hrs HW=290.71' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 1.3 cfs @ 2.3 fps)
  └─**2=Orifice/Grate** (Passes 1.3 cfs of 1.7 cfs potential flow)

Summary for Pond PSIS-8: PSIS-8

Inflow Area = 23,738 sf, 69.64% Impervious, Inflow Depth > 5.33" for 25-Yr 24 Hr event
Inflow = 3.2 cfs @ 12.08 hrs, Volume= 10,553 cf
Outflow = 1.2 cfs @ 12.33 hrs, Volume= 10,553 cf, Atten= 63%, Lag= 14.6 min
Discarded = 0.2 cfs @ 11.31 hrs, Volume= 9,211 cf
Primary = 1.0 cfs @ 12.33 hrs, Volume= 1,342 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 276.59' @ 12.33 hrs Surf.Area= 1,108 sf Storage= 3,275 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 98.4 min (876.9 - 778.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	272.00'	1,611 cf	**22.75'W x 48.72'L x 5.50'H Field A** 6,096 cf Overall - 2,069 cf Embedded = 4,028 cf x 40.0% Voids
#2A	272.75'	2,069 cf	**ADS_StormTech MC-3500 d +Cap** x 18 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 18 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		3,680 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	272.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	276.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	276.00'	**12.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 276.00' / 275.30' S= 0.1400 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.31 hrs HW=272.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=1.0 cfs @ 12.33 hrs HW=276.59' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 1.0 cfs @ 2.1 fps)
  └─**2=Orifice/Grate** (Passes 1.0 cfs of 1.1 cfs potential flow)

Summary for Pond SWB-1: SWB-1

Inflow Area = 104,326 sf, 80.92% Impervious, Inflow Depth > 2.20" for 25-Yr 24 Hr event
Inflow = 2.6 cfs @ 12.16 hrs, Volume= 19,154 cf
Outflow = 0.6 cfs @ 14.47 hrs, Volume= 19,154 cf, Atten= 79%, Lag= 138.5 min
Discarded = 0.6 cfs @ 14.47 hrs, Volume= 19,154 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP-3 : Ex. Wetland (seies B)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 287.65' @ 14.47 hrs Surf.Area= 2,904 sf Storage= 4,196 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 70.5 min (955.9 - 885.3)

Volume	Invert	Avail.Storage	Storage Description
#1	286.00'	12,428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
286.00	2,201	207.0	0	0	2,201
288.00	3,066	254.0	5,243	5,243	3,986
290.00	4,146	345.0	7,185	12,428	8,365

Device	Routing	Invert	Outlet Devices
#1	Discarded	286.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	289.60'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.6 cfs @ 14.47 hrs HW=287.65' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=286.00' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Subcatchment PR-1: northeastern locus

Runoff = 16.8 cfs @ 12.18 hrs, Volume= 65,336 cf, Depth> 3.57"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
	51,817	77	Woods, Good, HSG D
	813	80	>75% Grass cover, Good, HSG D
	162,557	55	Woods, Good, HSG B
*	4,295	72	Dirt Path
	219,482	61	Weighted Average
	219,482		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.8	165	0.0940	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	9	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
2.6	256	0.1110	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	10	0.1000	5.1		**Shallow Concentrated Flow, overland (path)** Unpaved Kv= 16.1 fps
1.2	113	0.0970	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
12.6	603	Total			

Summary for Subcatchment PR-1.1: south of BVW A

Runoff = 4.4 cfs @ 12.09 hrs, Volume= 13,805 cf, Depth> 3.24"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
21,801	77	Woods, Good, HSG D
603	39	>75% Grass cover, Good, HSG A
8,166	80	>75% Grass cover, Good, HSG D
20,582	30	Woods, Good, HSG A
51,152	58	Weighted Average
51,152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1.10: TO PSIS-3

Runoff = 3.6 cfs @ 12.08 hrs, Volume= 11,875 cf, Depth> 6.86"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	15,866	98	Impervious Area
	4,914	61	>75% Grass cover, Good, HSG B
	20,780	89	Weighted Average
	4,914		23.65% Pervious Area
	15,866		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.11: TO PSDS-2

Runoff = 4.8 cfs @ 12.08 hrs, Volume= 15,404 cf, Depth> 6.50"
Routed to Pond PSDS-2 : PSDS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	22,222	98	Impervious Area
	5,404	39	>75% Grass cover, Good, HSG A
	812	80	>75% Grass cover, Good, HSG D
	28,438	86	Weighted Average
	6,216		21.86% Pervious Area
	22,222		78.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.12: TO PSIS-2

Runoff = 3.0 cfs @ 12.08 hrs, Volume= 10,823 cf, Depth> 7.93"
Routed to Pond PSIS-2 : PSIS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	16,369	98	Roof Area
	16,369		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.13: TO PSIS-4

Runoff = 15.8 cfs @ 12.08 hrs, Volume= 52,305 cf, Depth> 6.98"
Routed to Pond PSIS-4 : PSIS-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	53,830	98	Impervious Area
	18,296	61	>75% Grass cover, Good, HSG B
*	17,839	98	Roof Area
	89,965	90	Weighted Average
	18,296		20.34% Pervious Area
	71,669		79.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.14: TO PSIS-5

Runoff = 9.6 cfs @ 12.09 hrs, Volume= 30,301 cf, Depth> 5.79"
Routed to Pond PSIS-5 : PSIS-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
	24,456	61	>75% Grass cover, Good, HSG B
	240	80	>75% Grass cover, Good, HSG D
	5,400	55	Woods, Good, HSG B
*	32,724	98	Impervious Area
	62,820	80	Weighted Average
	30,096		47.91% Pervious Area
	32,724		52.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.14A: TO PSDS-3

Runoff = 11.6 cfs @ 12.08 hrs, Volume= 38,799 cf, Depth> 7.10"
Routed to Pond PSDS-3 : PSDS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
	13,139	61	>75% Grass cover, Good, HSG B
*	17,839	98	Roof Area
*	34,634	98	Impervious Area
	65,612	91	Weighted Average
	13,139		20.03% Pervious Area
	52,473		79.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.15: clubhouse roof

Runoff = 1.5 cfs @ 12.08 hrs, Volume= 5,235 cf, Depth> 7.93"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	7,918	98	Roof Area
	7,918		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.2: northern locus @ prop line

Runoff = 4.3 cfs @ 12.10 hrs, Volume= 13,652 cf, Depth> 3.69"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
37,239	61	>75% Grass cover, Good, HSG B
3,652	55	Woods, Good, HSG B
3,492	80	>75% Grass cover, Good, HSG D
44,383	62	Weighted Average
44,383		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0500	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.32"
2.6	769	0.0930	4.9		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
6.4	819	Total			

Summary for Subcatchment PR-1.3: SE of BVW A

Runoff = 4.5 cfs @ 12.09 hrs, Volume= 13,938 cf, Depth> 5.20"
Routed to Reach DP-1 : Ex. Wetland (series A)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
9,167	61	>75% Grass cover, Good, HSG B
22,355	80	>75% Grass cover, Good, HSG D
649	77	Woods, Good, HSG D
32,171	75	Weighted Average
32,171		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1.4: TO PSIS-8

Runoff = 4.2 cfs @ 12.08 hrs, Volume= 14,037 cf, Depth> 7.10"
Routed to Pond PSIS-8 : PSIS-8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	16,532	98	Impervious Area
	6,483	80	>75% Grass cover, Good, HSG D
	723	39	>75% Grass cover, Good, HSG A
	23,738	91	Weighted Average
	7,206		30.36% Pervious Area
	16,532		69.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.5: TO PSIS-3

Runoff = 10.1 cfs @ 12.08 hrs, Volume= 33,338 cf, Depth> 6.86"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	32,702	98	Impervious Area
	9,258	39	>75% Grass cover, Good, HSG A
*	16,379	98	Roof Area
	58,339	89	Weighted Average
	9,258		15.87% Pervious Area
	49,081		84.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.6: TO PSIS-6

Runoff = 6.3 cfs @ 12.09 hrs, Volume= 19,917 cf, Depth> 5.91"
Routed to Pond PSIS-6 : PSIS-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	25,841	98	Impervious Area
	4,090	80	>75% Grass cover, Good, HSG D
	10,533	39	>75% Grass cover, Good, HSG A
	40,464	81	Weighted Average
	14,623		36.14% Pervious Area
	25,841		63.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.7: TO PSIS-3

Runoff = 3.5 cfs @ 12.08 hrs, Volume= 11,600 cf, Depth> 6.74"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	17,270	98	Impervious Area
	3,388	39	>75% Grass cover, Good, HSG A
	20,658	88	Weighted Average
	3,388		16.40% Pervious Area
	17,270		83.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.8: clubhouse amenity area

Runoff = 1.5 cfs @ 12.09 hrs, Volume= 4,726 cf, Depth> 3.69"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	5,928	98	Impervious Area
	124	80	>75% Grass cover, Good, HSG D
	9,311	39	>75% Grass cover, Good, HSG A
	15,363	62	Weighted Average
	9,435		61.41% Pervious Area
	5,928		38.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.8A: TO PSIS-7

Runoff = 1.2 cfs @ 12.09 hrs, Volume= 3,926 cf, Depth> 5.79"
Routed to Pond PSIS-7 : PSIS-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	5,632	98	Impervious Area
	2,508	39	>75% Grass cover, Good, HSG A
	8,140	80	Weighted Average
	2,508		30.81% Pervious Area
	5,632		69.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-1.9: TO PSIS-3

Runoff = 1.4 cfs @ 12.08 hrs, Volume= 4,647 cf, Depth> 7.34"
Routed to Pond PSIS-3 : PSIS-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	6,615	98	Impervious Area
	568	39	>75% Grass cover, Good, HSG A
	419	80	>75% Grass cover, Good, HSG D
	7,602	93	Weighted Average
	987		12.98% Pervious Area
	6,615		87.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-2: northeastern locus @ ROW

Runoff = 0.5 cfs @ 12.10 hrs, Volume= 1,538 cf, Depth> 2.68"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	936	98	Impervious Area
	4,916	39	>75% Grass cover, Good, HSG A
	1,026	80	>75% Grass cover, Good, HSG D
	6,878	53	Weighted Average
	5,942		86.39% Pervious Area
	936		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment PR-2.1: southeastern locus @ ROW

Runoff = 0.2 cfs @ 12.15 hrs, Volume= 1,682 cf, Depth> 0.86"
Routed to Reach DP-2 : Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
10,498	30	Woods, Good, HSG A
12,872	39	>75% Grass cover, Good, HSG A
23,370	35	Weighted Average
23,370		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. Engineering Practice**

Summary for Subcatchment PR-3: south of BVW B

Runoff = 0.1 cfs @ 12.34 hrs, Volume= 1,334 cf, Depth> 0.61"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
	19,666	30	Woods, Good, HSG A
	6,445	39	>75% Grass cover, Good, HSG A
*	64	98	Impervious Area
	26,175	32	Weighted Average
	26,111		99.76% Pervious Area
	64		0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.1: north of BVW B

Runoff = 0.4 cfs @ 12.15 hrs, Volume= 3,066 cf, Depth> 0.86"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
17,728	30	Woods, Good, HSG A
24,872	39	>75% Grass cover, Good, HSG A
42,600	35	Weighted Average
42,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.2: south western locus

Runoff = 0.1 cfs @ 12.51 hrs, Volume= 1,000 cf, Depth> 0.46"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
26,302	30	Woods, Good, HSG A
26,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.32"
0.9	53	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	103	Total			

Summary for Subcatchment PR-3.3: south of BVW B @ entrance

Runoff = 0.1 cfs @ 12.12 hrs, Volume= 504 cf, Depth> 1.23"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
4,917	39	>75% Grass cover, Good, HSG A
4,917		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.4: north of BVW B @ entrance

Runoff = 0.3 cfs @ 12.12 hrs, Volume= 1,174 cf, Depth> 1.23"
Routed to Reach DP-3 : Ex. Wetland (seies B)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
11,446	39	>75% Grass cover, Good, HSG A
11,446		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-3.5: to PSDS-1

Runoff = 10.4 cfs @ 12.08 hrs, Volume= 34,156 cf, Depth> 6.74"
Routed to Pond PSDS-1 : PSDS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	50,865	98	Impervious Area
	9,963	39	>75% Grass cover, Good, HSG A
	60,828	88	Weighted Average
	9,963		16.38% Pervious Area
	50,865		83.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-3.5A: to SWB-1

Runoff = 3.6 cfs @ 12.09 hrs, Volume= 11,116 cf, Depth> 5.20"
Routed to Pond SWB-1 : SWB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
	9,942	39	>75% Grass cover, Good, HSG A
*	15,717	98	Impervious Area
	25,659	75	Weighted Average
	9,942		38.75% Pervious Area
	15,717		61.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-3.6: bld 1 roof

Runoff = 3.3 cfs @ 12.08 hrs, Volume= 11,794 cf, Depth> 7.93"
Routed to Pond PSIS-1 : PSIS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	17,839	98	Roof Area
	17,839		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, min. eng pract**

Summary for Subcatchment PR-4: southwest corner locus

Runoff = 0.0 cfs @ 12.44 hrs, Volume= 580 cf, Depth> 0.46"
Routed to Reach DP-4 : 231 Grove Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
15,220	30	Woods, Good, HSG A
15,220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
0.6	61	0.1100	1.7		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
8.4	111	Total			

Summary for Reach DP-1: Ex. Wetland (series A)

Inflow Area = 813,394 sf, 42.56% Impervious, Inflow Depth > 2.69" for 100-Yr 24 Hr event
Inflow = 50.2 cfs @ 12.16 hrs, Volume= 182,629 cf
Outflow = 50.2 cfs @ 12.16 hrs, Volume= 182,629 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Grove Street

Inflow Area = 30,248 sf, 3.09% Impervious, Inflow Depth > 1.28" for 100-Yr 24 Hr event
Inflow = 0.7 cfs @ 12.11 hrs, Volume= 3,219 cf
Outflow = 0.7 cfs @ 12.11 hrs, Volume= 3,219 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Ex. Wetland (seies B)

Inflow Area = 215,766 sf, 39.16% Impervious, Inflow Depth > 0.51" for 100-Yr 24 Hr event
Inflow = 1.2 cfs @ 12.92 hrs, Volume= 9,113 cf
Outflow = 1.2 cfs @ 12.92 hrs, Volume= 9,113 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: 231 Grove Street

Inflow Area = 15,220 sf, 0.00% Impervious, Inflow Depth > 0.46" for 100-Yr 24 Hr event
Inflow = 0.0 cfs @ 12.44 hrs, Volume= 580 cf
Outflow = 0.0 cfs @ 12.44 hrs, Volume= 580 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Pond PSDS-1: PSDS-1

Inflow Area = 60,828 sf, 83.62% Impervious, Inflow Depth > 6.74" for 100-Yr 24 Hr event
Inflow = 10.4 cfs @ 12.08 hrs, Volume= 34,156 cf
Outflow = 3.5 cfs @ 12.37 hrs, Volume= 18,706 cf, Atten= 67%, Lag= 17.1 min
Primary = 3.5 cfs @ 12.37 hrs, Volume= 18,706 cf
Routed to Pond SWB-1 : SWB-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 293.63' @ 12.37 hrs Surf.Area= 4,481 sf Storage= 17,357 cf

Plug-Flow detention time= 213.4 min calculated for 18,706 cf (55% of inflow)
Center-of-Mass det. time= 104.5 min (885.3 - 780.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	288.00'	7,255 cf	**46.67'W x 96.02'L x 6.75'H Field A** 30,245 cf Overall - 12,109 cf Embedded = 18,136 cf x 40.0% Voids
#2A	288.75'	12,109 cf	**ADS_StormTech MC-4500 b +Cap** x 110 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.02'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 110 Chambers in 5 Rows Cap Storage= 39.5 cf x 2 x 5 rows = 395.0 cf
		19,363 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	292.75'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	292.75'	**24.0" Round Culvert** L= 21.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 292.75' / 292.00' S= 0.0347 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	288.00'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	288.00'	**2.0" Round Culvert** L= 90.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 288.00' / 286.00' S= 0.0222 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=3.5 cfs @ 12.37 hrs HW=293.63' TW=288.44' (Dynamic Tailwater)
2=Culvert (Inlet Controls 3.4 cfs @ 2.5 fps)
1=Orifice/Grate (Passes 3.4 cfs of 4.7 cfs potential flow)
4=Culvert (Outlet Controls 0.1 cfs @ 4.1 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSDS-2: PSDS-2

Inflow Area = 28,438 sf, 78.14% Impervious, Inflow Depth > 6.50" for 100-Yr 24 Hr event
Inflow = 4.8 cfs @ 12.08 hrs, Volume= 15,404 cf
Outflow = 4.7 cfs @ 12.10 hrs, Volume= 14,582 cf, Atten= 2%, Lag= 1.1 min
Primary = 4.7 cfs @ 12.10 hrs, Volume= 14,582 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 311.63' @ 12.10 hrs Surf.Area= 1,111 sf Storage= 2,054 cf

Plug-Flow detention time= 71.5 min calculated for 14,576 cf (95% of inflow)
Center-of-Mass det. time= 42.0 min (828.4 - 786.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	308.50'	1,114 cf	**17.75'W x 62.58'L x 3.50'H Field A** 3,888 cf Overall - 1,103 cf Embedded = 2,785 cf x 40.0% Voids
#2A	309.00'	1,103 cf	**ADS_StormTech SC-740 +Cap** x 24 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 24 Chambers in 3 Rows
		2,217 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	310.50'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	310.50'	**24.0" Round Culvert** L= 4.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 310.50' / 310.40' S= 0.0213 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	308.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	308.50'	**2.0" Round Culvert** L= 66.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 308.50' / 306.00' S= 0.0379 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=4.6 cfs @ 12.10 hrs HW=311.63' TW=0.00' (Dynamic Tailwater)
2=Culvert (Barrel Controls 4.5 cfs @ 3.6 fps)
1=Orifice/Grate (Passes 4.5 cfs of 6.0 cfs potential flow)
4=Culvert (Barrel Controls 0.1 cfs @ 4.8 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSDS-3: PSDS-3

Inflow Area = 65,612 sf, 79.97% Impervious, Inflow Depth > 7.10" for 100-Yr 24 Hr event
Inflow = 11.6 cfs @ 12.08 hrs, Volume= 38,799 cf
Outflow = 10.9 cfs @ 12.11 hrs, Volume= 30,237 cf, Atten= 7%, Lag= 1.8 min
Primary = 10.9 cfs @ 12.11 hrs, Volume= 30,237 cf
Routed to Pond PSIS-5 : PSIS-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 308.80' @ 12.11 hrs Surf.Area= 2,572 sf Storage= 10,643 cf

Plug-Flow detention time= 134.5 min calculated for 30,237 cf (78% of inflow)
Center-of-Mass det. time= 55.4 min (826.8 - 771.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	302.25'	4,337 cf	**64.83'W x 39.67'L x 6.75'H Field A** 17,359 cf Overall - 6,516 cf Embedded = 10,843 cf x 40.0% Voids
#2A	303.00'	6,516 cf	**ADS_StormTech MC-4500 b +Cap** x 56 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 56 Chambers in 7 Rows Cap Storage= 39.5 cf x 2 x 7 rows = 553.0 cf
		10,854 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	307.00'	**12.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	307.00'	**24.0" Round Culvert** L= 28.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.00' / 306.00' S= 0.0352 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 4	302.25'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	302.25'	**2.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 302.25' / 302.10' S= 0.0037 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=10.8 cfs @ 12.11 hrs HW=308.79' TW=289.73' (Dynamic Tailwater)
2=Culvert (Inlet Controls 10.7 cfs @ 3.6 fps)
1=Orifice/Grate (Passes 10.7 cfs of 12.9 cfs potential flow)
4=Culvert (Barrel Controls 0.1 cfs @ 6.5 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.3 cfs potential flow)

Summary for Pond PSIS-1: PSIS-1

Inflow Area = 17,839 sf,100.00% Impervious, Inflow Depth > 7.93" for 100-Yr 24 Hr event
Inflow = 3.3 cfs @ 12.08 hrs, Volume= 11,794 cf
Outflow = 2.4 cfs @ 12.16 hrs, Volume= 11,797 cf, Atten= 28%, Lag= 4.6 min
Discarded = 0.2 cfs @ 11.22 hrs, Volume= 9,088 cf
Primary = 2.1 cfs @ 12.16 hrs, Volume= 2,709 cf
Routed to Pond SWB-1 : SWB-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 296.01' @ 12.16 hrs Surf.Area= 1,224 sf Storage= 2,298 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 35.9 min (776.3 - 740.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	293.00'	1,162 cf	**49.00'W x 24.98'L x 3.50'H Field A** 4,283 cf Overall - 1,378 cf Embedded = 2,905 cf x 40.0% Voids
#2A	293.50'	1,378 cf	**ADS_StormTech SC-740 +Cap** x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 30 Chambers in 10 Rows
		2,540 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	293.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	295.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	295.00'	**12.0" Round Culvert** L= 3.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 295.00' / 294.80' S= 0.0541 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.22 hrs HW=293.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=2.1 cfs @ 12.16 hrs HW=296.00' TW=287.22' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 2.1 cfs @ 2.7 fps)
  └─**2=Orifice/Grate** (Passes 2.1 cfs of 2.7 cfs potential flow)

Summary for Pond PSIS-2: PSIS-2

Inflow Area = 16,369 sf,100.00% Impervious, Inflow Depth > 7.93" for 100-Yr 24 Hr event
Inflow = 3.0 cfs @ 12.08 hrs, Volume= 10,823 cf
Outflow = 2.4 cfs @ 12.14 hrs, Volume= 10,823 cf, Atten= 20%, Lag= 3.6 min
Discarded = 0.1 cfs @ 9.84 hrs, Volume= 7,290 cf
Primary = 2.3 cfs @ 12.14 hrs, Volume= 3,532 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 309.63' @ 12.14 hrs Surf.Area= 2,128 sf Storage= 2,518 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 82.7 min (823.1 - 740.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	307.50'	1,514 cf	**54.83'W x 38.80'L x 2.33'H Field A** 4,964 cf Overall - 1,179 cf Embedded = 3,785 cf x 40.0% Voids
#2A	308.00'	1,179 cf	**ADS_StormTech SC-310 +Cap** x 80 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 80 Chambers in 16 Rows
		2,693 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	308.83'	**6.0" Vert. Orifice/Grate X 8.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	308.83'	**18.0" Round Culvert** L= 13.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 308.83' / 307.00' S= 0.1356 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=0.1 cfs @ 9.84 hrs HW=307.53' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.3 cfs @ 12.14 hrs HW=309.63' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 2.3 cfs @ 2.4 fps)
  └─**2=Orifice/Grate** (Passes 2.3 cfs of 5.6 cfs potential flow)

Summary for Pond PSIS-3: PSIS-3

Inflow Area = 107,379 sf, 82.73% Impervious, Inflow Depth > 6.87" for 100-Yr 24 Hr event
Inflow = 18.7 cfs @ 12.08 hrs, Volume= 61,459 cf
Outflow = 5.6 cfs @ 12.41 hrs, Volume= 61,472 cf, Atten= 70%, Lag= 19.3 min
Discarded = 1.0 cfs @ 11.07 hrs, Volume= 51,795 cf
Primary = 4.5 cfs @ 12.41 hrs, Volume= 9,678 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 283.21' @ 12.41 hrs Surf.Area= 5,421 sf Storage= 20,894 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 120.7 min (898.0 - 777.3)

Volume	Invert	Avail.Storage	Storage Description
#1	277.50'	7,335 cf	**37.00'W x 146.50'L x 6.00'H Prismatoid** 32,523 cf Overall - 14,186 cf Embedded = 18,337 cf x 40.0% Voids
#2	278.00'	14,186 cf	**60.0" Round Pipe Storage** x 5 Inside #1 L= 144.5'
		21,521 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	282.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	282.00'	**18.0" Round Culvert** L= 92.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 282.00' / 276.00' S= 0.0652 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=1.0 cfs @ 11.07 hrs HW=277.56' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 1.0 cfs)

Primary OutFlow Max=4.5 cfs @ 12.41 hrs HW=283.21' TW=0.00' (Dynamic Tailwater)
└—**3=Culvert** (Inlet Controls 4.5 cfs @ 3.0 fps)
  └—**2=Orifice/Grate** (Passes 4.5 cfs of 6.4 cfs potential flow)

Summary for Pond PSIS-4: PSIS-4

Inflow Area = 89,965 sf, 79.66% Impervious, Inflow Depth > 6.98" for 100-Yr 24 Hr event
Inflow = 15.8 cfs @ 12.08 hrs, Volume= 52,305 cf
Outflow = 0.5 cfs @ 15.94 hrs, Volume= 18,579 cf, Atten= 97%, Lag= 231.4 min
Discarded = 0.3 cfs @ 8.79 hrs, Volume= 16,638 cf
Primary = 0.2 cfs @ 15.94 hrs, Volume= 1,941 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 287.33' @ 15.94 hrs Surf.Area= 4,560 sf Storage= 35,455 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 129.0 min (903.7 - 774.7)

Volume	Invert	Avail.Storage	Storage Description
#1	277.50'	27,803 cf	**120.0" Round Pipe Storage** x 3 Inside #2 L= 118.0'
#2	277.00'	10,767 cf	**38.00'W x 120.00'L x 12.00'H Prismatoid** 54,720 cf Overall - 27,803 cf Embedded = 26,917 cf x 40.0% Voids
		38,570 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	287.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	287.00'	**6.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 287.00' / 286.80' S= 0.0400 '/' Cc= 0.900
n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.3 cfs @ 8.79 hrs HW=277.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.2 cfs @ 15.94 hrs HW=287.33' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.2 cfs @ 1.5 fps)
  └─**2=Orifice/Grate** (Passes 0.2 cfs of 0.3 cfs potential flow)

Summary for Pond PSIS-5: PSIS-5

Inflow Area = 128,432 sf, 66.34% Impervious, Inflow Depth > 5.66" for 100-Yr 24 Hr event
Inflow = 20.2 cfs @ 12.10 hrs, Volume= 60,538 cf
Outflow = 13.8 cfs @ 12.20 hrs, Volume= 50,017 cf, Atten= 32%, Lag= 5.8 min
Discarded = 0.2 cfs @ 9.81 hrs, Volume= 14,444 cf
Primary = 13.6 cfs @ 12.20 hrs, Volume= 35,573 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 290.29' @ 12.20 hrs Surf.Area= 4,320 sf Storage= 16,000 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 35.6 min (849.7 - 814.1)

Volume	Invert	Avail.Storage	Storage Description
#1	285.50'	11,585 cf	**60.0" Round Pipe Storage** x 5 Inside #2 L= 118.0'
#2	285.00'	5,734 cf	**36.00'W x 120.00'L x 6.00'H Prismatoid** 25,920 cf Overall - 11,585 cf Embedded = 14,335 cf x 40.0% Voids
		17,319 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	285.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	288.50'	**24.0" Vert. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	288.50'	**30.0" Round Culvert** L= 19.1' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 288.50' / 287.50' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 4.91 sf

Discarded OutFlow Max=0.2 cfs @ 9.81 hrs HW=285.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=13.6 cfs @ 12.20 hrs HW=290.29' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 13.6 cfs @ 3.6 fps)
  └─**2=Orifice/Grate** (Passes 13.6 cfs of 67.7 cfs potential flow)

Summary for Pond PSIS-6: PSIS-6

Inflow Area = 40,464 sf, 63.86% Impervious, Inflow Depth > 5.91" for 100-Yr 24 Hr event
Inflow = 6.3 cfs @ 12.09 hrs, Volume= 19,917 cf
Outflow = 0.6 cfs @ 13.02 hrs, Volume= 19,917 cf, Atten= 91%, Lag= 56.0 min
Discarded = 0.4 cfs @ 11.41 hrs, Volume= 19,488 cf
Primary = 0.2 cfs @ 13.02 hrs, Volume= 429 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 284.22' @ 13.02 hrs Surf.Area= 2,039 sf Storage= 8,421 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 183.0 min (982.1 - 799.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	277.50'	3,550 cf	**73.92'W x 27.59'L x 6.75'H Field A** 13,767 cf Overall - 4,892 cf Embedded = 8,875 cf x 40.0% Voids
#2A	278.25'	4,892 cf	**ADS_StormTech MC-4500 b +Cap** x 40 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 40 Chambers in 8 Rows Cap Storage= 39.5 cf x 2 x 8 rows = 632.0 cf
		8,442 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	284.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	284.00'	**12.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 284.00' / 283.50' S= 0.0256 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.4 cfs @ 11.41 hrs HW=277.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.2 cfs @ 13.02 hrs HW=284.22' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.2 cfs @ 1.3 fps)
  └─**2=Orifice/Grate** (Passes 0.2 cfs of 0.2 cfs potential flow)

Summary for Pond PSIS-7: PSIS-7

Inflow Area = 31,421 sf, 61.99% Impervious, Inflow Depth > 5.30" for 100-Yr 24 Hr event
Inflow = 4.2 cfs @ 12.09 hrs, Volume= 13,888 cf
Outflow = 3.0 cfs @ 12.16 hrs, Volume= 12,297 cf, Atten= 29%, Lag= 4.7 min
Discarded = 0.1 cfs @ 9.93 hrs, Volume= 5,580 cf
Primary = 2.9 cfs @ 12.16 hrs, Volume= 6,717 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 291.46' @ 12.16 hrs Surf.Area= 1,616 sf Storage= 3,337 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 48.3 min (839.8 - 791.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	288.00'	1,528 cf	**26.25'W x 61.58'L x 3.50'H Field A** 5,657 cf Overall - 1,838 cf Embedded = 3,820 cf x 40.0% Voids
#2A	288.50'	1,838 cf	**ADS_StormTech SC-740 +Cap** x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 40 Chambers in 5 Rows
		3,366 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	288.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	290.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	290.00'	**12.0" Round Culvert** L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 290.00' / 288.00' S= 0.0690 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.1 cfs @ 9.93 hrs HW=288.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.9 cfs @ 12.16 hrs HW=291.45' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 2.9 cfs @ 3.7 fps)
  └─**2=Orifice/Grate** (Passes 2.9 cfs of 3.7 cfs potential flow)

Summary for Pond PSIS-8: PSIS-8

Inflow Area = 23,738 sf, 69.64% Impervious, Inflow Depth > 7.10" for 100-Yr 24 Hr event
Inflow = 4.2 cfs @ 12.08 hrs, Volume= 14,037 cf
Outflow = 2.3 cfs @ 12.20 hrs, Volume= 14,038 cf, Atten= 45%, Lag= 7.3 min
Discarded = 0.2 cfs @ 10.75 hrs, Volume= 10,592 cf
Primary = 2.1 cfs @ 12.20 hrs, Volume= 3,446 cf
Routed to Reach DP-1 : Ex. Wetland (series A)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 277.47' @ 12.20 hrs Surf.Area= 1,108 sf Storage= 3,664 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 88.0 min (859.4 - 771.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	272.00'	1,611 cf	**22.75'W x 48.72'L x 5.50'H Field A** 6,096 cf Overall - 2,069 cf Embedded = 4,028 cf x 40.0% Voids
#2A	272.75'	2,069 cf	**ADS_StormTech MC-3500 d +Cap**x 18 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 18 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		3,680 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	272.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	276.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	276.00'	**12.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 276.00' / 275.30' S= 0.1400 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 10.75 hrs HW=272.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=2.1 cfs @ 12.20 hrs HW=277.46' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Passes 2.1 cfs of 2.9 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 2.1 cfs @ 5.3 fps)

Summary for Pond SWB-1: SWB-1

Inflow Area = 104,326 sf, 80.92% Impervious, Inflow Depth > 3.74" for 100-Yr 24 Hr event
Inflow = 6.0 cfs @ 12.33 hrs, Volume= 32,532 cf
Outflow = 1.7 cfs @ 12.93 hrs, Volume= 32,245 cf, Atten= 72%, Lag= 36.2 min
Discarded = 0.8 cfs @ 12.93 hrs, Volume= 30,210 cf
Primary = 0.9 cfs @ 12.93 hrs, Volume= 2,035 cf
Routed to Reach DP-3 : Ex. Wetland (seies B)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 289.67' @ 12.93 hrs Surf.Area= 3,956 sf Storage= 11,085 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 143.5 min (992.0 - 848.5)

Volume	Invert	Avail.Storage	Storage Description
#1	286.00'	12,428 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
286.00	2,201	207.0	0	0	2,201
288.00	3,066	254.0	5,243	5,243	3,986
290.00	4,146	345.0	7,185	12,428	8,365

Device	Routing	Invert	Outlet Devices
#1	Discarded	286.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	289.60'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.8 cfs @ 12.93 hrs HW=289.67' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.8 cfs)

Primary OutFlow Max=0.9 cfs @ 12.93 hrs HW=289.67' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.9 cfs @ 0.7 fps)

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TSS Removal Train Calculations

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Average Annual Load of TSS Removal Calculation:

Stormwater design proposes three (3) types of TSS Removal Trains as outlined in the attached TSS Removal worksheets and as noted below:

- Proposed TSS Train types:
    - TSS-1: Deep Sump Catchbasin, Water Quality Unit, Subsurface Infiltration System
    - TSS-2: Deep Sump Catchbasin, Water Quality Unit, Surface Infiltration Basin
    - TSS-3: Deep Sump Catchbasin, Water Quality Unit, Subsurface Detention System
- Proposed TSS Train types provide removal rates of the following:
    - TSS-1: 97%
    - TSS-2: 97%
    - TSS-3: 85%
- A total impervious area of 428,001 s.f. is proposed within the development with 404,779 s.f. proposed to drain through these treatment trains, with areas being allocated to each type of treatment train as noted below:
    - TSS-1: 315,975 s.f.
    - TSS-2: 66,582 s.f.
    - TSS-3: 22,222 s.f.
- Applying a weighted average to the TSS removal trains proposed on the project yields the following Average Annual Load of TSS Removal:
    - (315,975/428,001)(97%) + (66,582/428,001)(97%) + (22,222/428,001)(85%)

      Average Annual Load of TSS Removal= 91.1%

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INSTRUCTIONS:
1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calcualtions must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: 121 Grove Street, Franklin MA

Train 1 Deep Sump Catchbasin, CDS Unit, SWB-1

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep-Sump Catchbasin	25%	1.00	0.25	0.75
CDS Unit	80%	0.75	0.60	0.15
Proposed Surface Infiltration Basin-1 (SWB-1)	80%	0.15	0.12	0.03

Total TSS Removal = 97.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 2/12/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

INSTRUCTIONS:
1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calcualtions must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: 121 Grove Street, Franklin MA

Train 1 Deep Sump Catchbasin, CDS Unit, SWB-1

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep-Sump Catchbasin	25%	1.00	0.25	0.75
CDS Unit	80%	0.75	0.60	0.15
Proposed Surface Infiltration Basin-1 (SWB-1)	80%	0.15	0.12	0.03

Total TSS Removal = 97.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 2/5/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

Non-automated: Mar.4, 2008

INSTRUCTIONS:
1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calcualtions must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: 121 Grove Street, Franklin MA

Train 1 Deep Sump Catchbasin, CDS Unit, PSDS, Detention Pond

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep-Sump Catchbasin	25%	1.00	0.25	0.75
CDS Unit	80%	0.75	0.60	0.15
Proposed Surface Detention System (PSDS)/FES	0%	0.15	0.00	0.15

Total TSS Removal = 85.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 2/12/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

Project:	**Grove Street Residences**	
Location:	**Franklin, MA**	
Prepared For:	**RJ O'Connell**	

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

Q = (qu) (A) (WQV)

where:

Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
CDS-1	0.32	0.0005000	6.0	0.100	1.00	774.00	0.39
CDS-2	0.93	0.0014531	6.0	0.100	1.00	774.00	1.12
CDS-3	1.76	0.0027500	6.0	0.100	1.00	774.00	2.13
CDS-4	0.40	0.0006250	6.0	0.100	1.00	774.00	0.48
CDS-5	0.08	0.0001250	6.0	0.100	1.00	774.00	0.10
CDS-6	0.42	0.0006563	6.0	0.100	1.00	774.00	0.51
CDS-7	0.76	0.0011875	6.0	0.100	1.00	774.00	0.92
CDS-8	0.37	0.0005781	6.0	0.100	1.00	774.00	0.45
CDS-9	0.61	0.0009531	6.0	0.100	1.00	774.00	0.74
CDS-10	0.61	0.0009531	6.0	0.100	1.00	774.00	0.74

Project:	**Grove Street Residences**
Location:	**Franklin, MA**
Prepared For:	**RJ O'Connell**

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

Q = (qu) (A) (WQV)

where:

Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
CDS-11	1.15	0.0017969	6.0	0.100	1.00	774.00	1.39
CDS-12	0.53	0.0008281	6.0	0.100	1.00	774.00	0.64
CDS-13	0.12	0.0001875	6.0	0.100	1.00	774.00	0.15
CB-14	0.37	0.0005781	6.0	0.100	1.00	774.00	0.45

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES FRANKLIN, MA

Area	0.32 ac	Unit Site Designation	CDS-1
Weighted C	0.9	Rainfall Station #	69
t_c	6 min		
CDS Model	1515-3	CDS Treatment Capacity	1.0 cfs

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.01	0.01	9.3
0.06	9.4%	29.3%	0.02	0.02	9.1
0.08	7.7%	37.0%	0.02	0.02	7.4
0.10	8.6%	45.6%	0.03	0.03	8.2
0.12	6.3%	51.9%	0.03	0.03	6.0
0.14	4.7%	56.5%	0.04	0.04	4.4
0.16	4.6%	61.2%	0.05	0.05	4.4
0.18	3.5%	64.7%	0.05	0.05	3.3
0.20	4.3%	69.1%	0.06	0.06	4.1
0.25	8.0%	77.1%	0.07	0.07	7.4
0.30	5.6%	82.7%	0.09	0.09	5.1
0.35	4.4%	87.0%	0.10	0.10	3.9
0.40	2.5%	89.5%	0.12	0.12	2.3
0.45	2.5%	92.1%	0.13	0.13	2.2
0.50	1.4%	93.5%	0.14	0.14	1.2
0.75	5.0%	98.5%	0.22	0.22	4.2
1.00	1.0%	99.5%	0.29	0.29	0.8
1.50	0.0%	99.5%	0.43	0.43	0.0
2.00	0.0%	99.5%	0.58	0.58	0.0
3.00	0.5%	100.0%	0.86	0.86	0.2
					93.2
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**86.7%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES
FRANKLIN, MA

Area	0.93 ac	Unit Site Designation	CDS-2
Weighted C	0.9	Rainfall Station #	69
t_c	6 min		
CDS Model	2015-4	CDS Treatment Capacity	**1.4 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.02	0.02	9.8
0.04	9.6%	19.8%	0.03	0.03	9.2
0.06	9.4%	29.3%	0.05	0.05	9.0
0.08	7.7%	37.0%	0.07	0.07	7.3
0.10	8.6%	45.6%	0.08	0.08	8.0
0.12	6.3%	51.9%	0.10	0.10	5.8
0.14	4.7%	56.5%	0.12	0.12	4.3
0.16	4.6%	61.2%	0.13	0.13	4.2
0.18	3.5%	64.7%	0.15	0.15	3.2
0.20	4.3%	69.1%	0.17	0.17	3.9
0.25	8.0%	77.1%	0.21	0.21	7.0
0.30	5.6%	82.7%	0.25	0.25	4.8
0.35	4.4%	87.0%	0.29	0.29	3.6
0.40	2.5%	89.5%	0.33	0.33	2.0
0.45	2.5%	92.1%	0.38	0.38	2.0
0.50	1.4%	93.5%	0.42	0.42	1.1
0.75	5.0%	98.5%	0.63	0.63	3.4
1.00	1.0%	99.5%	0.84	0.84	0.6
1.50	0.0%	99.5%	1.26	1.26	0.0
2.00	0.0%	99.5%	1.67	1.40	0.0
3.00	0.5%	100.0%	2.51	1.40	0.1
					89.0
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.3%
				Predicted Net Annual Load Removal Efficiency =	**82.6%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

GROVE STREET RESIDENCES
FRANKLIN, MA
SITE DESIGNATION: CDS-3

AREA	1.76	acres	**CASCADE MODEL**	CS-5	
WEIGHTED C	0.90		**PARTICLE SIZE**	110	microns
TC	6.00	minutes	**RAINFALL STATION**	69	

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Hydraulic Loading Rate (gpm/ft2)	Removal Efficiency (%)	Incremental Removal (%)
0.02	10.2%	0.72	100.0	10.2
0.04	9.6%	1.45	100.0	9.6
0.06	9.4%	2.17	100.0	9.4
0.08	7.7%	2.90	100.0	7.7
0.10	8.6%	3.62	100.0	8.6
0.12	6.3%	4.34	100.0	6.3
0.14	4.7%	5.07	100.0	4.7
0.16	4.6%	5.79	100.0	4.6
0.18	3.5%	6.52	100.0	3.5
0.20	4.3%	7.24	100.0	4.3
0.25	8.0%	9.05	100.0	8.0
0.30	5.6%	10.86	100.0	5.6
0.35	4.4%	12.67	100.0	4.4
0.40	2.5%	14.48	98.3	2.5
0.45	2.5%	16.29	96.6	2.4
0.50	1.4%	18.10	94.9	1.3
0.75	5.0%	27.16	86.4	4.4
1.00	1.0%	36.21	77.9	0.8
1.50	0.0%	54.31	60.8	0.0
2.00	0.0%	72.42	43.8	0.0
3.00	0.5%	80.01	27.0	0.1
				98.5
			Removal Efficiency Adjustment[2] =	6.5%
			Predicted % Annual Rainfall Treated =	93.4%
			Predicted Net Annual Load Removal Efficiency =	**92.1%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES
FRANKLIN, MA

Area	0.40 ac	Unit Site Designation	CDS-4
Weighted C	0.9	Rainfall Station #	69
t_c	6 min		
CDS Model	1515-3	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.01	0.01	9.3
0.06	9.4%	29.3%	0.02	0.02	9.0
0.08	7.7%	37.0%	0.03	0.03	7.4
0.10	8.6%	45.6%	0.04	0.04	8.1
0.12	6.3%	51.9%	0.04	0.04	5.9
0.14	4.7%	56.5%	0.05	0.05	4.4
0.16	4.6%	61.2%	0.06	0.06	4.3
0.18	3.5%	64.7%	0.06	0.06	3.3
0.20	4.3%	69.1%	0.07	0.07	4.0
0.25	8.0%	77.1%	0.09	0.09	7.3
0.30	5.6%	82.7%	0.11	0.11	5.0
0.35	4.4%	87.0%	0.13	0.13	3.9
0.40	2.5%	89.5%	0.14	0.14	2.2
0.45	2.5%	92.1%	0.16	0.16	2.2
0.50	1.4%	93.5%	0.18	0.18	1.2
0.75	5.0%	98.5%	0.27	0.27	4.0
1.00	1.0%	99.5%	0.36	0.36	0.7
1.50	0.0%	99.5%	0.54	0.54	0.0
2.00	0.0%	99.5%	0.72	0.72	0.0
3.00	0.5%	100.0%	1.08	1.00	0.1
					92.2
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**85.7%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES
FRANKLIN, MA

Area	**0.08 ac**	Unit Site Designation	**CDS-5**
Weighted C	**0.9**	Rainfall Station #	**69**
t_c	**6 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.00	0.00	9.9
0.04	9.6%	19.8%	0.00	0.00	9.4
0.06	9.4%	29.3%	0.00	0.00	9.2
0.08	7.7%	37.0%	0.01	0.01	7.5
0.10	8.6%	45.6%	0.01	0.01	8.3
0.12	6.3%	51.9%	0.01	0.01	6.1
0.14	4.7%	56.5%	0.01	0.01	4.5
0.16	4.6%	61.2%	0.01	0.01	4.5
0.18	3.5%	64.7%	0.01	0.01	3.4
0.20	4.3%	69.1%	0.01	0.01	4.2
0.25	8.0%	77.1%	0.02	0.02	7.7
0.30	5.6%	82.7%	0.02	0.02	5.4
0.35	4.4%	87.0%	0.03	0.03	4.2
0.40	2.5%	89.5%	0.03	0.03	2.4
0.45	2.5%	92.1%	0.03	0.03	2.4
0.50	1.4%	93.5%	0.04	0.04	1.3
0.75	5.0%	98.5%	0.05	0.05	4.7
1.00	1.0%	99.5%	0.07	0.07	0.9
1.50	0.0%	99.5%	0.11	0.11	0.0
2.00	0.0%	99.5%	0.14	0.14	0.0
3.00	0.5%	100.0%	0.22	0.22	0.4
					96.2
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**89.8%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES
FRANKLIN, MA

Area	0.42 ac	Unit Site Designation	CDS-6
Weighted C	0.9	Rainfall Station #	69
t_c	6 min		
CDS Model	1515-3	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.02	0.02	9.3
0.06	9.4%	29.3%	0.02	0.02	9.0
0.08	7.7%	37.0%	0.03	0.03	7.4
0.10	8.6%	45.6%	0.04	0.04	8.1
0.12	6.3%	51.9%	0.05	0.05	5.9
0.14	4.7%	56.5%	0.05	0.05	4.4
0.16	4.6%	61.2%	0.06	0.06	4.3
0.18	3.5%	64.7%	0.07	0.07	3.3
0.20	4.3%	69.1%	0.08	0.08	4.0
0.25	8.0%	77.1%	0.09	0.09	7.3
0.30	5.6%	82.7%	0.11	0.11	5.0
0.35	4.4%	87.0%	0.13	0.13	3.9
0.40	2.5%	89.5%	0.15	0.15	2.2
0.45	2.5%	92.1%	0.17	0.17	2.2
0.50	1.4%	93.5%	0.19	0.19	1.2
0.75	5.0%	98.5%	0.28	0.28	3.9
1.00	1.0%	99.5%	0.38	0.38	0.7
1.50	0.0%	99.5%	0.57	0.57	0.0
2.00	0.0%	99.5%	0.76	0.76	0.0
3.00	0.5%	100.0%	1.13	1.00	0.1
					91.9
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**85.5%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

GROVE STREET RESIDENCES
FRANKLIN, MA
SITE DESIGNATION: CDS-7

AREA	0.76	acres	**CASCADE MODEL**	CS-6	
WEIGHTED C	0.90		**PARTICLE SIZE**	110	microns
TC	6.00	minutes	**RAINFALL STATION**	69	

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Hydraulic Loading Rate (gpm/ft2)	Removal Efficiency (%)	Incremental Removal (%)
0.02	10.2%	0.22	100.0	10.2
0.04	9.6%	0.43	100.0	9.6
0.06	9.4%	0.65	100.0	9.4
0.08	7.7%	0.87	100.0	7.7
0.10	8.6%	1.09	100.0	8.6
0.12	6.3%	1.30	100.0	6.3
0.14	4.7%	1.52	100.0	4.7
0.16	4.6%	1.74	100.0	4.6
0.18	3.5%	1.95	100.0	3.5
0.20	4.3%	2.17	100.0	4.3
0.25	8.0%	2.71	100.0	8.0
0.30	5.6%	3.26	100.0	5.6
0.35	4.4%	3.80	100.0	4.4
0.40	2.5%	4.34	100.0	2.5
0.45	2.5%	4.89	100.0	2.5
0.50	1.4%	5.43	100.0	1.4
0.75	5.0%	8.14	100.0	5.0
1.00	1.0%	10.86	100.0	1.0
1.50	0.0%	16.29	96.6	0.0
2.00	0.0%	21.72	91.5	0.0
3.00	0.5%	32.57	81.3	0.4
				99.9
			Removal Efficiency Adjustment[2] =	6.5%
			Predicted % Annual Rainfall Treated =	93.5%
			Predicted Net Annual Load Removal Efficiency =	**93.5%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES
FRANKLIN, MA

Area	0.37 ac	Unit Site Designation	CDS-8
Weighted C	0.9	Rainfall Station #	69
t_c	6 min		
CDS Model	1515-3	CDS Treatment Capacity	1.0 cfs

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.01	0.01	9.3
0.06	9.4%	29.3%	0.02	0.02	9.1
0.08	7.7%	37.0%	0.03	0.03	7.4
0.10	8.6%	45.6%	0.03	0.03	8.1
0.12	6.3%	51.9%	0.04	0.04	6.0
0.14	4.7%	56.5%	0.05	0.05	4.4
0.16	4.6%	61.2%	0.05	0.05	4.3
0.18	3.5%	64.7%	0.06	0.06	3.3
0.20	4.3%	69.1%	0.07	0.07	4.0
0.25	8.0%	77.1%	0.08	0.08	7.3
0.30	5.6%	82.7%	0.10	0.10	5.1
0.35	4.4%	87.0%	0.12	0.12	3.9
0.40	2.5%	89.5%	0.13	0.13	2.2
0.45	2.5%	92.1%	0.15	0.15	2.2
0.50	1.4%	93.5%	0.17	0.17	1.2
0.75	5.0%	98.5%	0.25	0.25	4.0
1.00	1.0%	99.5%	0.33	0.33	0.8
1.50	0.0%	99.5%	0.50	0.50	0.0
2.00	0.0%	99.5%	0.67	0.67	0.0
3.00	0.5%	100.0%	1.00	1.00	0.1
					92.5

Removal Efficiency Adjustment[2] =	6.5%
Predicted % Annual Rainfall Treated =	93.5%
Predicted Net Annual Load Removal Efficiency =	**86.1%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

GROVE STREET RESIDENCES

FRANKLIN, MA

SITE DESIGNATION: CDS-9

AREA	0.61	acres	**CASCADE MODEL**	CS-3	
WEIGHTED C	0.90		**PARTICLE SIZE**	110	microns
TC	6.00	minutes	**RAINFALL STATION**	69	

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Hydraulic Loading Rate (gpm/ft2)	Removal Efficiency (%)	Incremental Removal (%)
0.02	10.2%	0.70	100.0	10.2
0.04	9.6%	1.39	100.0	9.6
0.06	9.4%	2.09	100.0	9.4
0.08	7.7%	2.79	100.0	7.7
0.10	8.6%	3.49	100.0	8.6
0.12	6.3%	4.18	100.0	6.3
0.14	4.7%	4.88	100.0	4.7
0.16	4.6%	5.58	100.0	4.6
0.18	3.5%	6.27	100.0	3.5
0.20	4.3%	6.97	100.0	4.3
0.25	8.0%	8.71	100.0	8.0
0.30	5.6%	10.46	100.0	5.6
0.35	4.4%	12.20	100.0	4.4
0.40	2.5%	13.94	98.8	2.5
0.45	2.5%	15.69	97.2	2.5
0.50	1.4%	17.43	95.5	1.3
0.75	5.0%	26.14	87.3	4.4
1.00	1.0%	34.86	79.1	0.8
1.50	0.0%	52.29	62.7	0.0
2.00	0.0%	64.13	47.5	0.0
3.00	0.5%	64.13	31.7	0.2
				98.7
			Removal Efficiency Adjustment[2] =	6.5%
			Predicted % Annual Rainfall Treated =	93.4%
			Predicted Net Annual Load Removal Efficiency =	**92.2%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES
FRANKLIN, MA

Area	0.61 ac	Unit Site Designation	CDS-10
Weighted C	0.9	Rainfall Station #	69
t_c	6 min		
CDS Model	2015-4	CDS Treatment Capacity	1.4 cfs

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.02	0.02	9.3
0.06	9.4%	29.3%	0.03	0.03	9.0
0.08	7.7%	37.0%	0.04	0.04	7.4
0.10	8.6%	45.6%	0.05	0.05	8.1
0.12	6.3%	51.9%	0.07	0.07	5.9
0.14	4.7%	56.5%	0.08	0.08	4.4
0.16	4.6%	61.2%	0.09	0.09	4.3
0.18	3.5%	64.7%	0.10	0.10	3.3
0.20	4.3%	69.1%	0.11	0.11	4.0
0.25	8.0%	77.1%	0.14	0.14	7.2
0.30	5.6%	82.7%	0.16	0.16	5.0
0.35	4.4%	87.0%	0.19	0.19	3.8
0.40	2.5%	89.5%	0.22	0.22	2.2
0.45	2.5%	92.1%	0.25	0.25	2.2
0.50	1.4%	93.5%	0.27	0.27	1.2
0.75	5.0%	98.5%	0.41	0.41	3.9
1.00	1.0%	99.5%	0.55	0.55	0.7
1.50	0.0%	99.5%	0.82	0.82	0.0
2.00	0.0%	99.5%	1.10	1.10	0.0
3.00	0.5%	100.0%	1.65	1.40	0.1
					91.8
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**85.3%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

GROVE STREET RESIDENCES

FRANKLIN, MA

SITE DESIGNATION: CDS-11

AREA	1.15	acres	**CASCADE MODEL**	CS-4	
WEIGHTED C	0.90		**PARTICLE SIZE**	110	microns
TC	6.00	minutes	**RAINFALL STATION**	69	

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Hydraulic Loading Rate (gpm/ft2)	Removal Efficiency (%)	Incremental Removal (%)
0.02	10.2%	0.74	100.0	10.2
0.04	9.6%	1.48	100.0	9.6
0.06	9.4%	2.22	100.0	9.4
0.08	7.7%	2.96	100.0	7.7
0.10	8.6%	3.70	100.0	8.6
0.12	6.3%	4.44	100.0	6.3
0.14	4.7%	5.18	100.0	4.7
0.16	4.6%	5.91	100.0	4.6
0.18	3.5%	6.65	100.0	3.5
0.20	4.3%	7.39	100.0	4.3
0.25	8.0%	9.24	100.0	8.0
0.30	5.6%	11.09	100.0	5.6
0.35	4.4%	12.94	99.7	4.4
0.40	2.5%	14.79	98.0	2.5
0.45	2.5%	16.64	96.3	2.4
0.50	1.4%	18.48	94.5	1.3
0.75	5.0%	27.73	85.8	4.3
1.00	1.0%	36.97	77.2	0.8
1.50	0.0%	55.45	59.8	0.0
2.00	0.0%	73.93	42.4	0.0
3.00	0.5%	76.08	27.7	0.1
				98.5
			Removal Efficiency Adjustment[2] =	6.5%
			Predicted % Annual Rainfall Treated =	93.4%
			Predicted Net Annual Load Removal Efficiency =	**92.0%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES
FRANKLIN, MA

Area	**0.53 ac**	Unit Site Designation	**CDS-12**
Weighted C	**0.9**	Rainfall Station #	**69**
t_c	**6 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.02	0.02	9.3
0.06	9.4%	29.3%	0.03	0.03	9.0
0.08	7.7%	37.0%	0.04	0.04	7.3
0.10	8.6%	45.6%	0.05	0.05	8.1
0.12	6.3%	51.9%	0.06	0.06	5.9
0.14	4.7%	56.5%	0.07	0.07	4.3
0.16	4.6%	61.2%	0.08	0.08	4.3
0.18	3.5%	64.7%	0.09	0.09	3.2
0.20	4.3%	69.1%	0.10	0.10	3.9
0.25	8.0%	77.1%	0.12	0.12	7.1
0.30	5.6%	82.7%	0.14	0.14	4.9
0.35	4.4%	87.0%	0.17	0.17	3.7
0.40	2.5%	89.5%	0.19	0.19	2.1
0.45	2.5%	92.1%	0.21	0.21	2.1
0.50	1.4%	93.5%	0.24	0.24	1.1
0.75	5.0%	98.5%	0.36	0.36	3.7
1.00	1.0%	99.5%	0.48	0.48	0.7
1.50	0.0%	99.5%	0.72	0.72	0.0
2.00	0.0%	99.5%	0.95	0.95	0.0
3.00	0.5%	100.0%	1.43	1.00	0.1
					90.6
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.4%
				Predicted Net Annual Load Removal Efficiency =	**84.2%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES
FRANKLIN, MA

Area	0.12 ac	Unit Site Designation	CDS-13
Weighted C	0.9	Rainfall Station #	69
t_c	6 min		
CDS Model	1515-3	CDS Treatment Capacity	1.0 cfs

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.00	0.00	9.9
0.04	9.6%	19.8%	0.00	0.00	9.4
0.06	9.4%	29.3%	0.01	0.01	9.1
0.08	7.7%	37.0%	0.01	0.01	7.5
0.10	8.6%	45.6%	0.01	0.01	8.3
0.12	6.3%	51.9%	0.01	0.01	6.1
0.14	4.7%	56.5%	0.02	0.02	4.5
0.16	4.6%	61.2%	0.02	0.02	4.5
0.18	3.5%	64.7%	0.02	0.02	3.4
0.20	4.3%	69.1%	0.02	0.02	4.2
0.25	8.0%	77.1%	0.03	0.03	7.6
0.30	5.6%	82.7%	0.03	0.03	5.3
0.35	4.4%	87.0%	0.04	0.04	4.1
0.40	2.5%	89.5%	0.04	0.04	2.4
0.45	2.5%	92.1%	0.05	0.05	2.4
0.50	1.4%	93.5%	0.05	0.05	1.3
0.75	5.0%	98.5%	0.08	0.08	4.6
1.00	1.0%	99.5%	0.11	0.11	0.9
1.50	0.0%	99.5%	0.16	0.16	0.0
2.00	0.0%	99.5%	0.22	0.22	0.0
3.00	0.5%	100.0%	0.32	0.32	0.4
					95.7

Removal Efficiency Adjustment[2] = 6.5%

Predicted % Annual Rainfall Treated = 93.5%

Predicted Net Annual Load Removal Efficiency = 89.2%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

GROVE STREET RESIDENCES
FRANKLIN, MA

Area	0.37 ac	Unit Site Designation	CB-14
Weighted C	0.9	Rainfall Station #	69
t_c	6 min		
CDS Model	1515-3	CDS Treatment Capacity	1.0 cfs

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.01	0.01	9.3
0.06	9.4%	29.3%	0.02	0.02	9.1
0.08	7.7%	37.0%	0.03	0.03	7.4
0.10	8.6%	45.6%	0.03	0.03	8.1
0.12	6.3%	51.9%	0.04	0.04	6.0
0.14	4.7%	56.5%	0.05	0.05	4.4
0.16	4.6%	61.2%	0.05	0.05	4.3
0.18	3.5%	64.7%	0.06	0.06	3.3
0.20	4.3%	69.1%	0.07	0.07	4.0
0.25	8.0%	77.1%	0.08	0.08	7.3
0.30	5.6%	82.7%	0.10	0.10	5.1
0.35	4.4%	87.0%	0.12	0.12	3.9
0.40	2.5%	89.5%	0.13	0.13	2.2
0.45	2.5%	92.1%	0.15	0.15	2.2
0.50	1.4%	93.5%	0.17	0.17	1.2
0.75	5.0%	98.5%	0.25	0.25	4.0
1.00	1.0%	99.5%	0.33	0.33	0.8
1.50	0.0%	99.5%	0.50	0.50	0.0
2.00	0.0%	99.5%	0.67	0.67	0.0
3.00	0.5%	100.0%	1.00	1.00	0.1
					92.5

Removal Efficiency Adjustment[2] = 6.5%

Predicted % Annual Rainfall Treated = 93.5%

Predicted Net Annual Load Removal Efficiency = 86.1%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

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Total Phosphorous Removal Calculations

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RJOC & ASSOCIATES, INC.
80 Montvale Ave
Stoneham MA 02180
P 781.279.0173

Name: 121 Grove Street
Franklin, MA
Client: Fairfield Grove Street LLC.
Proj. No.: 22016
Date: 2/12/2024
Computed by: MAC
Checked by: BJM

Phosphorous Loading Calculations

Land Use	Total Proposed Paved Impervious Area (Acres)	Phosphorous Loading Export (PFE)(1) (lb/Acre/Yr)	Phosphorous Load (lbs/Yr)
Multi-Family (MFR) and High-Density Residential (HDR)	9.83	2.32	22.81

BMPs Phosphorous Removal Calculations

	BMP Type	Impervious Area (Acres) I_A	Phosphorous Loading Export (PFE)(1) (lb/Acre/Yr)	Phosphorous Reduction Factor (PRF)(2) (lb/Acre/Yr)	Phosphorous Reduction (lbs/Yr)
Credit #1	PSIS-1	0.41	2.32	1.00	0.95
Credit #2	SWB-1	1.52	2.32	1.00	3.53
Credit #3	PSIS-2	0.38	2.32	0.98	0.86
Credit #4	PSIS-3	2.04	2.32	1.00	4.73
Credit #5	PSIS-4	1.24	2.32	1.00	2.88
Credit #6	PSIS-5	1.96	2.32	1.00	4.55
Credit #7	PSIS-6	0.59	2.32	1.00	1.37
Credit #8	PSIS-7	0.48	2.32	0.98	1.09
Credit #9	PSIS-8	0.38	2.32	1.00	0.88
				Total BMP Phosphorous Removal:	20.84
				Total Phosphorous Removal Rate:	**91%**

(1) - See attached Table 1-2; (2) - See attached BMP Performace Tables

Table 2-4: Nutrient reduction efficiency factors for sweeping impervious areas

Frequency[1]	Sweeper Technology	$PRF_{sweeping}$	$NFR_{sweeping}$
2/year (spring and fall)[2]	Mechanical Broom	0.01	0.01
2/year (spring and fall)[2]	Vacuum Assisted	0.02	0.02
2/year (spring and fall)[2]	High-Efficiency Regenerative Air-Vacuum	0.02	0.02
Monthly	Mechanical Broom	0.03	0.03
Monthly	Vacuum Assisted	0.04	0.04
Monthly	High Efficiency Regenerative Air-Vacuum	0.08	0.08
Weekly	Mechanical Broom	0.05	0.06
Weekly	Vacuum Assisted	0.08	0.07
Weekly	High Efficiency Regenerative Air-Vacuum	0.10	0.10

Appendix F Attachment 1

Table 1-2: Proposed average annual distinct P Load export rates for use in estimating P Load reduction credits the MA MS4 Permit

Phosphorus Source Category by Land Use	Land Surface Cover	P Load Export Rate, lbs/acre/year	P Load Export Rate, kg/ha/yr
Commercial (Com) and Industrial (Ind)	Directly connected impervious	1.78	2.0
	Pervious	See* DevPERV	See* DevPERV
Multi-Family (MFR) and High-Density Residential (HDR)	Directly connected impervious	2.32	2.6
	Pervious	See* DevPERV	See* DevPERV
Medium -Density Residential (MDR)	Directly connected impervious	1.96	2.2
	Pervious	See* DevPERV	See* DevPERV
Low Density Residential (LDR) - "Rural"	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Highway (HWY)	Directly connected impervious	1.34	1.5
	Pervious	See* DevPERV	See* DevPERV
Forest (For)	Directly connected impervious	1.52	1.7
	Pervious	0.13	0.13
Open Land (Open)	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Agriculture (Ag)	Directly connected impervious	1.52	1.7
	Pervious	0.45	0.5
*Developed Land Pervious (DevPERV)- Hydrologic Soil Group A	Pervious	0.03	0.03
*Developed Land Pervious (DevPERV)- Hydrologic Soil Group B	Pervious	0.12	0.13
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group C	Pervious	0.21	0.24
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group C/D	Pervious	0.29	0.33
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group D	Pervious	0.37	0.41

BMP Performance Tables for Soil Infiltration Rate: Infiltration Basin

		Cumulative Load Reduction				
Infiltration Rate (in/hr)	Depth of Runoff from Impervious Area (inches)	TSS	Phosphorus	Nitrogen	Zinc	Runoff Volume
1.02	0.1	67%	41%	59%	78%	25%
	0.2	94%	60%	77%	92%	42%
	0.4	96%	81%	92%	99%	66%
	0.6	99%	90%	96%	100%	79%
	0.8	100%	94%	98%	100%	87%
	1.0	100%	97%	100%	100%	91%
	1.5	100%	99%	100%	100%	96%
	2.0	100%	100%	100%	100%	98%
2.41	0.1	70%	46%	64%	82%	33%
	0.2	88%	67%	82%	95%	54%
	0.4	98%	87%	95%	100%	78%
	0.6	100%	94%	98%	100%	88%
	0.8	100%	97%	99%	100%	93%
	1.0	100%	98%	100%	100%	96%
	1.5	100%	100%	100%	100%	99%
	2.0	100%	100%	100%	100%	100%
8.27	0.1	79%	59%	75%	91%	55%
	0.2	95%	81%	92%	99%	77%
	0.4	100%	96%	99%	100%	93%
	0.6	100%	99%	100%	100%	98%
	0.8	100%	100%	100%	100%	99%
	1.0	100%	100%	100%	100%	100%
	1.5	100%	100%	100%	100%	100%
	2.0	100%	100%	100%	100%	100%

Pipe Sizing Calculations

RJOC

80 Montvale Ave

Stoneham MA 02180

P 781.279.0173

Storm Drainage Computations

Name: Fairfield at Grove Street

Client: Fairfield Grove Street LLC

Proj. No.: **22016**

Date: **2/12/2024**

Computed by: **CMM**

Checked by: **MAC**

Design Parameters:

25 Year Storm

k_e= 0.5

DESCRIPTION	LOCATION		AREA	Cn	Cn x A	SUM	TIME OF	INTENSITY	DESIGN					CAPACITY	
	FROM	TO	(AC.)			Cn x A	CONCENTRATION	IDF CURVE	Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s
To PSDS-1 (IN#1)	DCB-13	DMH-19	0.25	0.90	0.23	0.23	6.0	6.3	1.42	3.78	0.012	12	0.010	3.86	4.91
	DMH-19	DMH-20	-	-	-	0.23	6.0	6.3	1.42	6.19	0.012	12	0.040	7.72	9.83
	CB-14	DMH-20	0.37	0.90	0.33	0.33	6.0	6.3	2.10	5.13	0.012	12	0.017	5.03	6.41
	DMH-20	CDS-2	-	-	-	0.56	6.0	6.3	3.52	8.99	0.012	12	0.055	9.05	11.53
	CDS-2	PSDS-1	-	-	-	0.56	6.0	6.3	3.52	8.06	0.012	12	0.040	7.72	9.83
To PSDS-1 (IN #2)	CB-10	DMH-16	0.21	0.90	0.19	0.19	6.0	6.3	1.19	5.19	0.012	12	0.030	6.69	8.51
	CB-11	DMH-16	0.22	0.90	0.20	0.39	6.0	6.3	2.44	4.68	0.012	12	0.012	4.23	5.38
	DMH-16	DMH-17	-	-	-	0.58	6.0	6.3	3.63	3.73	0.012	18	0.005	8.05	4.55
	DCB-12	DMH-17	0.34	0.90	0.31	0.31	6.0	6.3	1.93	3.85	0.012	12	0.008	3.47	4.42
	DMH-17	CDS-1	-	-	-	0.88	6.0	6.3	5.56	4.23	0.012	18	0.005	8.05	4.55
	CDS-1	PSDS-1	-	-	-	0.88	6.0	6.3	5.56	4.49	0.012	18	0.006	8.81	4.99
To PSIS-1	BLDG-1	PSIS-1	0.41	0.90	0.37	0.37	6.0	6.3	2.32	6.77	0.012	12	0.032	6.90	8.79
Outlet to FES-1	PSIS-1	FES-1	-	-	-	-	6.0	6.3	1.0	6.11	0.012	12	0.055	9.05	11.53
Outlet to FES-2	PSDS-1	DMH-21	-	-	-	-	6.0	6.3	1.0	4.13	0.012	24	0.058	59.02	18.79
	DCB-15	DMH-21	0.44	0.90	0.40	0.40	6.0	6.3	2.5	3.77	0.012	24	0.009	23.25	7.40

80 Montvale Ave
Stoneham MA 02180
P 781.279.0173

Storm Drainage Computations

Name: Fairfield at Grove Street
Client: Fairfield Grove Street LLC

Proj. No.: **22016**
Date: **2/12/2024**
Computed by: **CMM**
Checked by: **MAC**

Design Parameters:
25 Year Storm

k_e= 0.5

DESCRIPTION	LOCATION		AREA	Cn	Cn x A	SUM	TIME OF	INTENSITY	DESIGN					CAPACITY	
	FROM	TO	(AC.)			Cn x A	CONCENTRATION	IDF CURVE	Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s
	DMH-21	FES-2	-	-	-	-	6.0	6.3	3.5	5.06	0.012	24	0.015	30.02	9.55

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DESCRIPTION	LOCATION		AREA	Cn	Cn x A	SUM	TIME OF	INTENSITY	DESIGN					CAPACITY	
	FROM	TO	(AC.)			Cn x A	CONCENTRATION	IDF CURVE	Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s
To PSDS-2 (IN#1)	CB-22	DMH-13	0.09	0.90	0.08	0.08	6.0	6.3	0.51	2.97	0.012	12	0.013	4.40	5.60
	CB-23	DMH-13	0.05	0.90	0.05	0.05	6.0	6.3	0.28	2.41	0.012	12	0.015	4.73	6.02
	DMH-13	DMH-14	-	-	-	0.13	6.0	6.3	0.79	2.54	0.012	12	0.005	2.73	3.48
	DCB-24	DMH-14	0.12	0.90	0.11	0.11	6.0	6.3	0.68	3.49	0.012	12	0.015	4.73	6.02
	DMH-14	CDS-6	-	-	-	0.23	6.0	6.3	1.47	3.97	0.012	12	0.011	4.05	5.15
	DCB-25	CDS-6	0.16	0.90	0.14	0.14	6.0	6.3	0.91	3.85	0.012	12	0.015	4.73	6.02
	CDS-6	PSDS-2	-	-	-	0.38	6.0	6.3	2.38	8.26	0.012	12	0.056	9.13	11.63
To PSDS-2 (IN#2)	CB-26	PSDS-2	0.11	0.90	0.10	0.10	6.0	6.3	0.62	3.88	0.012	12	0.024	5.98	7.61
Outlet to FES-6	PSDS-2	DMH-15	-	-	-	-	6.0	6.3	3.40	5.54	0.012	24	0.021	35.51	11.31
	DMH-15	FES-6	-	-	-	-	6.0	6.3	3.40	7.25	0.012	24	0.054	56.95	18.13
To PSDS-1 (IN #2)	BLDG-2	PSIS-2	0.37	0.90	0.33	0.33	6.0	6.3	2.10	6.98	0.012	12	0.040	7.72	9.83
Outlet to FES-5	PSIS-2	FES-5	-	-	-	-	6.0	6.3	1.10	6.89	0.012	18	0.136	41.97	23.75

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DESCRIPTION	LOCATION FROM	LOCATION TO	AREA (AC.)	Cn	Cn x A	SUM Cn x A	TIME OF CONCENTRATION	INTENSITY IDF CURVE	DESIGN Q cfs	DESIGN V fps	DESIGN n	DESIGN PIPE SIZE	DESIGN SLOPE	CAPACITY Q full ft^3/s	CAPACITY V full ft/s
To PSIS-6 (IN#1)	DCB-31	DMH-24	0.20	0.90	0.18	0.18	6.0	6.3	1.13	4.77	0.012	12	0.023	5.85	7.45
	DMH-24	CDS-9	-	-	-	0.18	6.0	6.3	1.13	3.59	0.012	12	0.010	3.86	4.91
	CB-29	DMH-23	0.03	0.90	0.03	0.03	6.0	6.3	0.17	2.18	0.012	12	0.018	5.18	6.59
	DCB-28	DMH-23	0.06	0.90	0.05	0.05	6.0	6.3	0.34	2.42	0.012	12	0.011	4.05	5.15
	DMH-24	CDS-9	-	-	-	0.18	6.0	6.3	1.13	3.45	0.012	12	0.009	3.66	4.66
	DMH-23	CDS-9	-	-	-	0.08	6.0	6.3	0.51	4.23	0.012	12	0.040	7.72	9.83
	DCB-30	CDS-9	0.22	0.90	0.20	0.20	6.0	6.3	1.25	5.17	0.012	12	0.027	6.34	8.08
	CDS-9	PSIS-6	-	-	-	0.46	6.0	6.3	2.89	8.12	0.012	12	0.046	8.28	10.54
To PSIS-6 (IN#2)	6 BG#1	PSIS-6	0.04	0.90	0.04	0.04	6.0	6.3	0.23	4.95	0.012	12	0.210	17.69	22.52
To PSDS-1 (IN #2)	6 BG#2	PSIS-6	0.04	0.90	0.04	0.04	6.0	6.3	0.23	4.95	0.012	12	0.210	17.69	22.52
Outlet to FES-8	PSIS-6	DMH-25	-	-	-	-	6.0	6.3	0.00	0.00	0.012	12	0.026	6.22	7.92
	DMH-25	FES-8	-	-	-	-	6.0	6.3	0.00	0.00	0.012	12	0.046	8.28	10.54
To PSIS-8 (IN#1)	TD-1	DMH-27	0.22	0.90	0.20	0.20	6.0	6.3	1.25	2.85	0.012	12	0.005	2.73	3.48
	DCB-36	DMH-27	0.18	0.90	0.16	0.16	6.0	6.3	1.02	4.04	0.012	12	0.016	4.88	6.22
	DMH-27	CDS-4	-	-	-	0.36	6.0	6.3	2.27	3.44	0.012	12	0.005	2.73	3.48
	CDS-4	PSIS-8	-	-	-	0.36	6.0	6.3	2.27	6.66	0.012	12	0.031	6.80	8.65
To PSIS-8 (IN#2)	CB-37	CDS-5	0.08	0.90	0.07	0.07	6.0	6.3	0.45	3.84	0.012	12	0.033	7.01	8.93
	CDS-5	PSIS-8	-	-	-	0.07	6.0	6.3	0.45	2.13	0.012	18	0.010	11.38	6.44
Outlet to FES-4	PSIS-8	DMH-28	-	-	-	-	6.0	6.3	1.00	3.97	0.012	12	0.015	4.73	6.02
	DMH-28	FES-4	-	-	-	-	6.0	6.3	1.00	5.18	0.012	12	0.033	7.01	8.93

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DESCRIPTION	LOCATION		AREA	Cn	Cn x A	SUM	TIME OF	INTENSITY	DESIGN					CAPACITY	
	FROM	TO	(AC.)			Cn x A	CONCENTRATION	IDF CURVE	Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s
To PSIS-3 (IN#1)	CB-20	DMH-12	0.08	0.90	0.07	0.07	6.0	6.3	0.45	4.44	0.012	12	0.051	8.72	11.10
	CB-21	DMH-12	0.04	0.90	0.04	0.04	6.0	6.3	0.23	3.12	0.012	12	0.048	8.46	10.77
	DMH-12	DMH-11	-	-	-	0.11	6.0	6.3	4.00	8.02	0.012	12	0.036	7.32	9.32
	CB-19	DMH-11	0.12	0.90	0.11	0.22	6.0	6.3	1.36	6.81	0.012	12	0.057	9.21	11.73
	DMH-11	DMH-10	-	-	-	0.22	6.0	6.3	1.36	2.92	0.012	12	0.005	2.73	3.48
	CB-18	DMH-10	0.05	0.90	0.05	0.26	6.0	6.3	1.64	6.70	0.012	12	0.044	8.10	10.31
	DMH-10	DMH-9	-	-	-	0.26	6.0	6.3	1.64	2.86	0.012	12	0.004	2.44	3.11
	DCB-17	DMH-9	0.15	0.90	0.14	0.14	6.0	6.3	0.85	3.03	0.012	12	0.008	3.45	4.40
	DCB-16	DMH-9	0.17	0.90	0.15	0.15	6.0	6.3	0.96	4.37	0.012	12	0.022	5.72	7.29
	DMH-9	DMH-8	-	-	-	0.55	6.0	6.3	3.46	8.70	0.012	12	0.049	8.54	10.88
	CB-8	DMH-8	0.08	0.90	0.07	0.07	6.0	6.3	0.45	2.85	0.012	12	0.014	4.57	5.81
	CB-9	DMH-8	0.06	0.90	0.05	0.05	6.0	6.3	0.34	2.91	0.012	12	0.019	5.32	6.77
	DMH-8	DMH-7	-	-	-	0.68	6.0	6.3	4.25	8.76	0.012	12	0.043	8.00	10.19
	CB-7	DMH-7	0.06	0.90	0.05	0.05	6.0	6.3	0.34	2.31	0.012	12	0.01	3.86	4.91
	CB-6	DMH-7	0.05	0.90	0.05	0.05	6.0	6.3	0.28	1.93	0.012	12	0.007	3.23	4.11
	DMH-7	DMH-6	-	-	-	0.77	6.0	6.3	4.88	7.89	0.012	12	0.028	6.46	8.22
	CB-5	DMH-6	0.02	0.90	0.02	0.02	6.0	6.3	0.11	1.62	0.012	12	0.013	4.40	5.60
	CB-4	DMH-6	0.02	0.90	0.02	0.02	6.0	6.3	0.11	1.84	0.012	12	0.029	6.57	8.37

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DESCRIPTION	LOCATION		AREA	Cn	Cn x A	SUM	TIME OF	INTENSITY	DESIGN					CAPACITY	
	FROM	TO	(AC.)			Cn x A	CONCENTRATION	IDF CURVE	Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s
	DMH-6	DMH-5	-	-	-	0.81	6.0	6.3	5.10	3.96	0.012	12	0.006	2.99	3.81
	CB-3	DMH-5	0.08	0.90	0.07	0.07	6.0	6.3	0.45	3.35	0.012	12	0.021	5.59	7.12
	DMH-5	DMH-4	-	-	-	0.88	6.0	6.3	5.56	7.19	0.012	18	0.021	16.49	9.33
	CB-32	DMH-4	0.11	0.90	0.10	0.10	6.0	6.3	0.62	3.96	0.012	12	0.025	6.10	7.77
	DMH-4	DMH-3	-	-	-	0.98	6.0	6.3	6.18	4.37	0.012	18	0.005	8.05	4.55
	CB-33	DMH-3	0.12	0.90	0.11	1.09	6.0	6.3	6.86	9.16	0.012	18	0.036	21.59	12.22
	DCB-1	DMH-2	0.12	0.90	0.11	0.11	6.0	6.3	0.68	2.40	0.012	12	0.005	2.73	3.48
	DCB-2	DMH-2	0.15	0.90	0.14	0.14	6.0	6.3	0.85	3.17	0.012	12	0.009	3.66	4.66
	DMH-2	DMH-1	-	-	-	0.24	6.0	6.3	1.53	3.02	0.012	12	0.005	2.73	3.48
	DMH-3	DMH-1	-	-	-	1.09	6.0	6.3	6.86	8.44	0.012	18	0.029	19.38	10.97
	CB-34	DMH-1	0.12	0.90	0.11	0.11	6.0	6.3	0.68	3.37	0.012	12	0.014	4.57	5.81
	DMH-1	CDS-3	-	-	-	1.44	6.0	6.3	9.07	5.02	0.012	24	0.006	18.98	6.04
	CB-35	CDS-3	0.16	0.90	0.14	0.14	6.0	6.3	0.91	6.37	0.012	12	0.076	10.64	13.55
	CDS-3	PSIS-3	-	-	-	1.58	6.0	6.3	9.98	8.88	0.012	30	0.033	80.72	16.44
To PSIS-3 (IN#2)	BLDG-3	PSIS-3	0.37	0.90	0.33	0.33	6.0	6.3	2.10	6.51	0.012	12	0.032	6.90	8.79
Outlet to FES-3	PSIS-3	DMH-26	-	-	-	-	6.0	6.3	0.20	3.78	0.012	18	0.06	27.87	15.77
	DHM-26	FES-3	-	-	-	-	6.0	6.3	0.20	1.27	0.012	18	0.008	10.18	5.76

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DESCRIPTION	LOCATION FROM	LOCATION TO	AREA (AC.)	Cn	Cn x A	SUM Cn x A	TIME OF CONCENTRATION	INTENSITY IDF CURVE	DESIGN Q cfs	DESIGN V fps	DESIGN n	DESIGN PIPE SIZE	DESIGN SLOPE	CAPACITY Q full ft^3/s	CAPACITY V full ft/s
To PSIS-4 (IN#1)	CB-57	DMH-43	0.13	0.90	0.12	0.12	6.0	6.3	0.74	2.47	0.012	12	0.005	2.73	3.48
	CB-58	DMH-43	0.17	0.90	0.15	0.15	6.0	6.3	0.96	3.50	0.012	12	0.011	4.05	5.15
	DMH-43	DMH-44	-	-	-	0.27	6.0	6.3	1.70	5.21	0.012	12	0.020	5.46	6.95
	DCB-59	DMH-44	0.25	0.90	0.23	0.23	6.0	6.3	1.42	5.28	0.012	12	0.025	6.10	7.77
	DMH-44	DMH-45	-	-	-	0.50	6.0	6.3	3.12	3.55	0.012	18	0.005	8.05	4.55
	DCB-60	DMH-45	0.25	0.90	0.23	0.23	6.0	6.3	1.42	4.26	0.012	12	0.013	4.40	5.60
	DMH-45	CDS-11	-	-	-	0.72	6.0	6.3	4.54	3.67	0.012	18	0.004	7.20	4.07
	CB-61	CDS-11	0.25	0.90	0.23	0.23	6.0	6.3	1.42	7.15	0.012	12	0.063	9.69	12.34
	CB-62	CDS-11	0.10	0.90	0.09	0.09	6.0	6.3	0.57	4.27	0.012	12	0.039	7.62	9.71
To PSDS-1 (IN #2)	CDS-11	PSIS-4	-	-	-	1.04	6.0	6.3	6.52	19.71	0.012	18	0.424	74.10	41.93
To PSIS-4 (IN#2)	CB-56	DMH-41	0.15	0.90	0.14	0.14	6.0	6.3	0.85	2.61	0.012	12	0.005	2.73	3.48
	DMH-41	DMH-40	-	-	-	0.14	6.0	6.3	0.85	2.39	0.012	12	0.004	2.44	3.11
	CB-55	DMH-40	0.19	0.90	0.17	0.17	6.0	6.3	1.08	3.95	0.012	12	0.014	4.57	5.81
	DMH-40	DMH-39	-	-	-	0.31	6.0	6.3	1.93	3.27	0.012	12	0.005	2.73	3.48
	DCB-54	DMH-39	0.08	0.90	0.07	0.07	6.0	6.3	0.43	2.37	0.012	12	0.008	3.45	4.40
	DMH-39	CDS-12	-	-	-	0.37	6.0	6.3	2.35	6.06	0.012	12	0.025	6.10	7.77
	CB-53	CDS-12	0.11	0.90	0.10	0.10	6.0	6.3	0.62	5.00	0.012	12	0.056	9.13	11.63

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	FROM	TO	(AC.)			Cn x A	CONCENTRATION	IDF CURVE	Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s
	CDS-12	PSIS-4	-	-	-	0.47	6.0	6.3	2.98	3.51	0.012	18	0.005	8.05	4.55
To PSIS-4 (IN#3)	BLDG-4	PSIS-4	0.41	0.90	0.37	0.37	6.0	6.3	2.32	7.80	0.012	12	0.05	8.63	10.99
Outlet to FES-10	PSIS-4	DMH-42	-	-	-	-	6.0	6.3	4.0	0.00	0.012	6	0.04	1.22	6.19
	DMH-42	FES-10	-	-	-	-	6.0	6.3	0.0	0.00	0.012	6	0.054	1.41	7.19

Storm Drainage Computations

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	FROM	TO	(AC.)			Cn x A	CONCENTRATION	IDF CURVE	Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s
To PSDS-3 (IN#1)	DCB-54	DMH-37	0.17	0.90	0.15	0.15	6.0	6.3	0.96	4.57	0.012	12	0.024	5.98	7.61
	DMH-37	DMH-36	-	-	-	0.15	6.0	6.3	0.96	6.14	0.012	12	0.065	9.84	12.53
	CB-53	DMH-36	0.07	0.90	0.06	0.06	6.0	6.3	0.40	5.23	0.012	12	0.104	12.45	15.85
	CB-52	DMH-36	0.13	0.90	0.12	0.12	6.0	6.3	0.74	5.21	0.012	12	0.058	9.30	11.84
	DMH-36	DMH-35	-	-	-	0.33	6.0	6.3	2.10	7.51	0.012	12	0.049	8.54	10.88
	DMH-35	CDS-8	-	-	-	0.33	6.0	6.3	2.10	5.35	0.012	12	0.019	5.32	6.77
	CDS-8	PSDS-3	-	-	-	0.33	6.0	6.3	2.10	3.34	0.012	12	0.005	2.73	3.48
To PSDS-3 (IN#2)	DCB-51	DMH-34	0.14	0.90	0.13	0.13	6.0	6.3	0.79	2.70	0.012	12	0.006	2.99	3.81
	DCB-50	DMH-34	0.38	0.90	0.34	0.34	6.0	6.3	2.15	5.19	0.012	12	0.017	5.03	6.41
	DMH-34	CDS-10	-	-	-	0.47	6.0	6.3	2.95	3.51	0.012	18	0.005	8.05	4.55
	CB-49	CDS-10	0.09	0.90	0.08	0.08	6.0	6.3	0.51	2.61	0.012	12	0.009	3.66	4.66
	CDS-10	PSDS-3	-	-	-	0.55	6.0	6.3	3.46	7.33	0.012	18	0.036	21.59	12.22
To PSDE-3 (IN#2)	BLDG-5	PSDS-3	0.41	0.90	0.37	0.37	6.0	6.3	2.32	4.37	0.012	12	0.010	3.86	4.91

Storm Drainage Computations

RJOC

80 Montvale Ave

Stoneham MA 02180

P 781.279.0173

Name: Fairfield at Grove Street

Client: Fairfield Grove Street LLC

Proj. No.: **22016**
Date: **2/12/2024**
Computed by: **CMM**
Checked by: **MAC**

Design Parameters:
25 Year Storm

k_e= 0.5

DESCRIPTION	LOCATION FROM	LOCATION TO	AREA (AC.)	Cn	Cn x A	SUM Cn x A	TIME OF CONCENTRATION	INTENSITY IDF CURVE	DESIGN Q cfs	DESIGN V fps	DESIGN n	DESIGN PIPE SIZE	DESIGN SLOPE	CAPACITY Q full ft^3/s	CAPACITY V full ft/s
TO PSIS-5	PSDS-3	DMH-33	-	-	-	-	6.0	6.3	8.40	9.19	0.012	24	0.035	45.85	14.59
											0.011				
	DMH-33	DMH-32					6.0	6.3	8.40	12.60	0.011	24	0.078	74.67	23.77
	DCB-45	DMH-32	0.05	0.90	0.05	0.05	6.0	6.3	0.28	3.01	0.011	12	0.029	7.17	9.13
	CB-46	DMH-32	0.12	0.90	0.11	0.11	6.0	6.3	0.68	5.00	0.011	12	0.045	8.93	11.37
									4.00		0.011				
	DMH-32	DMH-31	-	-	-	0.15	6.0	6.3	9.36	11.68	0.011	24	0.056	63.27	20.14
	CB-44	DMH-31	0.28	0.90	0.25	0.25	6.0	6.3	1.59	6.12	0.011	12	0.029	7.17	9.13
	CB-43	DMH-31	0.04	0.90	0.04	0.04	6.0	6.3	0.23	2.87	0.011	12	0.034	7.76	9.89
											0.011				
	DMH-31	DMH-30	-	-	-	0.44	6.0	6.3	11.18	6.81	0.011	24	0.01	26.74	8.51
	CB-42	DMH-30	0.04	0.90	0.04	0.04	6.0	6.3	0.23	3.78	0.011	12	0.059	10.23	13.02
	CB-41	DMH-30	0.04	0.90	0.04	0.04	6.0	6.3	0.23	2.74	0.011	12	0.024	6.52	8.31
											0.011				
	CB-39	DMH-29	0.06	0.90	0.05	0.05	6.0	6.3	0.34	3.96	0.011	12	0.05	9.42	11.99
	DCB-38	DMH-29	0.05	0.90	0.05	0.05	6.0	6.3	0.28	2.42	0.011	12	0.011	4.42	5.62
	CB-40	DMH-29	0.08	0.90	0.07	0.07	6.0	6.3	0.45	3.79	0.011	12	0.027	6.92	8.81
											0.011				
	DMH-29	CDS-7	-	-	-	0.17	6.0	6.3	1.08	6.64	0.011	12	0.059	10.23	13.02
	DMH-30	CDS-7	-	-	-	0.51	6.0	6.3	11.63	7.21	0.011	24	0.0112	28.29	9.01
											0.011				
	CDS-7	PSIS-5				0.68	6.0	6.3	12.71	7.09	0.011	36	0.012	86.35	12.22
Outlet to FES-9	PSIS-5	DMH-38	-	-	-	-	6.0	6.3	5.7	9.01	0.011	30	0.052	110.54	22.52
	DMH-38	FES-9	-	-	-	-	6.0	6.3	5.7	9.34	0.011	30	0.069	127.33	25.94

Storm Drainage Computations

80 Montvale Ave
Stoneham MA 02180
P 781.279.0173

Name: Fairfield at Grove Street

Client: Fairfield Grove Street LLC

Proj. No.: **22016**
Date: **2/12/2024**
Computed by: **CMM**
Checked by: **MAC**

Design Parameters:
25 Year Storm

k_e= 0.5

DESCRIPTION	LOCATION		AREA	Cn	Cn x A	SUM	TIME OF	INTENSITY	DESIGN					CAPACITY	
	FROM	TO	(AC.)			Cn x A	CONCENTRATION	IDF CURVE	Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s
To Psis-7 (IN#1)	BLDG	PSIS-7	0.18	0.90	0.16	0.16	6.0	6.3	1.02	4.64	0.012	12	0.024	5.98	7.61
To Psis-7 (IN#2)	CB-27	CDS-13	0.12	0.90	0.11	0.11	6.0	6.3	0.68	3.37	0.012	12	0.014	4.57	5.81
	CDS-13	PSIS-7	-	-	-	0.11	6.0	6.3	0.68	3.86	0.012	12	0.022	5.72	7.29
Outlet to FES-7	PSIS-7	DMH-22	-	-	-		6.0	6.3	1.30	6.97	0.012	12	0.069	10.14	12.91
	DMH-22	FES-7	-	-	-	-	6.0	6.3	1.30	7.12	0.012	12	0.067	9.99	12.72

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Rip-Rap Apron Design

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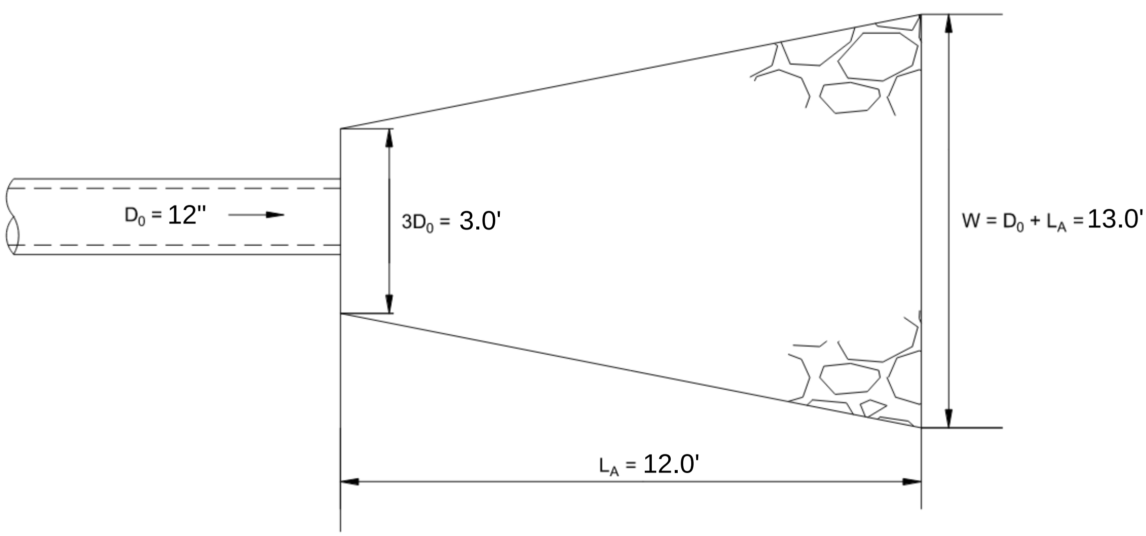
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-1

- **Outlet Pipe Diameter:** D_0 = 12" in (1.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 1.0 cfs
- **25-Year Design Storm Velocity:** V_{25} = 6.22 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (1.0)/(3(1.0)(6.22)

  T_w = 0.05 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** L_A = 12.0'

  W = $D_0 + L_A$ = 13.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

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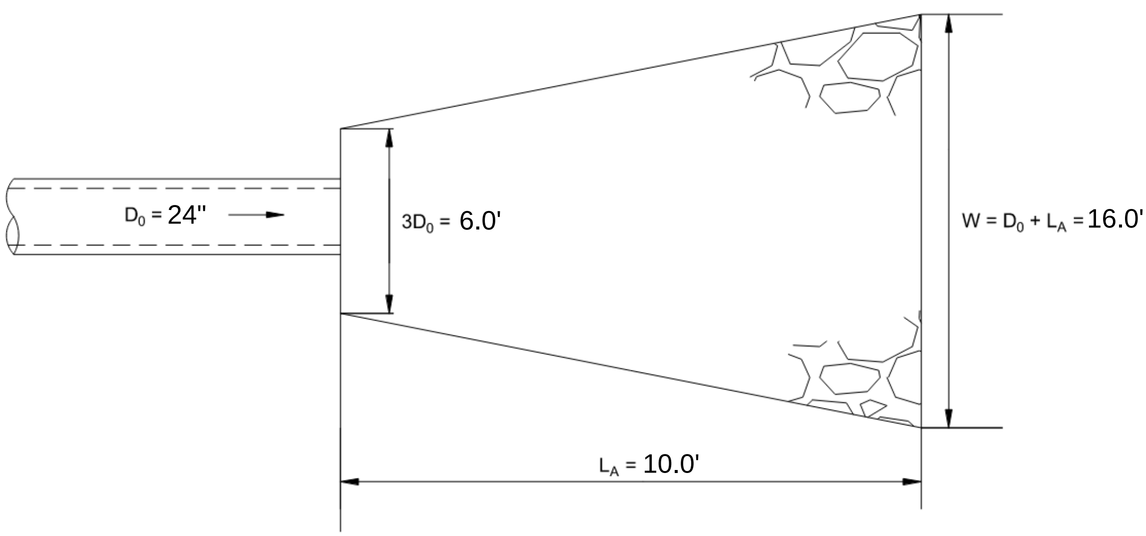
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-2

- **Outlet Pipe Diameter:** D_0 = 24" in (2.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 3.5 cfs
- **25-Year Design Storm Velocity:** V_{25} = 5.06 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (3.5)/(3(2.0)(5.06))

  T_w = 0.12 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** L_A = 12.0'

  W = D_0 + L_A = 13.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

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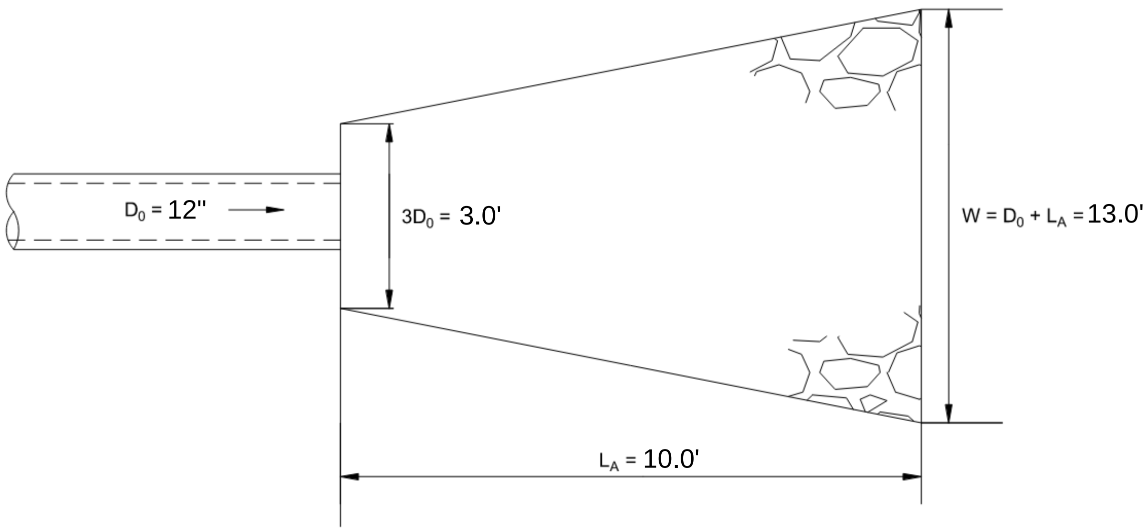
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-3

- **Outlet Pipe Diameter:** D_0 = 18" in (1.5 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 0.2 cfs
- **25-Year Design Storm Velocity:** V_{25} = 1.27 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (0.2)/(3(1.0)(1.27)

  T_w = 0.05 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** L_A = 10.0'

  W = $D_0 + L_A$ = 13.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

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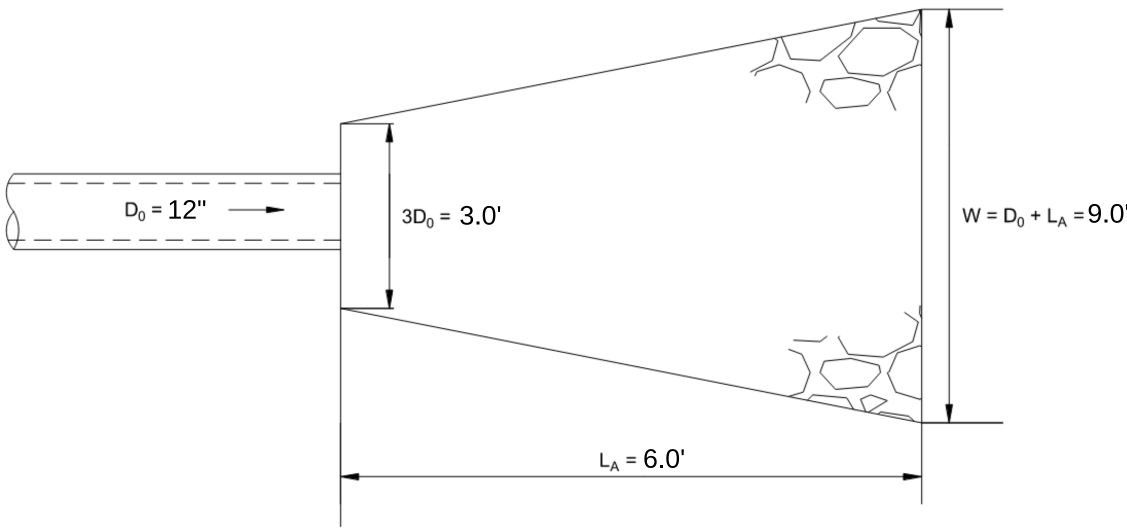
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-4

- **Outlet Pipe Diameter:** D_0 = 12" in (1.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 1.0 cfs
- **25-Year Design Storm Velocity:** V_{25} = 5.18 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (1.0)/(3(1.0)(5.45)

  T_w = 0.06 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** L_A = 6.0'

  $W = D_0 + L_A$ = 9.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

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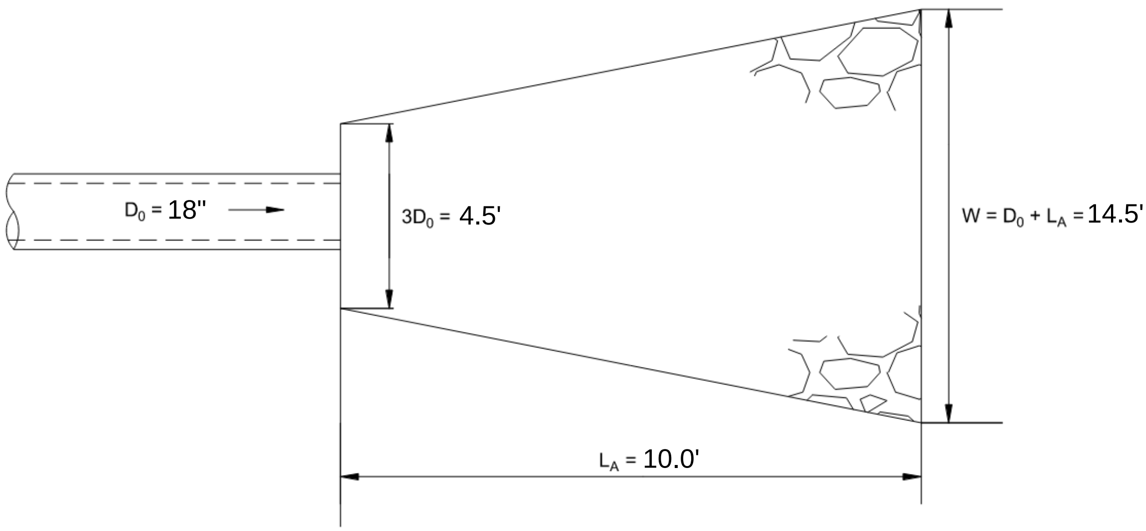
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-5

- **Outlet Pipe Diameter:** D_0 = 18" in (1.5 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 1.1 cfs
- **25-Year Design Storm Velocity:** V_{25} = 6.89 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (1.1)/(3(1.5)(6.89)

  T_w = 0.04 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** $\mathbf{L_A}$ = 10.0'

  $\mathbf{W = D_0 + L_A}$ = 14.5'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

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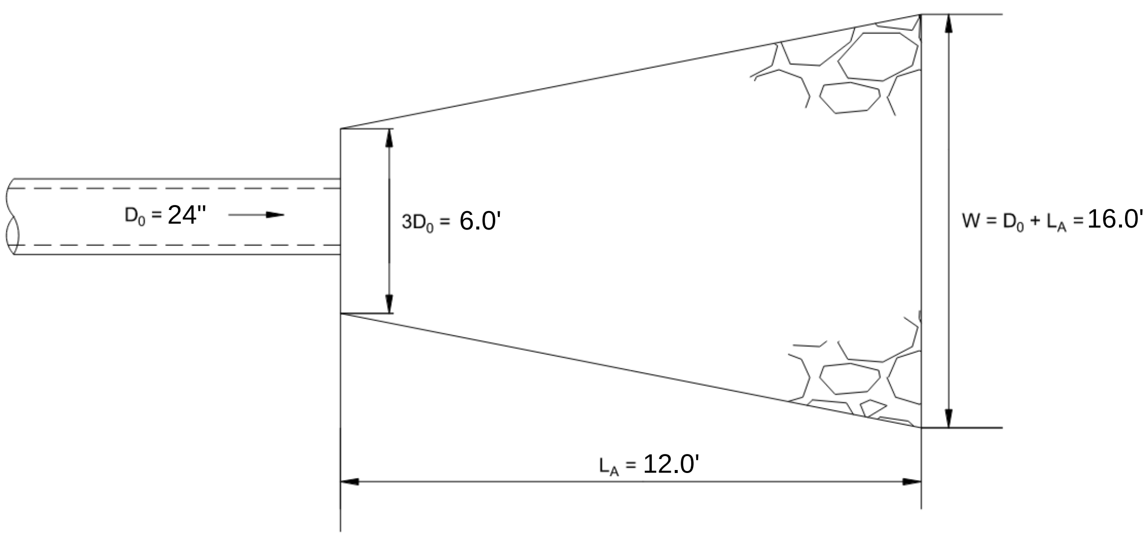
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-6

- **Outlet Pipe Diameter:** D_0 = 24" in (2.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 3.4 cfs
- **25-Year Design Storm Velocity:** V_{25} = 7.25 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (3.4)/(3(2.0)(7.25)

  T_w = 0.08 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** $\mathbf{L_A}$ **=** 12.0'

  $\mathbf{W = D_0 + L_A =}$ 16.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

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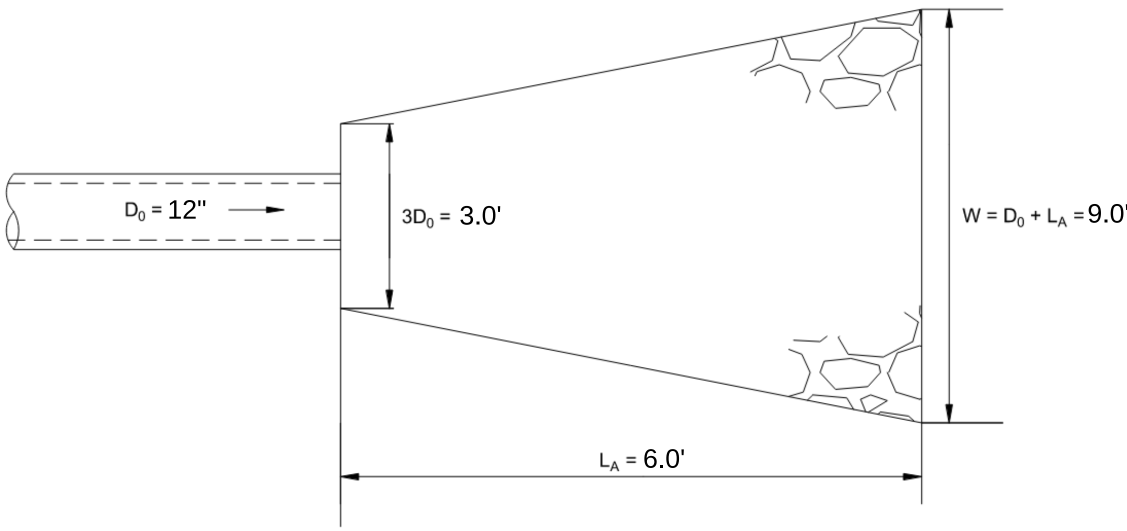
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-7

- **Outlet Pipe Diameter:** D_0 = 12" in (1.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 1.3 cfs
- **25-Year Design Storm Velocity:** V_{25} = 7.12 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (1.3)/(3(1.0)(7.12)

  T_w = 0.06 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** $\mathbf{L_A}$ = 6.0'

  $\mathbf{W = D_0 + L_A}$ = 9.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

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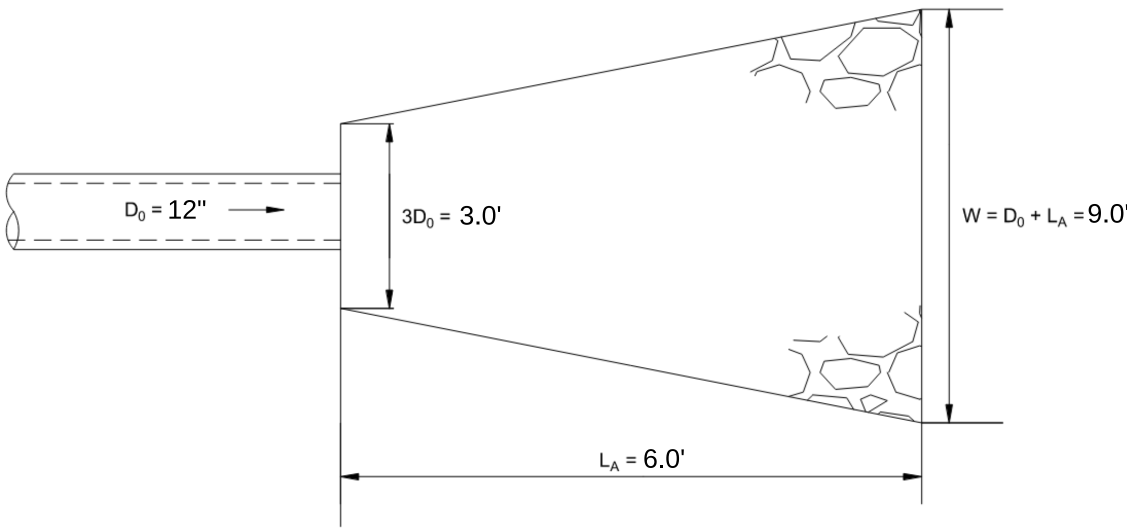
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-8

- **Outlet Pipe Diameter:** D_0 = 12" in (1.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 0.0 cfs
- **25-Year Design Storm Velocity:** V_{25} = 0.00 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (0.2)/(3(1.0)(0.00)

  T_w = 0.00 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** L_A = 6.0'

  $W = D_0 + L_A$ = 9.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

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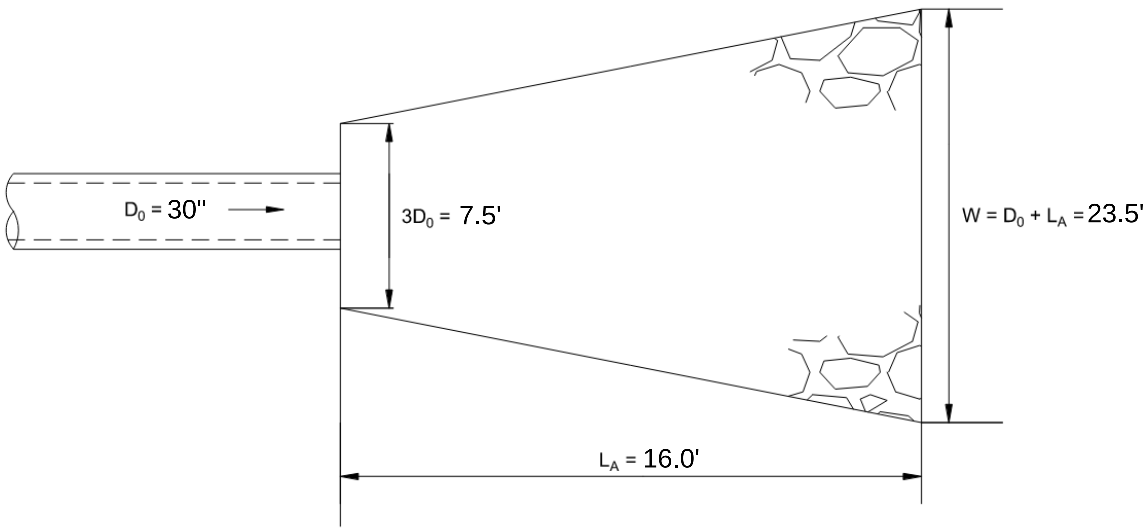
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-9

- **Outlet Pipe Diameter:** D_0 = 30" in (2.5 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 5.7 cfs
- **25-Year Design Storm Velocity:** V_{25} = 9.34 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (5.7)/(3(2.5)(9.34)

  T_w = 0.08 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** L_A = 16.0'

  $W = D_0 + L_A$ = 23.5'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

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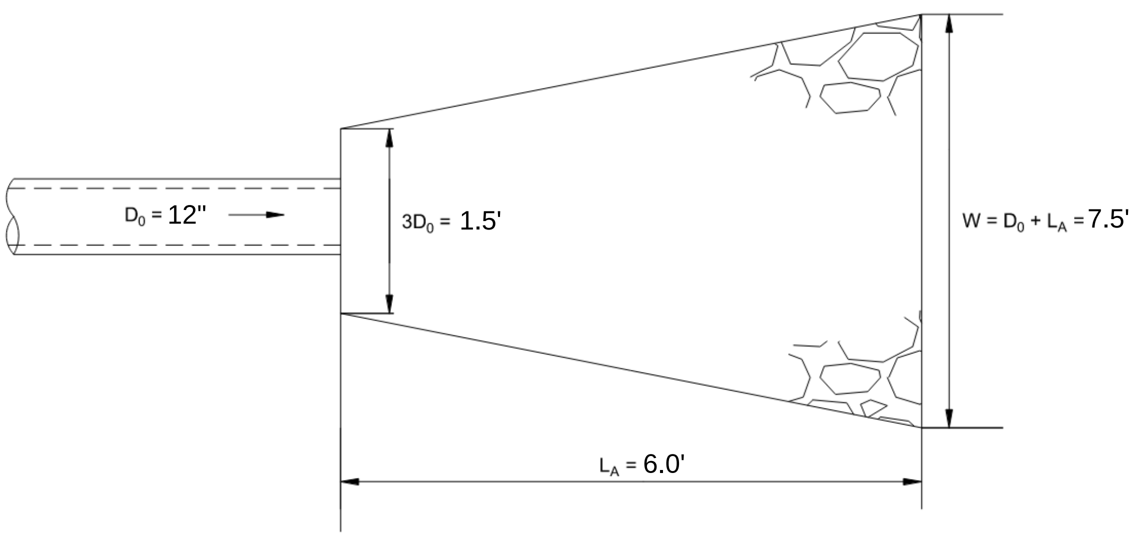
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-10

- **Outlet Pipe Diameter:** D_0 = 6" in (0.5 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 0.0 cfs
- **25-Year Design Storm Velocity:** V_{25} = 0.0 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (0.0)/(3(0.5)(0.0)

  T_w = 0.00 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

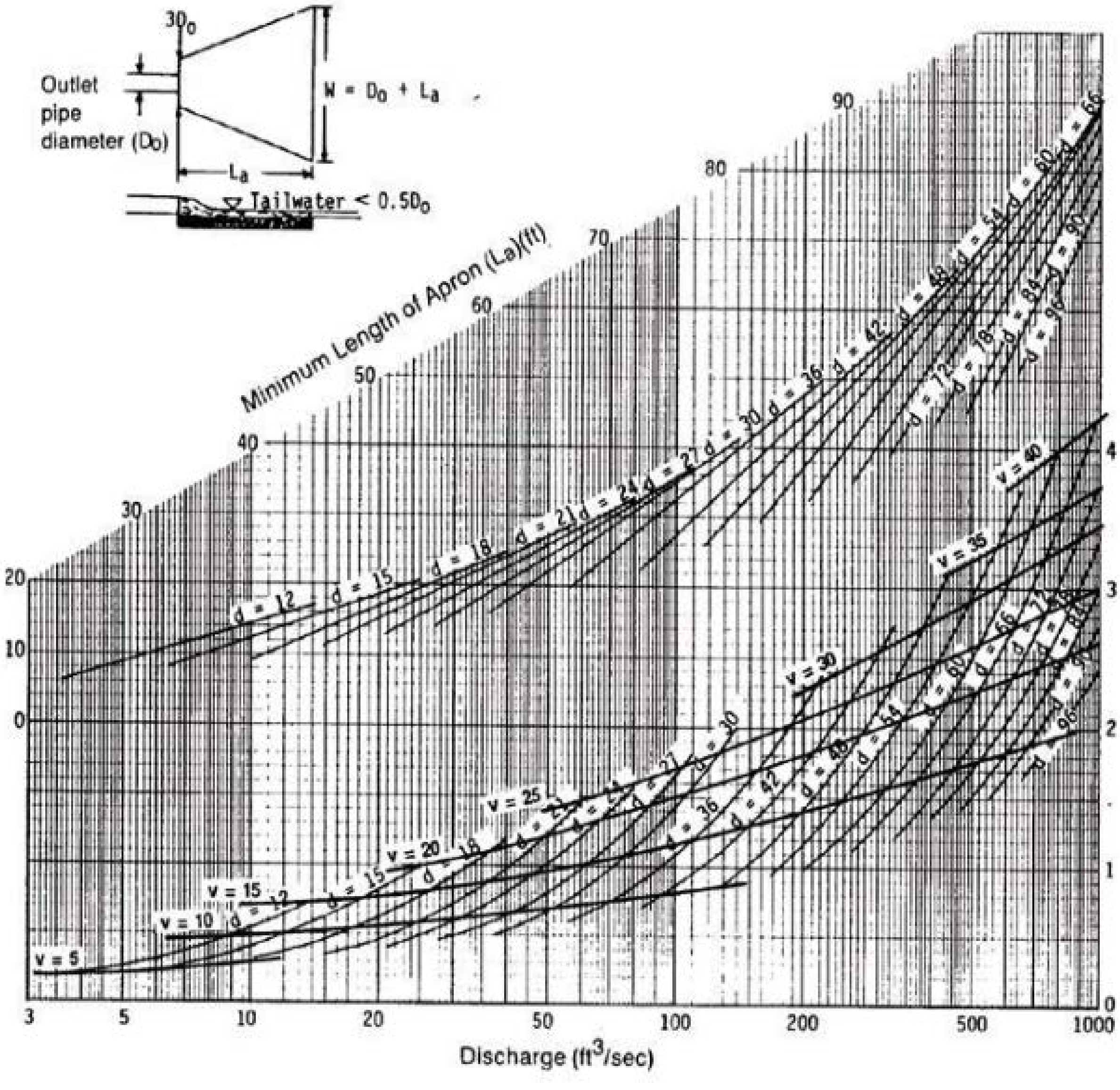
  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** $\mathbf{L_A}$ = 6.0'

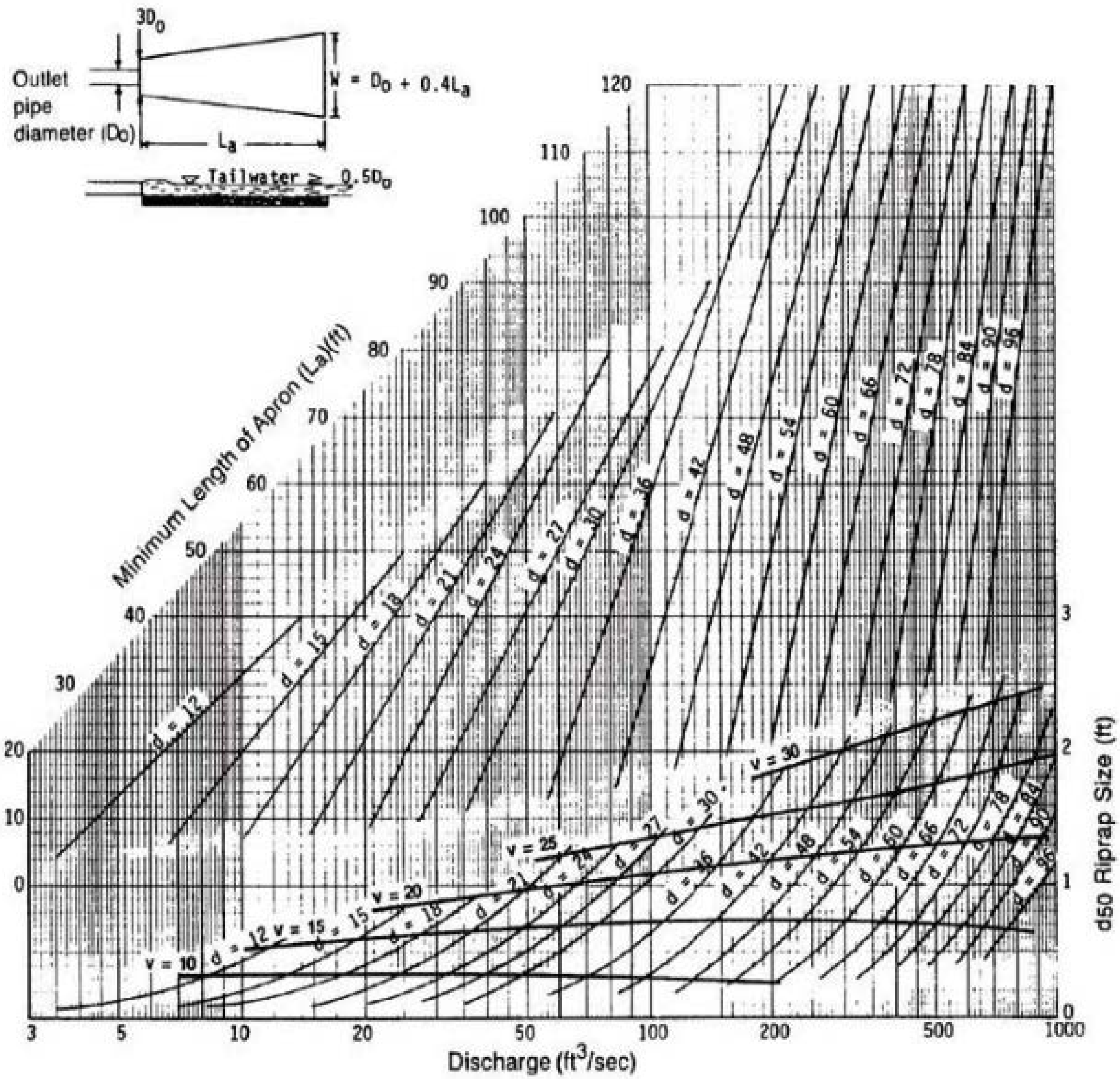
  $\mathbf{W = D_0 + L_A}$ = 7.5'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

Figure 1: Design of Riprap Apron under Minimum Tailwater Conditions:



<u>Figure 2</u>: Design of Riprap Apron under Maximum Tailwater Conditions:



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APPENDIX C
Soil Evaluation by RJ O'Connell & Associates, Inc.

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LEGEND

- TP-X ADDED TEST PITS
- TP-X APPROVED TEST PITS
- TP-X APPROVED BUT NOT EXCAVATED TEST PITS

NOTES:

1. THIS PLAN DEPICTS TEST PIT LOCATIONS ANTICIPATED REQUIRED IN ORDER TO PERFORM INVESTIGATIONS REQUIRED FOR LAND DEVELOPMENT.
2. TEST PITS SHALL BE BACKFILLED TO MATCH EXISTING GRADE. APPLY NEW ENGLAND CONSERVATION/WILDLIFE MIX TO DISTURBED AREA.
3. ON-SITE JURISDICTIONAL AREAS DEPICTED HEREON ARE AS ESTABLISHED BY THE ORAD ISSUED BY THE FRANKLIN CONSERVATION COMMISSION DATED 05/11/2023.
4. WETLAND FLAG SERIES FRW OFF THE SOUTHEAST CORNER OF THE SITE WERE REPORTEDLY FLAGGED IN AUGUST OF 2021 FOR THE OWNER OF THE ABUTTING PROPERTY. THEY WERE FIELD LOCATED BY GUERRIERE & HALNON, INC IN JANUARY OF 2022.

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Exhibits\22016_TP LOCATIONS-2.dwg
Dec 08, 2023 - 7:38am

RJOC

NO.	REVISION	DATE

NO.	REVISION	DATE
2.	ADDED BUFFER ZONES TO ISOLATED VEGETATED WETLAND & NOTES FOR TEST PIT BACKFILL AND SEEDING	10/10/2023
1.	ADD OFFSITE WETLANDS & BUFFER ZONES (OFF SE CORNER)	07/13/2023

DESIGNED BY:	MAC
DRAWN BY:	MAC
REVIEWED BY:	BJM
SCALE:	1" = 80'

PREPARED FOR:

FAIRFIELD GROVE STREET LLC
30 BRAINTREE HILL PARK
SUITE 105
BRAINTREE, MA 02184

SEAL:

PREPARED BY:

RJO'CONNELL & ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
80 MONTVALE AVENUE, SUITE 201 STONEHAM, MA 02180
PHONE: 781.279.0180 RJOCONNELL.COM

PROJECT NAME:

FAIRFIELD AT GROVE STREET
FRANKLIN, MA

DRAWING NAME:

UPDATED TEST PIT LOCATION PLAN

DRAWING NUMBER:

TP

DATE: 12/08/2023

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	293.8	Observed	Depth	Elevation	Notes
Test Pit ID	TP-01				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-6"	Ap	SL									
6-25"	Bw	Fine SL									
25"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	287.5	Observed	Depth	Elevation	Notes
Test Pit ID	TP-02				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-12"	Ap	SL									
12-25"	Bw	Fine SL									
25-34"	C1	Sand									
34-75"+	C2	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	28"	283.7	Weeping @ 38", Standing @ 59"
Reviewed by					
Surface Elevation	286	Observed	Depth	Elevation	Notes
Test Pit ID	TP-03				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-15"	Ap	SL									
15-31"	Bw	Fine SL									
31-61"+	C	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		Weeping @ 65", Standing @ 107"
Reviewed by					
Surface Elevation	286.3	Observed	Depth	Elevation	Notes
Test Pit ID	TP-04				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-11"	Ap	SL									
11-44"	Bw	Fine SL									
44-62"	C1	Sand									
62-110"+	C2	Gravel									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	286.1	Observed	Depth	Elevation	Notes
Test Pit ID	TP-05				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-10"	Ap	SL									
10-23"	Bw	Fine SL									
23-39"	C1	Sand									
39-83"	C2	Gravel									
83"	R	Ledge									

Test Pit Log

RJOC & ASSOCIATES, INC.

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	285.5	Observed	Depth	Elevation	Notes
Test Pit ID	TP-06				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-8"	Ap	SL									
8-35"	Bw	Fine SL									
35-56"	C	Sand									
56"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Observed	Depth	Elevation	Notes
Excavator	Bill	Redox	N/A	273.1	Weeping @ 101", Standing @ 113"
Logged by	Drew Gallant (SE# 14482)	.			
Reviewed by		Observed	Depth	Elevation	Notes
Surface Elevation	281.5				
Test Pit ID	TP-07				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-10"	Ap	SL									
10-23"	Bw	LS									
23-121"+	C	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/26/2023
City, State	Franklin, MA	Weather	Sunny / 61° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	95"	273.1	
Reviewed by					
Surface Elevation	281	Observed	Depth	Elevation	Notes
Test Pit ID	TP-08				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-67"	HTM	Fill									
67-84"	Bw	LS									
84-114"+	C	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Observed	Depth	Elevation	Notes
Excavator	Bill	Redox	40"	275.5	Weeping @ 44", Standing @ 52"
Logged by	Drew Gallant (SE# 14482)				
Reviewed by		Observed	Depth	Elevation	Notes
Surface Elevation	278.8				
Test Pit ID	TP-09				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-13"	Ap	SL									
13-24"	Bw	Fine SL									
24-56"+	C	LS									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/26/2023
City, State	Franklin, MA	Weather	Sunny / 61° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	52"	276.7	Weeping @ 54", Standing @ 60"
Reviewed by					
Surface Elevation	281	Observed	Depth	Elevation	Notes
Test Pit ID	TP-10				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-35"	Ap	SL									
35-49"	Bw	Fine SL									
49-68"+	C	LS									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/26/2023
City, State	Franklin, MA	Weather	Sunny / 61° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	52"	278.2	Weeping @ 58", Standing @ 61"
Reviewed by					
Surface Elevation	282.5	Observed	Depth	Elevation	Notes
Test Pit ID	TP-11				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-39"	Ap	SL									
39-51"	Bw	Fine SL									
51-67"+	C	LS									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	37"	283.8	Weeping @ 46", Standing @ 113"
Reviewed by					
Surface Elevation	286.9	Observed	Depth	Elevation	Notes
Test Pit ID	TP-12				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-15"	Ap	SL									
15-33"	Bw	Fine SL									
33-121"	C	LS									
121"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	72"		Weeping @ 78", Standing @ 105"
Reviewed by					
Surface Elevation	283.1	Observed	Depth	Elevation	Notes
Test Pit ID	TP-13				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-14"	Ap	SL									
14-27"	Bw	Fine SL									
27-118"	C	LS									
118"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	292.8	Observed	Depth	Elevation	Notes
Test Pit ID	TP-14				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-12"	Ap	SL									
12-33"	Bw	Fine SL									
33-71"	C	LS									
71"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	33"	29.5	Weeping @ 46", Standing @ 71"
Reviewed by					
Surface Elevation	296.2	Observed	Depth	Elevation	Notes
Test Pit ID	TP-15				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-14"	Ap	SL									
14-29"	Bw	Fine SL									
29-89"	C	LS									
89"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	299.8	Observed	Depth	Elevation	Notes
Test Pit ID	TP-16				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-13"	Ap	SL									
13-27"	Bw	Fine SL									
27-45"	C	LS									
45"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	307.8	Observed	Depth	Elevation	Notes
Test Pit ID	TP-17				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-14"	Ap	SL									
14-24"	Bw	Fine SL									
24-37"	C	Fine SL									
37"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	28"	307.2	Weeping @ 36"
Reviewed by					
Surface Elevation	309.5	Observed	Depth	Elevation	Notes
Test Pit ID	TP-18				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-13"	Ap	SL									
13-22"	Bw	Fine SL									
22-52"	C	SL									
52"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	34"	309.3	Weeping @ 48"
Reviewed by					
Surface Elevation	312.1	Observed	Depth	Elevation	Notes
Test Pit ID	TP-19				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-14"	Ap	SL									
14-23"	Bw	Fine SL									
23-42"	C1	Fine SL									
42-63"	C2	SL									
63"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	59"	301	Weeping @ 64", Standing @ 106"
Reviewed by					
Surface Elevation	305.9	Observed	Depth	Elevation	Notes
Test Pit ID	TP-20				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-11"	Ap	SL									
11-31"	Bw	Fine SL									
31-53"	C1	LS									
53-109"+	C2	LS									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	46"	299.3	Weeping @ 77", Standing @ 94"
Reviewed by					
Surface Elevation	303.1	Observed	Depth	Elevation	Notes
Test Pit ID	TP-21				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-11"	Ap	SL									
11-34"	Bw	Fine SL									
34-96"+	C	LS									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	39"	302	Weeping @ 67", Standing @ 89"
Reviewed by					
Surface Elevation	305.2	Observed	Depth	Elevation	Notes
Test Pit ID	TP-22				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-10"	Ap	SL									
10-32"	Bw	Fine SL									
32-91"+	C	LS									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	60"	280.9	Weeping @ 94", Standing @ 99"
Reviewed by					
Surface Elevation	285.9	Observed	Depth	Elevation	Notes
Test Pit ID	TP-23				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-11"	Ap	SL									
11-28"	Bw	Fine SL									
28-103"	C	LS									
103"	R	Ledge									

Test Pit Log

RJOC & ASSOCIATES, INC.

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	67"	275.8	Weeping @ 71", Standing @ 74"
Reviewed by					
Surface Elevation	281.4	Observed	Depth	Elevation	Notes
Test Pit ID	TP-24				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-12	Ap	SL									
12-27"	Bw	Fine SL									
27-76"+	C	LS									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	44"	274.8	Weeping @ 50", Standing @ 59"
Reviewed by					
Surface Elevation	278.5	Observed	Depth	Elevation	Notes
Test Pit ID	TP-25				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-9"	Ap	SL									
9-28"	Bw	Fine SL									
28-43"	C1	LS									
43-70"+	C2	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	30"	273.5	Weeping @ 63", Standing @ 83"
Reviewed by					
Surface Elevation	276	Observed	Depth	Elevation	Notes
Test Pit ID	TP-26				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-12"	Ap	SL									
12-25"	Bw	Fine SL									
25-91"+	C	LS									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	270.5	Observed	Depth	Elevation	Notes
Test Pit ID	TP-27				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-8"	Ap	SL									
8-22"	Bw	Fine SL									
22-43"	C	LS									
43"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	37"	272.7	
Reviewed by					
Surface Elevation	275.8	Observed	Depth	Elevation	Notes
Test Pit ID	TP-28				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-14"	Ap	SL									
14-35"	Bw	Fine SL									
35-101"	C	LS									
101"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	277	Observed	Depth	Elevation	Notes
Test Pit ID	TP-29				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-9"	Ap	SL									
9-25"	Bw	Fine SL									
25-52"	C	LS									
52"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/26/2023
City, State	Franklin, MA	Weather	Sunny / 61° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Observed	Depth	Elevation	Notes
Excavator	Bill	Redox	N/A	291.6	Weeping @ 64", Standing @ 67"
Logged by	Drew Gallant (SE# 14482)				
Reviewed by		Observed	Depth	Elevation	Notes
Surface Elevation	296.9				
Test Pit ID	TP-30				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-5"	Ap	SL									
5-30"	Bw	Fine SL									
30-72"	C	SL									
72"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/26/2023
City, State	Franklin, MA	Weather	Sunny / 61° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	53"	294.1	Weeping @ 66", Standing @ 68"
Reviewed by					
Surface Elevation	298.5	Observed	Depth	Elevation	Notes
Test Pit ID	TP-31				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-6"	Ap	SL									
6-38"	Bw	Fine SL									
38-89"+	C	SL									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/26/2023
City, State	Franklin, MA	Weather	Sunny / 61° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	29"	296.8	
Reviewed by					
Surface Elevation	299.2	Observed	Depth	Elevation	Notes
Test Pit ID	TP-32				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-4"	Ap	SL									
4-31"	Bw	Fine SL									
31-86"+	C	SL									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	59"	268	Weeping @ 60", Standing @ 63"
Reviewed by					
Surface Elevation	272.9	Observed	Depth	Elevation	Notes
Test Pit ID	TP-36				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-10"	Ap	Fine SL									
10-24"	Bw	LS									
24-45"	C1	Sand									
45-73"+	C2	Sand									

Test Pit Log

RJOC & ASSOCIATES, INC.

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	44"	268.8	Weeping @ 57", Standing @ 62"
Reviewed by					
Surface Elevation	272.5	Observed	Depth	Elevation	Notes
Test Pit ID	TP-37				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-13"	Ap	Fine SL									
13-27"	Bw	LS									
27-79"+	C	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	56"	267.1	Weeping @ 62", Standing @ 78"
Reviewed by					
Surface Elevation	271.8	Observed	Depth	Elevation	Notes
Test Pit ID	TP-38				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-14"	Ap	Fine SL									
14-28"	Bw	LS									
28-93"+	C	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Observed	Depth	Elevation	Notes
Excavator	Bill	Redox	N/A	267.2	Weeping @ 74", Standing @ 76"
Logged by	Drew Gallant (SE# 14482)				
Reviewed by		Observed	Depth	Elevation	Notes
Surface Elevation	273.4				
Test Pit ID	TP-39				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-19"	HTM	Fill									
19-34"	Bw	LS									
34-85"+	C	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	30"	285.5	Weeping @ 52", Standing @ 54"
Reviewed by					
Surface Elevation	288	Observed	Depth	Elevation	Notes
Test Pit ID	TP-40				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-14"	Ap	SL									
14-26"	Bw	Fine SL									
26-41"	C1	LS									
41-57"+	C2	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/24/2023
City, State	Franklin, MA	Weather	Partly Cloudy / 47° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	293.1	Observed	Depth	Elevation	Notes
Test Pit ID	TP-41				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-3"	Ap	SL									
3-16"	Bw	Fine SL									
16"	R	Ledge									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	283	Observed	Depth	Elevation	Notes
Test Pit ID	TP-42				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-11"	Ap	SL									
11-28"	Bw	Fine SL									
28-122"+	C	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A		
Reviewed by					
Surface Elevation	284.3	Observed	Depth	Elevation	Notes
Test Pit ID	TP-43				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-7"	Ap	SL									
7-18"	Bw	Fine SL									
18-31"	C1	LS									
31-126"+	C2	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Observed	Depth	Elevation	Notes
Excavator	Bill	Redox	38"	274	Weeping @ 60", Standing @ 73"
Logged by	Drew Gallant (SE# 14482)				
Reviewed by		Observed	Depth	Elevation	Notes
Surface Elevation	277.2				
Test Pit ID	TP-44				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-11"	Ap	SL									
11-33"	Bw	Fine SL									
33-39"	C	LS									
39-78"+	C2	Sand									

Test Pit Log

Project	121 Grove Street	Job Number	22016
Location	121 Grove Street	Date	10/25/2023
City, State	Franklin, MA	Weather	Sunny / 55° F
Property Owner	Fairfield Residential Company, LLC	Lat., Long.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	44"	303.5	Weeping @ 58", Standing @ 82"
Reviewed by					
Surface Elevation	307.2	Observed	Depth	Elevation	Notes
Test Pit ID	TP-45				

				Redoximophic Features			Coarse Fragments % B.V.				
Depth	Soil Horizon	Soil Texture	Soil Matrix	Depth	Color	%	Gravel	Cobbles & Stones	Soil Structure	Soil Consistence	Other
0-9"	Ap	SL									
9-23"	Bw	Fine SL									
23-49"	C1	LS									
49-84"+	C2	LS									

PRELIMINARY
GEOTECHNICAL ENGINEERING STUDIES
PROPOSED RESIDENTIAL DEVELOPMENT
121 GROVE STREET
FRANKLIN, MA

Prepared For:
Fairfield Residential
5 Burlington Woods Drive
Burlington MA, 01803

Prepared By:
Northeast Geotechnical, Inc.
166 Raymond Hall Drive
North Attleborough, MA 02760

Project No. O473.00
May 24, 2022

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NORTHEAST GEOTECHNICAL, INC.
Delivering Practical Engineering Solutions

May 24, 2022 Project No. O473.00

Robert D. Hewitt
Fairfield Residential
5 Burlington Woods Drive
Burlington MA, 01803

SUBJECT: Preliminary Geotechnical Engineering Report
Proposed Residential Development
121 Grove Street
Franklin, MA

Dear Robert:

Northeast Geotechnical, Inc. is pleased to present our preliminary geotechnical engineering report for the proposed residential development project at the subject site. The report summarizes our preliminary opinions about earthwork construction including rock removal, building foundations, and building ground floor slabs. In addition, this report summarizes our preliminary opinions about the general subsurface soil, bedrock and groundwater conditions anticipated to be encountered at the site and soil/bedrock reuse potential. Our services have been performed in accordance with our proposal dated January 14, 2022 and are subject to the limitations and service constraints presented in Appendix A of the enclosed report.

Please note that our preliminary geotechnical engineering conclusions and recommendations presented in this report are intended to assist the project team with preliminary evaluation of the project proposed at the subject site. This report, including the preliminary recommendations presented, is not sufficient for use as the basis for design. Additional geotechnical engineering studies will be required if the project should progress into the design phase.

We have enjoyed working with you on this project and look forward to continuing our involvement during future design and construction phases. If you have any questions or require additional information, please contact Glenn Olson, at 508-274-0887 or at golson@northeastgeotechnical.com.

Sincerely,

Northeast Geotechnical, Inc.

Glenn A. Olson
Principal Engineer

James M. Handanyan, P.E.
Principal Engineer

TABLE OF CONTENTS

1.0 INTRODUCTION

This report summarizes the results of Northeast Geotechnical's preliminary geotechnical engineering studies performed for the proposed residential building project located at 121 Grove Street in Franklin, Massachusetts. We understand that Fairfield Residential is considering a multi-building residential development on a 31±-acre parcel of land at the site.

A "Topographic Plan of Land", prepared by Alpha Land Surveying & Engineering Associates, dated January 9, 2005 was provided at the time of our proposal for this study showing the property proposed for development. The plan shows the locations of existing residential type buildings on the site fronting on Grove Street, existing topographical information, limits of wooded areas and wetlands markings.

In addition, a plan was provided entitled "Site Option #3", prepared by Allen & Major Associates, Inc. (A&M), dated November 7, 2017 showing a proposed six building development at the site. Fairfield did not have a project conceptual plan developed at the time of our proposal but indicated that in the future, the proposed site layout and building locations may look similar to the layout shown on A&M's plan. We developed and performed a subsurface exploration program based on the information available at the time of our proposal.

We were provided an additional plan prior to mobilization to the site for our subsurface exploration program. The plan titled "Existing Conditions", dated May XX, 2022, prepared by Guerriere & Halnon, Inc. showed staked test pit locations with existing ground surface elevations along with numbered wetland flags. No updated topographic information was shown on the plan.

1.1 Current Site Conditions

The project site is located on the western side of Grove Street. The eastern portion of the site, in addition to containing existing residential type buildings, appears to contain some open fields, some areas of sparse vegetation and delineated wetlands. Apparent bedrock outcroppings were visible within the open fields. The remainder of the site to the west appears to be heavily wooded and contains numerous apparent bedrock outcroppings. It appears that the delineated wetlands divide the site into three distinct areas for development with the need for two wetlands crossings to be established on site to link the areas together.

The general site grading in the area of proposed development appears to slope in a westerly to easterly direction. Existing site grading in the area of proposed development appears to vary between elevations 325± and 335± feet in the west to between elevations 265± feet and 280± feet in the east at Grove Street.

1.2 Proposed Development

RJO'Connell & Associates, Inc. has prepared an undated plan titled "Conceptual Plan W/ Topo", drawing number CP-1A. This plan shows the proposed project consisting of five residential buildings and a clubhouse building, paved parking areas, site roadways, wetlands crossings and potential stormwater basins. Existing topographical information along with proposed site grading is also presented. This plan was developed and distributed following completion of our subsurface exploration program. The plan also contains the locations of staked test pits.

2.0 SUBSURFACE EXPLORATIONS

A subsurface exploration program was coordinated and observed by Northeast Geotechnical personnel at the site on May 5 & 6, 2022. The subsurface exploration program consisted of test pits excavated by Silversmith Excavating Co., Inc. of Tewksbury, Massachusetts. The test pits were excavated using a Takeuchi model TB1140 rubber track mounted excavator having a 1± cubic yard toothed bucket and an 18± foot reach.

The soils encountered in the test pits were visually described in the field by Northeast Geotechnical personnel using Burmister's soil descriptions as indicated on the attached test pit logs (Appendix B). Observations of cobbles, boulders, bedrock and groundwater are also presented on the logs. Representative photos of the completed test pits are presented in Appendix C.

Northeast Geotechnical, Inc. prepared a proposed test pit location plan in an effort to gain representative coverage across the site and to assess general subsurface conditions in potential proposed development areas. The plan was forwarded to Fairfield Residential and Shipe Consulting Group who then engaged a surveyor to stake the test pits in the field prior to excavation. The test pits were generally excavated at the staked locations or offset a few feet due to obstructions in the woods.

Existing ground surface elevations shown on the test pit logs were established from the surveyed location stakes or estimated from the existing conditions plan where the test pit was off set from the staked locations. Ground surface elevations and references to elevations made throughout this report should therefore be considered approximate and accurate to the degree implied by the methods used. Test pit locations are shown approximately on the Subsurface Exploration Location Plans attached to this report as Figures 1 and 2.

3.0 LABORATORY TESTING

Laboratory testing was performed on representative samples of soil obtained from the test pits by Thielsch Engineering of Cranston, Rhode Island. Gradation analyses were performed on six representative samples of natural granular soils to assist us in understanding their engineering behavior. The soils laboratory test results are appended to this report (Appendix D).

4.0 GENERAL SUBSURFACE CONDITIONS

Numerous bedrock outcrops were visible throughout the surface of the site. The test pits were excavated at locations which were beyond obvious rock outcroppings observed in the field. Therefore, when estimating anticipated rock excavation quantities, it is important to understand that the bedrock surface undulates between the levels indicated in the test pits and those represented by rock outcroppings.

The general subsurface conditions at the site were assessed based upon the results of the test pit exploration program. In general, the subsurface conditions consisted of a layer of natural topsoil or topsoil fill overlying a layer of natural subsoil that appeared absent in the areas of existing fill. These layers were followed by some granular fill and then natural sand with various quantities of gravel and silt on the eastern portion of the site.

Natural, bouldery glacial till appeared to underly the natural sands on the eastern portion of the site and underly the topsoil and subsoil over much of the site to the west and in particular with the wooded areas.

The test pits terminated in apparent clustered boulders or on apparent bedrock in thirteen of the nineteen test pits observed. Groundwater and/or mottling, indicative of potential seasonal high groundwater was observed in eleven of the nineteen test pits. Greater details about the observed subsurface conditions are presented on the test pit logs contained in Appendix B and in the following paragraphs

The natural topsoil and topsoil fill were generally observed to be approximately 0.4± to 1± foot thick. Natural Subsoil encountered at the site below the natural topsoil extended approximately 1.5± to 3.5± feet below ground surface. Descriptions of the topsoil, topsoil fill and subsoil are presented in the test pit logs.

Four of the test pits encountered fill soils beneath topsoil fill at the site (TP-5, TP-7, TP-12 and TP-13). The fill was observed to extend to depths of approximately 2.5± to 4.5± feet below ground surface. The observed fill appeared to consist of primarily granular soils which would be potentially suitable for reuse provided these soils can be maintained at a suitable moisture content and in a non-frozen condition. There was some roots and topsoil mixed in with the fill however, which should be culled out prior to reuse.

Natural granular soils described on the logs as natural gravelly sand or natural sand and gravel as well as natural sand and silt were encountered in seven of the test pits (TP-1, TP-2, TP-5, TP-12, TP-13, TP-14 and TP-15). These natural granular soils were observed to extend to depths ranging from approximately 4± to 9± feet below ground surface where encountered. The natural gravelly sand/sand and gravel generally consisted of fine to coarse sand with 20± to 50± percent fine to coarse gravel, and less than 10± percent silt with cobbles and boulders. The natural sand and silt (TP-1 and TP-2) generally consisted of fine and/or fine to medium sand with 35± to 50± percent silt and less than 10± percent fine to coarse gravel.

Glacial till soil, also considered a natural granular soil, was encountered in sixteen of the nineteen test pit excavations performed. The soil is generally comprised of a heterogeneous mixture of sand, gravel, and silt to clay size particles (fines) interspersed with cobbles and boulders. In general, the glacial till soil is comprised of approximately 15± to greater than 50± percent fines. Cobbles and boulders were encountered within the glacial till deposit as indicated on the test pit logs.

Ten of the nineteen test pits terminated on an apparent bedrock surface while and additional three terminated on either tightly nested boulders or possible bedrock. Depths to these refusal conditions in the test pits varied from approximately 1± to 8± feet below ground surface.

Groundwater was observed in eight of the test pits excavated at depths of approximately 2± to 8± feet below ground surface. In some instances, mottling, which may be an indication of seasonally higher groundwater levels was observed above groundwater levels as shown on the test pit logs. In addition, apparent perched groundwater, which was observed to be flowing into some of the test pits within the subsoil layer was observed.

Groundwater levels will fluctuate due to variations in temperature, precipitation and other factors. Infiltrating storm water runoff or groundwater could become perched especially within or on top of the siltier soils or bedrock. As a result, groundwater conditions encountered during construction and during the design life of the project are likely to be different than reported herein.

5.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

The following geotechnical engineering preliminary conclusions and recommendations are presented subject to the attached Statement of Limitations in Appendix A.

5.1 General Earthwork

The following subsections provide preliminary geotechnical engineering recommendations for planning and performing earthwork at the site given the subsurface conditions encountered.

5.11 Earthwork

The topsoil, topsoil fill, subsoil, and existing fill are not considered suitable to support foundations or slabs on grade for the proposed building areas and are therefore collectively referred to as unsuitable materials. These unsuitable materials should be removed to a minimum of 10 feet beyond the buildings' exterior wall lines or within the limits defined by a one horizontal to one vertical line extending down and out from bottom of proposed exterior foundations to firm natural ground, whichever is greater. Firm natural ground is considered the natural granular soils at the site below the unsuitable materials.

Trees can be cut flush with ground surface and natural topsoil and subsoil may remain in place beneath landscaped areas and proposed pavement areas where the distance between the top of the topsoil layer and proposed finish grade is at least four feet provided these materials do not become overly disturbed. Topsoil fill and existing fill should be removed from proposed pavement areas to firm natural ground.

We anticipate the on-site materials to be used in performing the required fills on the site will consist of natural granular soils and blasted/processed bedrock. The natural silty sand and the natural glacial till soils at the site generally contain from 15± to greater than 50± percent silt. The elevated silt content on-site soils will be considered suitable for reuse as structural fill only if they can be properly placed and compacted at a suitable moisture content. These silty soils should be placed and compacted to their required degree of compaction the same day they are excavated unless they are excavated in a wet condition. Dry stockpiled soils may become unsuitable for reuse if they become too wet or frozen.

Boulders greater than eight inches in size will be encountered in the excavated glacial till soils and will be encountered when removing blasted bedrock. Boulders greater than eight inches in size should not be used in twelve-inch-thick lifts of structural fill. Rather, the chosen contractor may decide it is economically feasible to crush or otherwise process over-sized boulders along with the blasted bedrock to create a product which is suitable for use as structural fill or possibly as base course sand and gravel.

Structural fill should be placed in controlled compacted lifts. Thickness of lifts of structural fill will be a function of compaction equipment used. Fill placed in trenches, compacted using hand operated vibratory plate or roller compactors, should be placed in maximum 6-inch-thick lifts. Structural fill placed in open areas, compacted using large self-propelled ride on vibratory compactors, may be placed in maximum 12-inch-thick lifts.

Each lift of soil fill placed within the proposed building areas should be compacted to at least 95 percent of the fill material’s maximum dry density in accordance with ASTM D-1557. In proposed pavement areas, structural soil fill should be compacted to at least 90 percent of the fill material’s maximum dry density in accordance with ASTM D-1557 except for the base course layer which should be compacted to at least 95 percent. Besides meeting the minimum compaction requirements, each lift of fill should be compacted to a firm and stable condition.

Exposed natural silty sand and glacial till soils at proposed foundation and slab subgrade elevations should be protected from disturbance resulting from exposure to moisture and construction traffic as well as frost penetration. Protection of the subgrade soils should be performed from the time of excavation to subgrade elevation to the time of the foundations are adequately backfilled and the building is enclosed and heated. Subgrade soils that are not adequately protected will need to be excavated and replaced if they become disturbed or frozen. Consideration should be given to including a six-inch minimum thick layer of ¾-inch crushed stone at proposed bottom of footing elevations where foundations are anticipated to terminate in soils.

5.12 Rock Removal

Northeast Geotechnical anticipates a rock removal effort will be necessary both during mass cut operations and during trenching for utilities and foundations and other appurtenances on the site. Rock should be removed in a controlled manner to both mitigate on- and off-site effects. The chosen contractor should also consider producing a product which is suitable for reuse on-site. Blasting of bedrock produces ground induced vibrations and air blast overpressures which may have a detrimental effect on nearby structures and effect occupants.

Ground vibration and air blast overpressure limits at adjacent off-site buildings as well as at property lines should be maintained below the limits specified in Massachusetts 527 CMR 13.00: Board of Fire Protection Regulations - Explosives. Maximum allowable blast induced vibrations are established in the referenced publication in the form of frequency dependent peak particle velocities.

Pre-blast surveys of off-site buildings within 250 feet of the blasting area should be performed in accordance with The Massachusetts 527 CMR 13.00: State Board of Fire Prevention Regulations - Explosives. Pre-blast surveys should be the responsibility of the contractor. This survey will develop a record of existing conditions prior to blasting which may assist in defending blast damage claims.

In general, competent rock should be removed to the following minimum depths:

- Twelve inches (12”) below design bottom elevation of foundations,
- Six inches (6”) below bottom elevation of utility lines and utility structures,
- Eighteen inches (18”) below building floor slab elevations, and
- Twenty-four inches (24”) below pavement surface and landscaping areas.

During production blasting, the blasting contractor should be required to cover blast areas with mats to limit fly rock. Seismic blast monitoring should be performed in accordance with The State of

Massachusetts' and local regulations for each blast. The contractor and the on-site geotechnical engineering representative should provide monitoring of the blasts and evaluate compliance with specified vibration and air blast overpressure criteria.

Generally, we recommend that fill below structures be placed in controlled, compacted lifts no thicker than twelve inches. Boulder size is generally limited to two thirds the loose lift thickness which in this case will be eight inches. Blasting should therefore attempt to produce a maximum rock size of eight inches. Otherwise, the rock produced by blasting as well as oversized boulders that are otherwise excavated should be processed and crushed to produce a well-graded crushed rock with a maximum particle size of less than 8-inches for use in 12-inch lifts of compacted structural fill and less than 4-inches for use in trench backfills where fill is compacted in 6-inch lifts.

5.2 Building Foundations

It is our preliminary opinion that proposed buildings to be constructed on this site should be able to be designed to be supported using spread footing foundations provided the building and foundation subgrades are properly prepared. Spread footings should bear directly on the natural granular soils or on properly placed and compacted structural fill over the natural glacial till soils. An allowable bearing capacity of at least two tons per square foot (2 TSF) appears feasible based on our preliminary exploration program.

Bedrock encountered at or above bottom of footing elevation should be excavated to at least 12 inches below bottom of footing elevation and be replaced with compacted ¾-inch crushed stone or 4-inch minus processed rock. If the contractor elects to compact the crushed stone or processed rock with a vibratory plate compactor, the lift thickness should be limited to a maximum of 6 inches. In other words, at least two lifts will be required to reach bottom of footing elevation above excavated rock.

If in the final design, it is anticipated that all foundations for a particular building will extend to competent bedrock, a higher bearing capacity can be recommended. Recommendations can be presented during design to prepare foundation subgrades to be supported on competent rock.

5.3 Floor Slabs-on-Grade

Slab-on-grade construction should be considered suitable provided the building areas are properly prepared as recommended herein and as part of future design phase studies. We anticipate the floor slabs-on-grade will bear on a combination of natural granular soils, controlled compacted lifts of structural fill or above a shallow bedrock surface. A base course layer of "clean sand and gravel is generally recommended for slab support.

5.4 Underdrains

We anticipate flow of groundwater (perched or otherwise) may occur near surface at the interface between the natural subsoil and glacial till, or at the surface of competent bedrock. The need for underdrains to protect slabs on grade and pavement areas should be assessed as part of design phase studies and will be dependent upon the design grading plans. Additional underdrains may need to be added during construction based on the observed conditions encountered during earthwork activities.

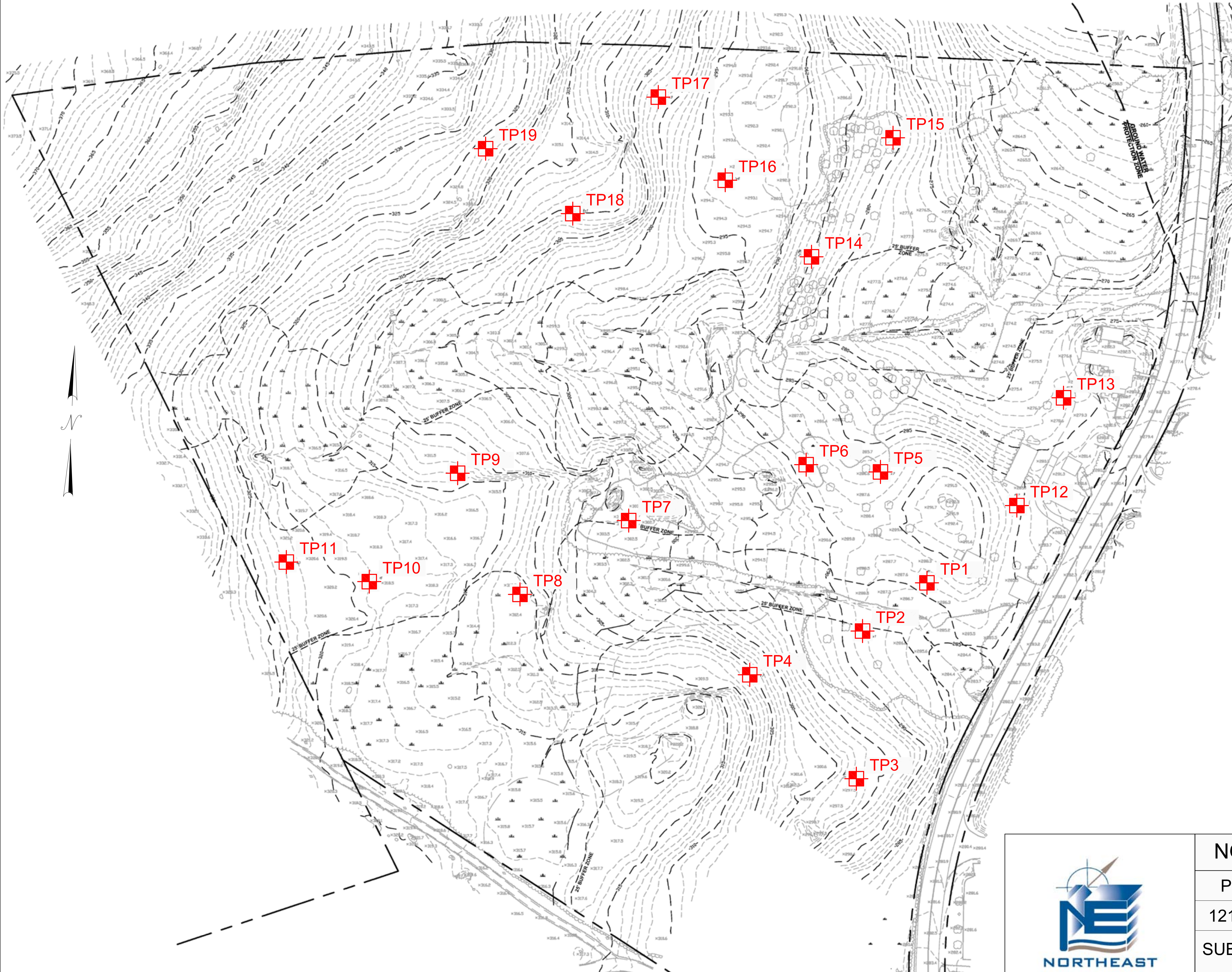
6.0 ADDITIONAL STUDIES AND SERVICES

Northeast Geotechnical, Inc. should be retained to review the proposed design grading and layout plans for the project. Then, we can develop a design phase scope of services to complete our recommendations for use in design and earthwork construction. We will complete our recommendations for allowable foundation bearing pressures, slab base course, site seismic classification, flexible pavement design, need for underdrains and additional earthwork recommendations. We anticipate there may be a need for additional subsurface explorations given the conditions encountered in the subsurface explorations performed to date and the limited overall site and proposed building area coverage.

Northeast Geotechnical, Inc. should also be retained to provide construction observation and soil testing services during the earthwork construction phase of the project. The purpose of our participation is twofold: to observe that the contractor performs earthwork in general compliance with the recommendations presented in this report, and to verify our design assumptions in the field. In addition, we can provide engineering input in a timely manner if subsurface conditions are found to vary from those anticipated prior to construction and warrant a design change or a change in earthwork procedures.

We also recommend Northeast Geotechnical be afforded the opportunity to review the foundation and site plans, and earthwork specifications prior to bidding for construction to see that our recommendations have been properly interpreted and included.

FIGURES



NOTES:

1. BASE MAP DEVELOPED FROM PLAN TITLED "EXISTING CONDITIONS", SHEET No. 1 OF 1, DATED MAY 13, 2022, ORIGINAL SCALE: 1"=60', PREPARED BY GUERRIERE & HALNON, INC.
2. TEST PIT LOCATIONS SURVEY LOCATED AT THE SITE BY GUERRIERE & HALNON, INC. EXPLORATION LOCATIONS SHOWN ON THIS PLAN SHOULD BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHODS USED.
3. TEST PITS OBSERVED AND LOGGED BY NORTHEAST GEOTECHNICAL, INC. PERSONNEL.

LEGEND:

TEST PITS PERFORMED BY SILVERSMITH EXCAVATING CO. INC. OF TEWKSBURY, MA ON MAY 5 AND 6, 2022.

NORTHEAST GEOTECHNICAL

NORTHEAST GEOTECHNICAL, INC.		
PROPOSED RESIDENTIAL DEVELOPMENT		
121 GROVE STREET		FRANKLIN, MA
SUBSURFACE EXPLORATION LOCATION PLAN		
Project No.: O473.00	Drawn By: JJP	Reviewed By: G. OLSON, P.E.
Date: 5/21/2022	Scale: 1"=140'	Figure No.: 1

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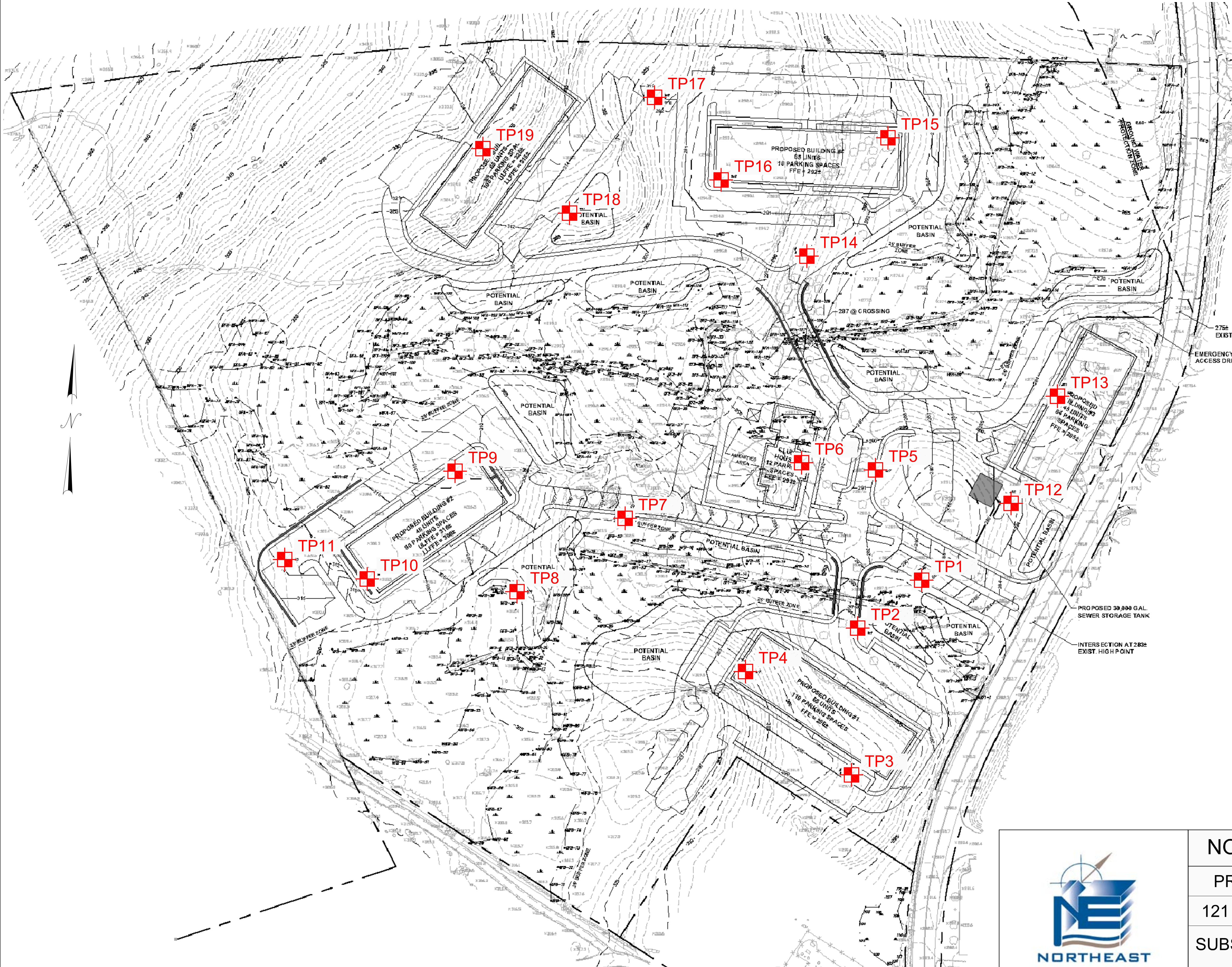

NOTES:

1. BASE MAP DEVELOPED FROM PLAN TITLED "CONCEPTUAL PLAN W / TOPO", UNDATED, ORIGINAL SCALE: 1"=60', DRAWING No. CP-1A, PREPARED BY RJO'CONNELL & ASSOCIATES, INC.
2. TEST PIT LOCATIONS SURVEY LOCATED AT THE SITE BY GUERRIERE & HALNON, INC. EXPLORATION LOCATIONS SHOWN ON THIS PLAN SHOULD BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHODS USED.
3. TEST PITS OBSERVED AND LOGGED BY NORTHEAST GEOTECHNICAL, INC. PERSONNEL.

LEGEND:

TEST PITS PERFORMED BY SILVERSMITH EXCAVATING CO. INC. OF TEWKSBURY, MA ON MAY 5 AND 6, 2022.

NORTHEAST GEOTECHNICAL

NORTHEAST GEOTECHNICAL, INC.		
PROPOSED RESIDENTIAL DEVELOPMENT		
121 GROVE STREET	FRANKLIN, MA	
SUBSURFACE EXPLORATION LOCATION PLAN		
Project No.: O473.00	Drawn By: JJP	Reviewed By: G. OLSON, P.E.
Date: 5/21/2022	Scale: 1"=140'	Figure No.: 2

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APPENDIX A

Limitations and Service Constraints

LIMITATIONS AND SERVICE CONSTRAINTS
Geotechnical Engineering Consulting Services

The opinions, conclusions and recommendations presented in this report are based upon the scope of services, information obtained through the performance of the services, and the schedule as agreed upon by Northeast Geotechnical, Inc. and the party for whom this report was originally prepared. This report is an instrument of professional service and was prepared in accordance with the generally accepted standards and level of skill and care under similar conditions and circumstances established by the geotechnical consulting industry. No representation, warranty, or guarantee, express or implied, is intended or given. To the extent that Northeast Geotechnical, Inc. relied upon any information prepared by other parties not under contract to Northeast Geotechnical, Inc. , Northeast Geotechnical, Inc. makes no representation as to the accuracy or completeness of such information. This report is expressly for the sole and exclusive use of the party for whom this report was originally prepared and/or other specifically named parties have the right to make use of and rely upon this report. Reuse of this report or any portion thereof for other than its intended purpose, or if modified, or if used by third parties, shall be at the user's sole risk.

Furthermore, nothing contained in this document shall relieve any other party of its responsibility to abide by contract documents and applicable laws, codes, regulations, or standards.

Subsurface Explorations and Testing

Results of any observations, subsurface exploration or testing, and any findings presented in this report apply solely to conditions existing at the time when Northeast Geotechnical, Inc.'s exploratory work was performed. It must be recognized that any such observations and exploratory or testing activities are inherently limited and do not represent a conclusive or complete characterization. Conditions in other parts of the project site may vary from those at the locations where data were collected and conditions can change with time. Northeast Geotechnical, Inc.'s ability to interpret exploratory and test results is related to the availability of the data and the extent of the exploratory and testing activities.

The findings, conclusions and recommendations submitted in this report are based, in part, on data obtained from subsurface borings, test pits, and specific, discrete sampling locations. The nature and extent of variation between these test locations, which may be widely spaced, may not become evident until construction. If variations are subsequently encountered, it will be necessary to re-evaluate the conclusions and recommendations of this report.

Correlations and descriptions of subsurface conditions presented in boring logs, test pit logs, subsurface profiles, and other materials are approximate only. Subsurface conditions may vary significantly from those encountered in borings and sampling locations and transitions between subsurface materials may be gradual or highly variable.

Conditions at the time water level measurements and other subsurface observations were made are presented in the boring logs or other sampling forms. This field data has been reviewed and interpretations provided in this report. However, groundwater levels may be variable and may fluctuate due to variation in precipitation, temperature, and other factors. Therefore, groundwater levels at the site at any time may be different than stated in this report.

Review

In the event that any change in the nature, design, or location of the proposed structure(s) is planned, the conclusions and recommendations in this report shall not be considered valid unless the changes are reviewed and the conclusions and recommendations of this report are modified or verified in writing.

Northeast Geotechnical, Inc. should be provided the opportunity for a general review of final design plans and specifications to assess that our recommendations have been properly interpreted and included in the design and construction documents.

Construction

To verify conditions presented in this report and modify recommendations based on field conditions encountered in the field, Northeast Geotechnical, Inc. should be retained to provide geotechnical engineering services during the construction phase of the project. This is to observe compliance with design concepts, specifications, and recommendations contained in this report, and to verify and refine our recommendations as necessary in the event that subsurface conditions differ from those anticipated prior to the start of construction.

APPENDIX B

Test Pit Logs

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA	Test Pit No.:	TP-1
		Page:	1 of 1
		File No.:	O473.00
		Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-6-2022 / Overcast, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	287± feet
		Depth to Water:	8± feet

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'–2'	Topsoil Fill 1.8'±	Dark brown, SILT, little F/M Sand, little Roots, trace F. Gravel, moist	E	0	
3'–5'	Natural Sand and Silt 5.3'±	Light brown, F/M SAND and SILT, trace (-) Roots, moist	E	0	1
6'–9'	Natural Gravelly Sand 9'±	Tan, F/C SAND, some F/C Gravel, trace Silt, occasional Cobbles, moist to wet	M	3± to 5± (A)	2
10'	Natural Glacial Till 10'±	Gray, F/C SAND, some Silt, some F/C Gravel, occasional Cobbles, wet	M	3± to 5± (A)	3
11'–15'		Bottom of test pit at 10± feet			

Notes:
1. Mottling observed at approximately 5± feet below ground surface (bgs).
2. Groundwater encountered at 8± feet bgs while excavating.
3. Test pit terminated at 10± feet bgs.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S = 15± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 3± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA	Test Pit No.:	TP-2
		Page:	1 of 1
		File No.:	O473.00
		Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-6-2022 / Overcast, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	288± feet
		Depth to Water:	4.3± feet

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
	Topsoil Fill, 0.6'±	Brown, SILT, some F/M Sand, little Roots, moist	E	0	
1'					
2'					
3'	Natural Gravelly Sand	Brown, F/C SAND, some F/C Gravel, trace Silt, moist	M	0	
4'					1
	4.6'±				2
5'					
6'					3
7'	Natural Fine Sand and Silt	Tan-gray, F. SAND and SILT, trace (-) F/C Gravel wet	M	0	
8'					
	8.5'±				4
9'		Bottom of test pit at 8.5± feet			
10'					
11'					
12'					
13'					
14'					
15'					

Notes:
1. Groundwater encountered at 4.3± feet below ground surface (bgs).
2. Mottling observed at 4.6± feet bgs.
3. Bulk soil sample collected from approximately 4.6± to 7± feet bgs.
4. Test pit terminated upon soils caving in at 8.5± feet bgs.

Test Pit Dimensions		Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S =	3± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
		6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W =	15± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
		>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG	Project: Proposed Residential Development 121 Grove Street Franklin, MA	Test Pit No.: TP-3 Page: 1 of 1 File No.: O473.00 Reviewed By: Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-6-2022 / Overcast, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	296± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
	Topsoil, 0.5'±	Dark brown, SILT, some Roots, trace F. Sand, moist	E	0	
1'–2'	Subsoil 1.7'±	Light brown, SILT, some F/M Sand, some Roots, moist	E	0	
3'–4'	Natural Glacial Till 4.2'±	Gray, F/C SAND, some F/C Gravel, little Silt, occasional Cobbles, moist	M	5± (A)	1,2
5'	Apparent Bedrock	Bottom of test pit at 4.2± feet			
6'					
7'					
8'					
9'					
10'					
11'					
12'					
13'					
14'					
15'					

Notes:

1. No mottling or redoximorphic features observed.
2. Test pit terminated upon excavator refusal on apparent bedrock at 4.2± feet below ground surface.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S = 3± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 12± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA	Test Pit No.:	TP-4
		Page:	1 of 1
		File No.:	O473.00
		Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-6-2022 / Overcast, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	305± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
	Topsoil, 0.6'±	Dark brown, SILT, little Roots, trace F. Sand, moist	E	0	
1'	Subsoil 1.5'±	Light brown, SILT, little F/M Sand, little Roots, moist	E	0	
2' – 7'	Natural Glacial Till 7.5'±	Gray-tan, F/C SAND, some F/C Gravel, little Silt, trace (-) Roots, occasional Cobbles, moist	M/D	5± to 10± (A) 3± to 5± (B)	1,2
8'	Apparent Bedrock	Bottom of test pit at 7.5± feet			
9'					
10'					
11'					
12'					
13'					
14'					
15'					

Notes:

1. No mottling or redoximorphic features observed.
2. Test pit terminated upon excavator refusal on apparent bedrock at 7.5± feet below ground surface.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
N/S = 3± feet	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 13± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-5
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	287± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil Fill 1'±	Dark brown, SILT, little F/M Sand, little F/C Gravel, little Roots, moist	E	0	
2'–2.5'	Existing Fill 2.5'±	Brown, F/C SAND, some F/C Gravel, little Silt, trace Roots, occasional Cobbles, moist	M	2± to 3± (A)	
3'–4'	Natural Sand and Gravel 4.2'±	Tan-brown, F/C SAND and F/C GRAVEL, trace Silt, occasional Cobbles, moist	M	0	
5'–6'	Natural Glacial Till 6'±	Gray, SILT and F/M SAND, some F/C Gravel, occasional Cobbles, moist	D	2± to 3± (A)	1 2
7'	Apparent Bedrock	Bottom of test pit at 6± feet			
8'					
9'					
10'					
11'					
12'					
13'					
14'					
15'					

Notes:
1. Mottling observed at approximately 4.5± feet below ground surface (bgs).
2. Test pit terminated upon excavator refusal on apparent bedrock at 6± feet bgs.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
N/S = 3± feet	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 16± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-6
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	288± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil 0.9'±	Dark brown, SILT, some F/M Sand, some Roots, trace F/C Gravel, moist	E	0	
2'	Subsoil 1.9'±	Light brown, SILT, some F/C Sand, trace F/C Gravel, trace Roots, moist	E	0	1
3'					2
4'	Natural Glacial Till	Gray-brown, F/C SAND, some F/C Gravel, little (+) Silt, moist to wet	M	5± (A) 2± to 3± (B)	3
5'					
6'	3.8'± to 5.5'± (varies) Apparent Bedrock	Bottom of test pit at 3.8± to 5.5± feet (varies)			4
7'					
8'					
9'					
10'					
11'					
12'					
13'					
14'					
15'					

Notes:

1. Mottling observed at approximately 2± feet below ground surface (bgs).
2. Bulk soil sample collected from approximately 2± to 4± feet bgs.
3. Groundwater encountered at 4± feet bgs while excavating.
4. Test pit terminated upon excavator refusal on apparent bedrock at 3.8± to 5± feet bgs (varies).

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S = 15± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 3.5± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA	Test Pit No.:	TP-7
		Page:	1 of 1
		File No.:	O473.00
		Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	308± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
	Topsoil Fill, 0.5'±	Dark brown SILT, some F/M Sand, little Roots, moist	E	0	
1'					
2'					1
3'	Existing Fill	Brown, F/C SAND, some Silt, some F/C Gravel, occasional Cobbles, moist	M	5± to 10± (A) 2± to 3± (B)	
4'					
	4.5'±				
5'	Nat'l Glacial Till, 5'±	Gray, F/C SAND, some F/C Gravel, little Silt, occasional Cobbles, moist	D	2± to 3± (A)	2,3
	Apparent Bedrock	Bottom of test pit at 5± feet			
6'					
7'					
8'					
9'					
10'					
11'					
12'					
13'					
14'					
15'					

Notes:

1. Bulk soil sample collected from approximately 1± to 4± feet below ground surface (bgs).
2. No mottling or redoximorphic features observed.
3. Test pit terminated upon excavator refusal on apparent bedrock at 5± feet bgs.

Test Pit Dimensions		Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S =	3± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
		6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W =	13± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
		>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-8
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.
Subcontractor:	Silversmith Excavating Co. Inc.
Operator:	Dave Tebbetts
Equipment:	Takeuchi TB1140 Excavator
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft
Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Northeast Geotechnical Observer:	Christian Rice, P.E.
Test Pit Location:	See Subsurface Exploration Location Plan
Ground Surface Elevation:	312± feet
Depth to Water:	2± feet (perched)

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil 0.8'±	Dark brown, SILT, some Roots, trace F. Sand, moist	E	0	
2'	Subsoil 2'±	Gray-brown, SILT, some F/M Sand, trace F/C Gravel, trace Roots, wet	M	0	1,2
3'–8'	Natural Glacial Till 8'±	Gray, F/C SAND, some Silt, some F/C Gravel, frequent Cobbles, moist to wet	D	5± to 10± (A)	3
9'–15'	Apparent Bedrock	Bottom of test pit at 8± feet			

Notes:

1. Perched groundwater encountered at 2± feet below ground surface (bgs) while excavating.
2. Mottling observed at approximately 2± feet bgs.
3. Test pit terminated upon excavator refusal on apparent bedrock at 8± feet bgs.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
N/S = 15± feet	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 3± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-9
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	313± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
	Topsoil, 0.5'±	Dark brown, SILT, some Roots, little F. Sand, moist	E	0	
1'–3'	Subsoil 3'±	Light brown, SILT and F/M SAND, little Roots, trace F/C Gravel, occasional Cobbles, moist	M	1 (B)	
4'–7'	Natural Glacial Till 6'± to 7'± (varies)	Gray-brown, F/C SAND, some (+) F/C Gravel, little (+) Silt, trace (-) Roots, frequent Cobbles, moist	D	5± to 10± (A) 2± to 3± (B)	1 2
8'–15'	Apparent Bedrock	Bottom of test pit at 6± to 7± feet (varies)			

Notes:

1. Mottling observed at approximately 5± feet below ground surface (bgs).
2. Test pit terminated upon excavator refusal on apparent bedrock at 6± to 7± feet bgs (varies).

Test Pit Dimensions		Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S =	12± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
		6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W =	3± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
		>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG	Project: Proposed Residential Development, 121 Grove Street, Franklin, MA	Test Pit No.: TP-10
		Page: 1 of 1
		File No.: O473.00
		Reviewed By: Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	319± feet
		Depth to Water:	6± feet

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil 0.8'±	Dark brown, SILT, some Roots, trace F. Sand, moist	E	0	
2'–3'	Subsoil 3.5'±	Light brown, SILT and F/M SAND, little Roots, trace F/C Gravel, occasional Cobbles, moist	E/M	3± to 5± (A)	
4'–7'	Natural Glacial Till 7'±	Gray-tan, F/C SAND, some F/C Gravel, little Silt, frequent Cobbles, moist to wet	D	5± to 10± (A) 3± to 5± (B)	1,2 (5') 3 (6') 4 (7')
8'–15'	Possible Bedrock	Bottom of test pit at 7± feet			

Notes:
1. Bulk soil sample collected from approximately 4± to 6± feet below ground surface (bgs).
2. Mottling observed at approximately 4± feet bgs.
3. Groundwater encountered at 6± feet bgs while excavating.
4. Test pit terminated upon excavator refusal on possible bedrock at 7± feet bgs.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S = 3± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 14± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA	Test Pit No.:	TP-11
		Page:	1 of 1
		File No.:	O473.00
		Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	321± feet
		Depth to Water:	3± feet (perched), 7± feet (groundwater table)

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil 1'±	Dark brown, SILT, some Roots, trace F. Sand, moist	E	0	
2' 3'	Subsoil 3'±	Gray-brown, F/M SAND and SILT, little F/C Gravel, little Roots, occasional Cobbles, moist to wet	M	3± (A)	1 2
4' 5' 6' 7' 8' 9'	Natural Glacial Till 9'±	Gray-brown, F/C SAND, some F/C Gravel, some Silt, frequent Cobbles, moist to wet	D	10± (A) 5± (B)	3 4
10' 11' 12' 13' 14' 15'		Bottom of test pit at 9± feet			

Notes:

1. Mottling observed at approximately 2.5± feet below ground surface (bgs).
2. Apparent perched groundwater encountered at 3± feet bgs while excavating.
3. Groundwater encountered at 7± feet bgs while excavating.
4. Test pit terminated at 9± feet bgs.

Test Pit Dimensions		Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S =	3± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
		6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W =	15± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
		>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-12
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	285± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil Fill 1'±	Dark brown, SILT, some F/M Sand, little (+) F/C Gravel, little Roots, moist	E	0	
2' 3'	Existing Fill 2.7'±	Brown, SILT, some F/M Sand, little F/C Gravel, trace Roots, occasional Cobbles, moist	M	2	
4' 5' 6' 7'	Natural Gravelly Sand 7.2'±	Tan, F/C SAND, some F/C Gravel, trace Silt, occasional Cobbles, moist	M	5± (A) 2± to 3± (B)	1,2
8' 9' 10' 11' 12' 13' 14' 15'		Bottom of test pit at 7.2± feet			

Notes:
1. No mottling or redoximorphic features observed.
2. Test pit terminated upon excavator refusal on apparent boulders at 7.2± feet below ground surface.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S = 3± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 12± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-13
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	278± feet
		Depth to Water:	5± feet

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil Fill, 0.8'±	Drk. brown, SILT, some F/M Sand, some Roots, little F. Gravel	E	0	
2'	Existing Fill	Tan, F/C SAND, some F/C Gravel, trace Silt, trace Brick, occasional Cobbles, isolated pockets of buried Topsoil/Roots, moist		2± to 3± (A) 3± to 5± (B)	
3'	2.5'±		E		
4'					1
5'					
6'	Natural Gravelly Sand	Tan, F/C SAND, some F/C Gravel, trace Silt, frequent Cobbles, moist to wet		5± to 10± (A)	2
7'					
8'	8'±		M		
9'	Natural Glacial Till 9'±	Gray, F/C SAND and SILT, some F/C Gravel, frequent Cobbles, wet	M	3± to 5± (A) 1 (B)	3,4
10'		Bottom of test pit at 9± feet			
11'					
12'					
13'					
14'					
15'					

Notes:
1. Bulk soil sample collected from approximately 3± to 6± feet below ground surface (bgs).
2. Groundwater encountered at 5± feet bgs while excavating.
3. No mottling or redoximorphic features observed.
4. Test pit terminated at 9± feet bgs.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
N/S = 3± feet	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 13± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-14
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	285± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil 1'±	Dark brown, SILT, some F. Sand, little Roots, moist	E	0	
2' 3'	Subsoil 3'±	Light brown, SILT, some F/M Sand, little Roots, occasional Cobbles, moist	E	3± to 5± (A)	
4' 5'	Natural Gravelly Sand 5.5'±	Tan, F/C SAND, some (+) F/C Gravel, trace Silt, frequent Cobbles, moist	M	5± to 10± (A) 2± to 3± (B)	
6' 7' 8'	Natural Glacial Till 8'±	Gray, F/C SAND, some (+) Silt, some F/C Gravel, frequent Cobbles, moist	M	5± to 10± (A)	1 2
9' 10' 11' 12' 13' 14' 15'		Bottom of test pit at 8± feet			

Notes:

1. Mottling observed at approximately 6± feet below ground surface (bgs).
2. Test pit terminated at 8± feet bgs.

Test Pit Dimensions		Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S =	13± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
		6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W =	3± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
		>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-15
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.
Subcontractor:	Silversmith Excavating Co. Inc.
Operator:	Dave Tebbetts
Equipment:	Takeuchi TB1140 Excavator
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft
Date/Weather:	5-5-2022 / Clear, 50s to 60s °F
Northeast Geotechnical Observer:	Christian Rice, P.E.
Test Pit Location:	See Subsurface Exploration Location Plan
Ground Surface Elevation:	280± feet
Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil 1'±	Dark brown, SILT and F/M SAND, some Roots, trace F/C Gravel, moist	E	0	
2'–3'	Subsoil 2.8'±	Light brown, F/C SAND, some Silt, little F/C Gravel, trace Roots, occasional Cobbles, moist	M	3± to 5± (A)	
4'–7'	Natural Gravelly Sand 6.5'±	Tan, F/C SAND, some F/C Gravel, trace (+) Silt, frequent Cobbles, moist	M/D	10± (A) 5± (B)	
8'	Natural Glacial Till 8'±	Gray-tan, F/C SAND, some Silt, little F/C Gravel, occasional Cobbles, moist	D	3± to 5± (A)	1,2
9'–15'		Bottom of test pit at 8± feet			

Notes:
1. No mottling or redoximorphic features observed.
2. Test pit terminated upon excavator refusal on apparent boulders at 8± feet below ground surface.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
	Diameter	Class			
N/S = 3± feet	6" - 18"	A	Trace (T): 0-10%	F = Fine	E = Easy
	18" - 36"	B	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 15± feet	>36"	C	Some (So): 20-35%	C = Coarse	D = Difficult
			And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA	Test Pit No.:	TP-16
		Page:	1 of 1
		File No.:	O473.00
		Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-6-2022 / Overcast, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	293± feet
		Depth to Water:	1± foot (perched), 4± feet (groundwater)

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil 1'±	Dark brown, SILT and ROOTS, trace F. Sand, moist	E	0	1
2'	Subsoil 2'±	Light brown-gray-rust, SILT and F/M SAND, little Roots, trace F/C Gravel, wet	E	0	2
3'					
4'					3
5'	Natural Glacial Till	Gray-brown, F/C SAND, some F/C Gravel, little Silt, frequent Cobbles, moist to wet	M	5± to 10± (A) 3± to 5± (B)	
6'					
7'					
8'	7.5'±				4
	Possible Bedrock	Bottom of test pit at 7.5± feet			
9'					
10'					
11'					
12'					
13'					
14'					
15'					

Notes:
1. Apparent perched groundwater encountered at 1± foot below ground surface (bgs) while excavating.
2. Mottling observed at approximately 2± feet bgs.
3. Grounwater encountered at 4± feet bgs while excavating.
4. Test pit terminated upon excavator refusal on possible bedrock at 7.5± feet bgs.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
N/S = 3± feet	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 16± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA	Test Pit No.:	TP-17
		Page:	1 of 1
		File No.:	O473.00
		Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-6-2022 / Overcast, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	301± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil 0.6'±	Dark brown, SILT, some Roots, trace (-) F. Sand, moist	E	0	
2'–3'	Subsoil 3'±	Light brown, SILT, some F/M Sand, little Roots, trace F. Gravel, moist	E	0	
4'–8'	Natural Glacial Till 8.5'±	Gray-tan., F/C SAND, some (+) F/C Gravel, little Silt, frequent Cobbles, moist	D	10± to 15± (A) 5± to 10± (B) 3± to 5± (C)	1
9'–15'		Bottom of test pit at 8.5± feet (refusal on apparent boulders)			2,3

Notes:
1. Bulk soil sample collected from approximately 3± to 5± feet below ground surface (bgs).
2. No mottling or redoximorphic features observed.
3. Test pit terminated upon excavator refusal on apparent boulders at 8.5± feet bgs.

Test Pit Dimensions		Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S =	3± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
		6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W =	17± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
		>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-18
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.

Subcontractor:	Silversmith Excavating Co. Inc.	Date/Weather:	5-6-2022 / Overcast, 50s to 60s °F
Operator:	Dave Tebbetts	Northeast Geotechnical Observer:	Christian Rice, P.E.
Equipment:	Takeuchi TB1140 Excavator	Test Pit Location:	See Subsurface Exploration Location Plan
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft	Ground Surface Elevation:	309± feet
		Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
1'	Topsoil 0.8'±	Dark brown, SILT, some Roots, trace F. Sand, moist	E	1 (A)	
2'	Subsoil	Light brown, SILT, some F/M Sand, little Roots, trace F/C Gravel, occasional Cobbles, moist	M	2± to 3± (A) 2 (C)	
3'	1'± to 2.5'± (varies) Apparent Bedrock	Bottom of test pit at 1± to 2.5± feet (varies)			1,2
4'					
5'					
6'					
7'					
8'					
9'					
10'					
11'					
12'					
13'					
14'					
15'					

Notes:
1. No mottling or redoximorphic features observed.
2. Test pit terminated upon excavator refusal on apparent bedrock at 1± to 2.5± feet below ground surface (varies).

Test Pit Dimensions		Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S =	5± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
		6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W =	14± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
		>36"	C	And: 35-50%	F/M = Fine to Medium	

NORTHEAST GEOTECHNICAL, INC.

TEST PIT LOG

Project:	Proposed Residential Development 121 Grove Street Franklin, MA
Test Pit No.:	TP-19
Page:	1 of 1
File No.:	O473.00
Reviewed By:	Glenn Olson, P.E.
Subcontractor:	Silversmith Excavating Co. Inc.
Operator:	Dave Tebbetts
Equipment:	Takeuchi TB1140 Excavator
Capacity/Reach:	1± cubic yard toothed bucket / 18± ft
Date/Weather:	5-6-2022 / Overcast, 50s to 60s °F
Northeast Geotechnical Observer:	Christian Rice, P.E.
Test Pit Location:	See Subsurface Exploration Location Plan
Ground Surface Elevation:	323± feet
Depth to Water:	None Observed

Depth	Strata Change	Soil Description (Burmister Identification System)	Excavation Effort	Boulder Count	Note No.
	Topsoil, 0.4'±	Dark brown, SILT, some Roots, trace (-) F. Sand, moist	E	0	
1'–2'	Subsoil 2'±	Light brown, SILT, some F/M Sand, little Roots, trace F/C Gravel, occasional Cobbles, moist	E	3± to 5± (A)	
3'–6'	Natural Glacial Till 6'±	Gray, F/C SAND, some (+) F/C Gravel, little Silt, frequent Cobbles, moist	D	10± (A) 3± to 5± (B) 1 (C)	1,2
7'–15'	Apparent Bedrock	Bottom of test pit at 6± feet			

Notes:

1. No mottling or redoximorphic features observed.
2. Test pit terminated upon excavator refusal on apparent bedrock at 6± feet below ground surface.

Test Pit Dimensions	Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
N/S = 3.5± feet	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
	6" - 18"	A	Little (Li): 10-20%	M = Medium	M = Moderate
E/W = 12± feet	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
	>36"	C	And: 35-50%	F/M = Fine to Medium	

APPENDIX C

Test Pit Photos

NORTHEAST GEOTECHNICAL, INC.

Photograph #1

Description of Photograph:
Test Pit TP-1

Photograph Taken By:
Christian Rice dated 5-6-2022

Photograph #2

Description of Photograph:
Test Pit TP-2

Photograph Taken By:
Christian Rice dated 5-6-2022

NORTHEAST GEOTECHNICAL, INC.

Photograph #3

Description of Photograph:
Test Pit TP-3

Photograph Taken By:
Christian Rice dated 5-6-2022

Photograph #4

Description of Photograph:
Test Pit TP-4

Photograph Taken By:
Christian Rice dated 5-6-2022

Photograph #5

Description of Photograph:
Test Pit TP-5

Photograph Taken By:
Christian Rice dated 5-5-2022

Photograph #6

Description of Photograph:
Test Pit TP-6

Photograph Taken By:
Christian Rice dated 5-5-2022

Photograph #7

Description of Photograph:
Test Pit TP-7

Photograph Taken By:
Christian Rice dated 5-5-2022

Photograph #8

Description of Photograph:
Test Pit TP-8

Photograph Taken By:
Christian Rice dated 5-5-2022

NORTHEAST GEOTECHNICAL, INC.

Photograph #9

Description of Photograph:
Test Pit TP-9

Photograph Taken By:
Christian Rice dated 5-5-2022

Photograph #10

Description of Photograph:
Test Pit TP-10

Photograph Taken By:
Christian Rice dated 5-5-2022

NORTHEAST GEOTECHNICAL, INC.

Photograph #11

Description of Photograph:
Test Pit TP-11

Photograph Taken By:
Christian Rice dated 5-5-2022

Photograph #12

Description of Photograph:
Test Pit TP-12

Photograph Taken By:
Christian Rice dated 5-5-2022

NORTHEAST GEOTECHNICAL, INC.

Photograph #13

Description of Photograph:
Test Pit TP-13

Photograph Taken By:
Christian Rice dated 5-5-2022

Photograph #14

Description of Photograph:
Test Pit TP-14

Photograph Taken By:
Christian Rice dated 5-5-2022

Photograph #15

Description of Photograph:
Test Pit TP-15

Photograph Taken By:
Christian Rice dated 5-5-2022

Photograph #16

Description of Photograph:
Test Pit TP-16

Photograph Taken By:
Christian Rice dated 5-6-2022

NORTHEAST GEOTECHNICAL, INC.

Photograph #17

Description of Photograph:
Test Pit TP-17

Photograph Taken By:
Christian Rice dated 5-6-2022

Photograph #18

Description of Photograph:
Test Pit TP-18

Photograph Taken By:
Christian Rice dated 5-6-2022

NORTHEAST GEOTECHNICAL, INC.

Photograph #19

Description of Photograph:
Test Pit TP-19

Photograph Taken By:
Christian Rice dated 5-6-2022

APPENDIX D

Soil Laboratory Test Results

THIELSCH ENGINEERING	195 Frances Avenue Cranston RI, 02910 Phone: (401)-467-6454 Fax: (401)-467-2398 thielsch.com *Let's Build a Solid Foundation*	Client Information: Northeast Geotechnical, Inc. North Attleboro, MA PM: Glenn A. Olson, P. E. Assigned By: Glenn A. Olson, P. E. Collected By: Christian Rice	Project Information: **Proposed Residential Development** **Franklin, MA** NEG Project Number: O473.00 Summary Page: 1 of 1 Report Date: 05.13.22

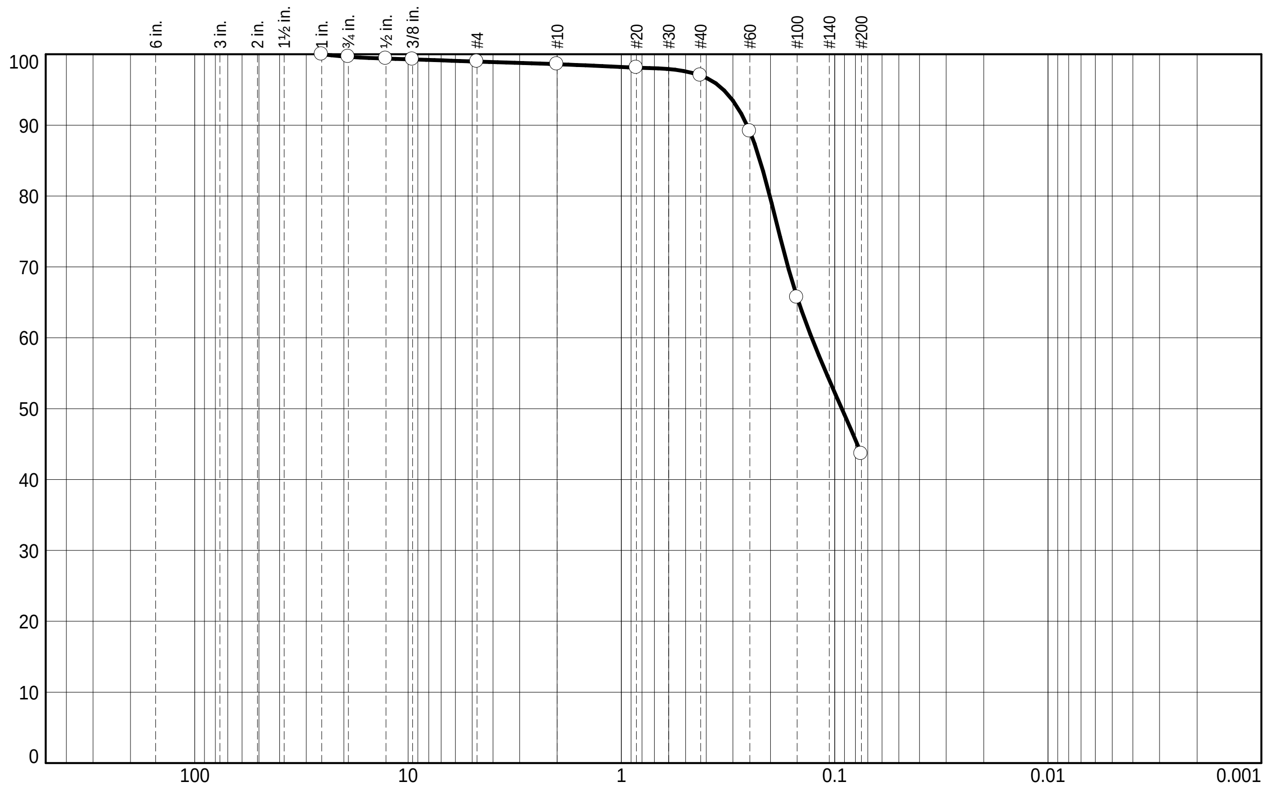
LABORATORY TESTING DATA SHEET, Report No.: 7422-E-119

Boring No.	Sample No.	Depth (ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Received Moisture Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	pH	Dry unit wt. (pcf)	Test Moisture Content %	γ_d MAX (pcf) W_{opt} (%)	γ_d MAX (pcf) W_{opt} (%) (Corr.)	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318		D6913			D2974	D4792			D1557						
TP-2	S-1	4.6-7	22-S-1492				1.0	55.4	43.6											Brown silty sand
TP-6	S-1	2-4	22-S-1493				31.7	48.6	19.7											Brown silty sand with gravel
TP-7	S-1	1-4	22-S-1494				23.3	45.4	31.3											Brown silty sand with gravel
TP-10	S-1	4-6	22-S-1495				26.8	59.4	13.8											Brown silty sand with gravel
TP-13	S-1	3-6	22-S-1496				43.0	51.1	5.9											Brown poorly graded sand with silt and gravel
TP-17	S-1	3-5	22-S-1497				32.9	52.5	14.6											Brown silty sand with gravel

Date Received: 05.05.22 Reviewed By: Date Reviewed: 05.13.22

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.4	0.6	0.4	1.6	53.4	43.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	99.6		
1/2"	99.4		
3/8"	99.3		
#4	99.0		
#10	98.6		
#20	98.1		
#40	97.0		
#60	89.1		
#100	65.7		
#200	43.6		

* (no specification provided)

Soil Description

Brown silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.2575 D_{85}= 0.2239 D_{60}= 0.1281
D_{50}= 0.0926 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample visually classified as non-plastic.

Source of Sample: Test Pits Depth: 4.6-7'
Sample Number: TP-2 / S-1

Date: 05.10.22

Thielsch Engineering Inc.

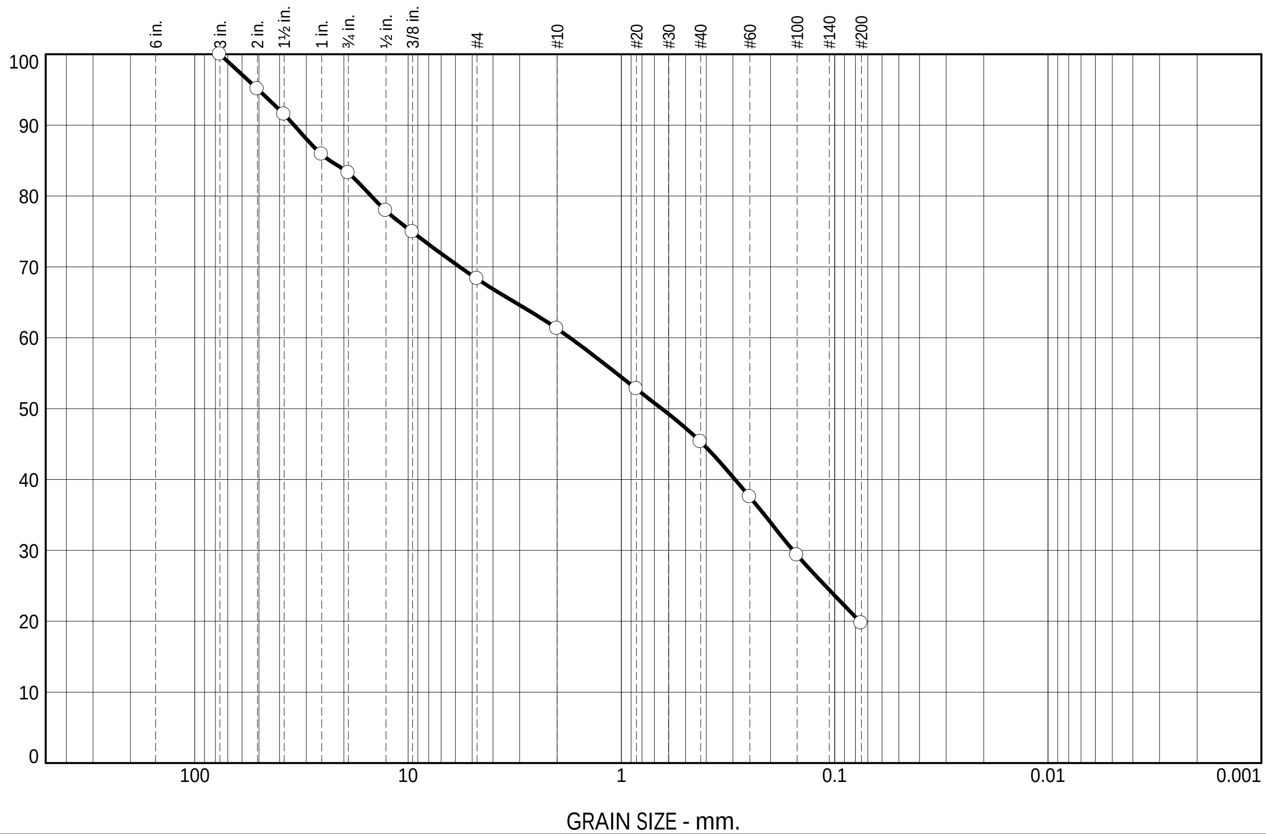
Cranston, RI

Client: Northeast Geotechnical, Inc.
Project: Proposed Residential Development
Franklin, MA
Project No: O473.00 Figure 22-S-1492

Tested By: SF / FR Checked By: Rebecca Roth

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.7	15.0	7.0	16.0	25.6	19.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	95.1		
1 1/2"	91.5		
1"	85.9		
3/4"	83.3		
1/2"	77.9		
3/8"	74.9		
#4	68.3		
#10	61.3		
#20	52.8		
#40	45.3		
#60	37.5		
#100	29.3		
#200	19.7		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 34.2186 D_{85}= 23.2742 D_{60}= 1.7416
D_{50}= 0.6466 D_{30}= 0.1567 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Source of Sample: Test Pits Depth: 2-4'
Sample Number: TP-6 / S-1

Date: 05.10.22

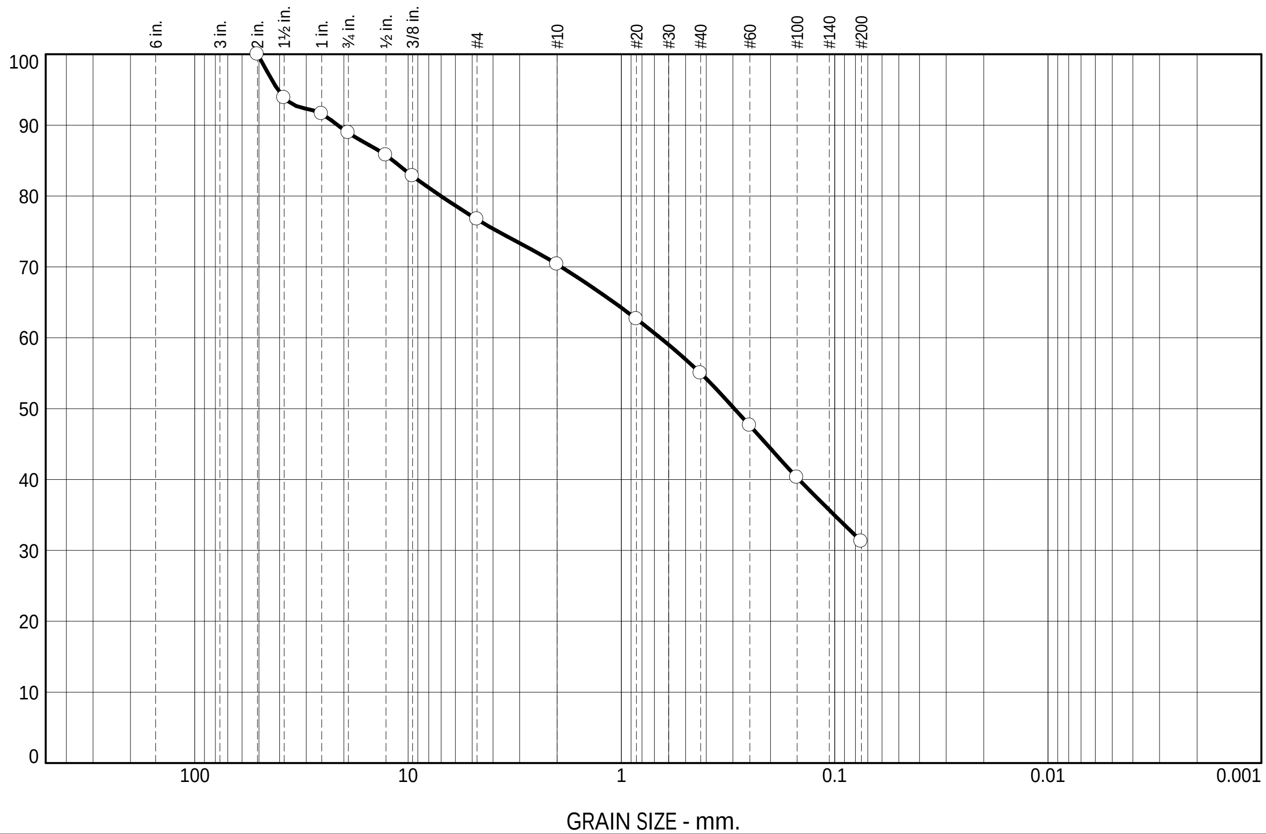
Thielsch Engineering Inc.

Cranston, RI

Client: Northeast Geotechnical, Inc.
Project: Proposed Residential Development
Franklin, MA
Project No: O473.00 Figure 22-S-1493

Tested By: SF / FR Checked By: Rebecca Roth

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.1	12.2	6.3	15.4	23.7	31.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100.0		
1 1/2"	93.9		
1"	91.6		
3/4"	88.9		
1/2"	85.8		
3/8"	82.8		
#4	76.7		
#10	70.4		
#20	62.6		
#40	55.0		
#60	47.6		
#100	40.3		
#200	31.3		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 21.3675 D_{85}= 11.7560 D_{60}= 0.6574
D_{50}= 0.2954 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Sample visually classified as non-plastic.

Source of Sample: Test Pits Depth: 1-4'
Sample Number: TP-7 / S-1

Date: 05.10.22

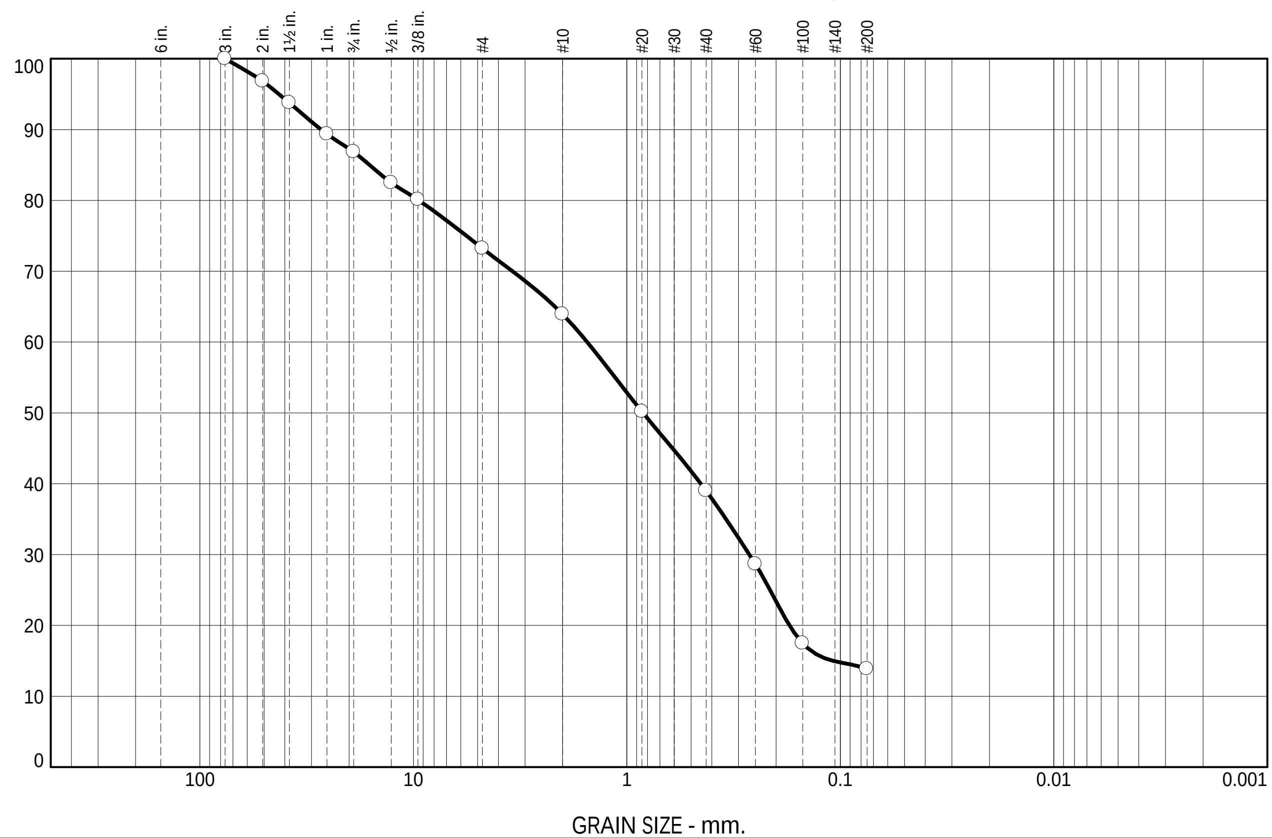
Thielsch Engineering Inc.

Cranston, RI

Client: Northeast Geotechnical, Inc.
Project: Proposed Residential Development
Franklin, MA
Project No: O473.00 Figure 22-S-1494

Tested By: SF / FR Checked By: Rebecca Roth

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.2	13.6	9.3	24.9	25.2	13.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	96.8		
1 1/2"	93.8		
1"	89.4		
3/4"	86.8		
1/2"	82.5		
3/8"	80.1		
#4	73.2		
#10	63.9		
#20	50.2		
#40	39.0		
#60	28.6		
#100	17.5		
#200	13.8		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 27.0762 D_{85}= 16.0412 D_{60}= 1.5341
D_{50}= 0.8404 D_{30}= 0.2670 D_{15}= 0.1084
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Source of Sample: Test Pits Depth: 4-6'
Sample Number: TP-10 / S-1

Date: 05.10.22

Thielsch Engineering Inc.

Cranston, RI

Client: Northeast Geotechnical, Inc.
Project: Proposed Residential Development
Franklin, MA
Project No: O473.00 Figure 22-S-1495

Tested By: SF / FR Checked By: Rebecca Roth

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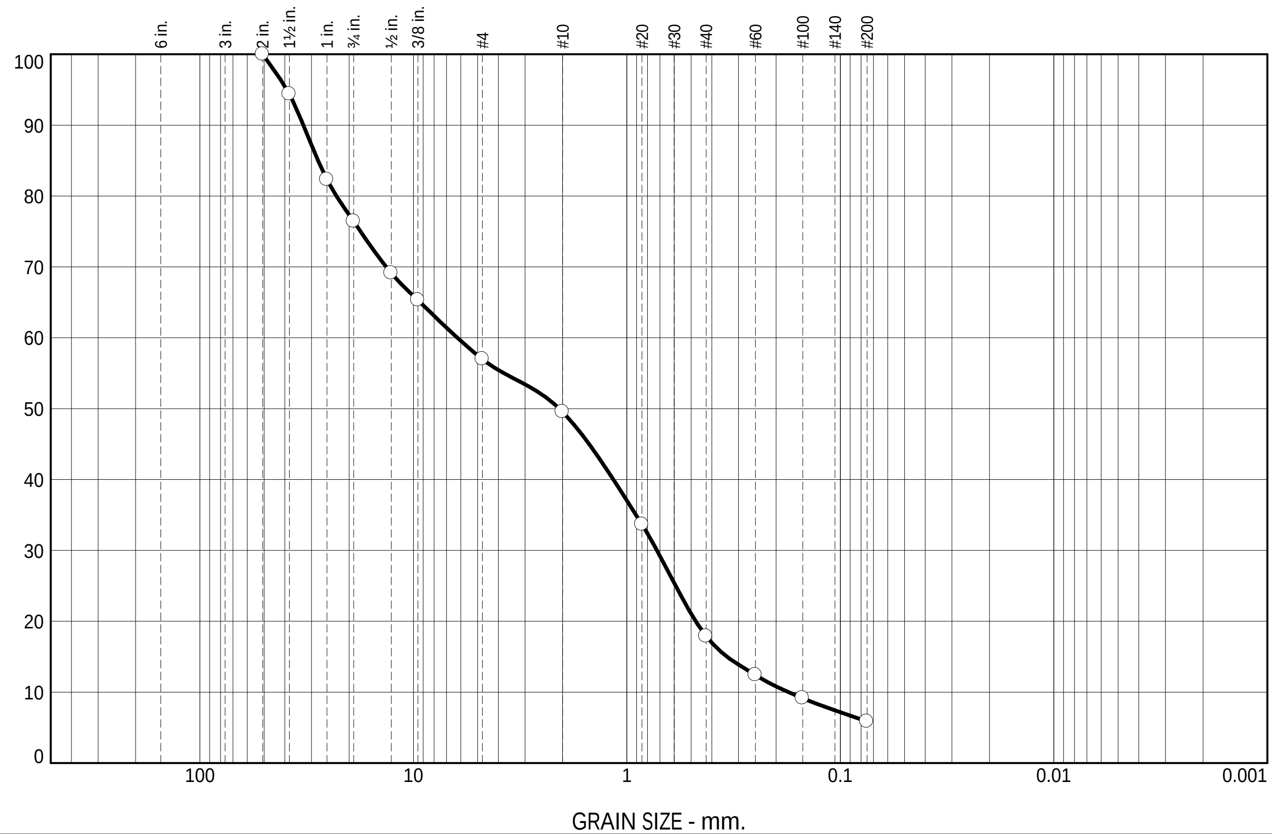
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.6	19.4	7.5	31.6	12.0	5.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100.0		
1 1/2"	94.4		
1"	82.3		
3/4"	76.4		
1/2"	69.1		
3/8"	65.3		
#4	57.0		
#10	49.5		
#20	33.7		
#40	17.9		
#60	12.4		
#100	9.2		
#200	5.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 32.7456 D_{85}= 27.9630 D_{60}= 6.2227
D_{50}= 2.0716 D_{30}= 0.7228 D_{15}= 0.3394
D_{10}= 0.1746 C_u= 35.64 C_c= 0.48

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Source of Sample: Test Pits Depth: 3-6'
Sample Number: TP-13 / S-1

Date: 05.10.22

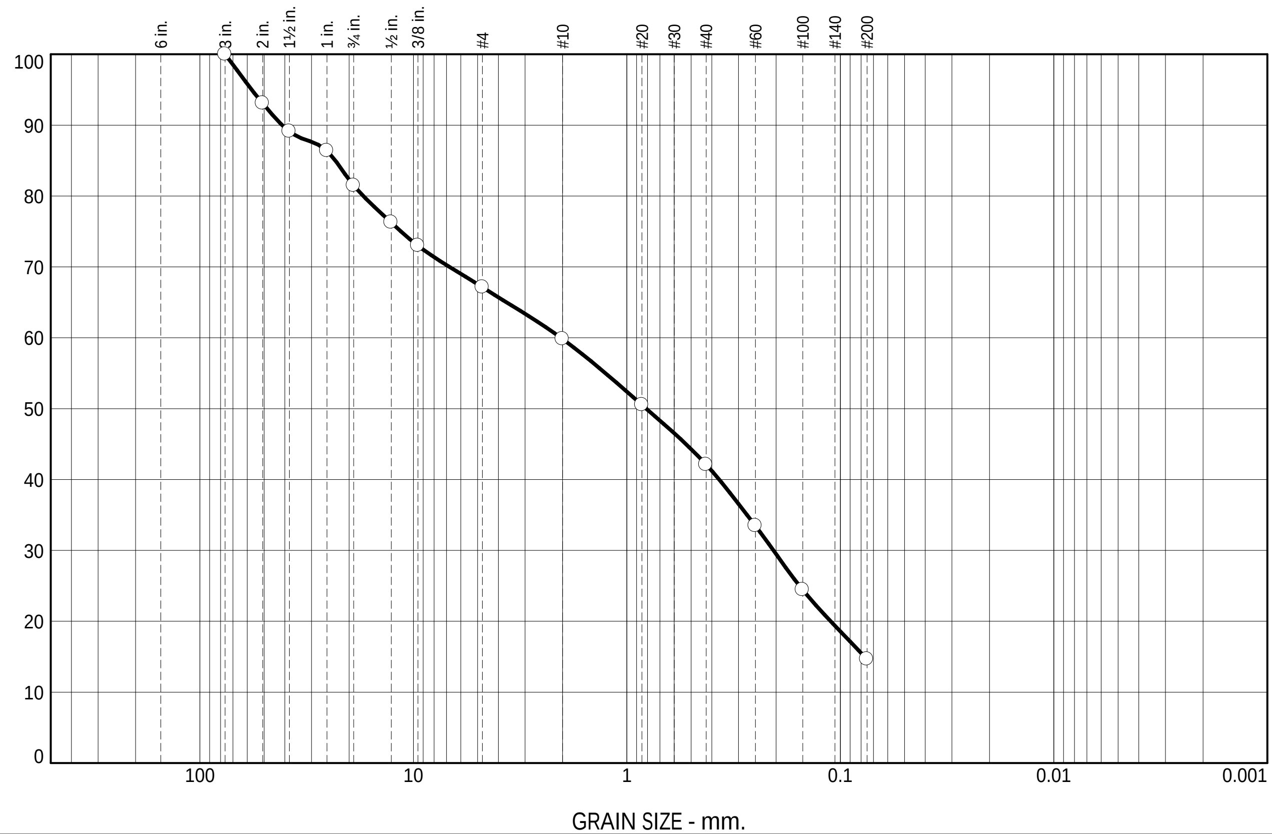
Thielsch Engineering Inc.

Cranston, RI

Client: Northeast Geotechnical, Inc.
Project: Proposed Residential Development
Franklin, MA
Project No: O473.00 Figure 22-S-1496

Tested By: SF / FR Checked By: Rebecca Roth

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.5	14.4	7.3	17.7	27.5	14.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	93.1		
1 1/2"	89.1		
1"	86.4		
3/4"	81.5		
1/2"	76.3		
3/8"	73.0		
#4	67.1		
#10	59.8		
#20	50.5		
#40	42.1		
#60	33.5		
#100	24.4		
#200	14.6		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 41.1811 D_{85}= 23.1814 D_{60}= 2.0371
D_{50}= 0.8117 D_{30}= 0.2058 D_{15}= 0.0770
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Source of Sample: Test Pits Depth: 3-5'
Sample Number: TP-17 / S-1

Date: 05.10.22

Thielsch Engineering Inc.

Cranston, RI

Client: Northeast Geotechnical, Inc.
Project: Proposed Residential Development
Franklin, MA
Project No: O473.00 Figure 22-S-1497

Tested By: SF / FR Checked By: Rebecca Roth

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

APPENDIX D
Stormwater Pollution Prevention Plan (SWPPP)
(To be submitted prior to construction)

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APPENDIX E
Operation and Maintenance Plan (O & M) with Long Term Pollution Prevention Plan (LTPPP)

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Operation and Maintenance Plan

Long Term Pollution Prevention Plan (LTPPP) & Illicit Discharge Statement

Fairfield at Grove Street
121 Grove Street
Franklin, Massachusetts

Prepared for:
Fairfield Grove Street, LLC
30 Braintree Hill Park, Suite 105
Braintree, MA 02184

Prepared by:
R.J. O'Connell & Associates, Inc.
80 Montvale Ave, Suite 201
Stoneham, MA 02180

Date: December 18, 2023
Revised: 02/02/24, 02/12/24

TABLE OF CONTENTS

Operations and Maintenance Plan

INTRODUCTION

This Operations and Maintenance Plan has been prepared to ensure that the stormwater management system implemented at Fairfield at Grove Street (121 Grove Street located in Franklin, MA) functions as designed and to develop and carry out suitable practices for source control and pollution prevention. It describes the various components of the stormwater management system, identifies the inspection and maintenance tasks to be undertaken after construction is complete, and establishes a schedule for implementing these tasks to ensure the proper, long-term operation of the system.

SECTION 1 - STORMWATER MANAGEMENT SYSTEM- OPERATION AND MAINTENANCE

The objectives of the stormwater management system are to effectively control and treat stormwater runoff from the site in accordance with the Massachusetts Stormwater Management Standards. To accomplish this objective, the following Best Management Practices (BMP's) are included in the stormwater management system:

BMPs

- Installation and maintenance of the catch basins with deep sumps and hoods to reduce the discharge of sediment and pollutants.
- Installation of inline type hydrodynamic particle separator units for removal of oil, grease and suspended solids.
- Installation of subsurface infiltrations system to provide the required recharge of groundwater.
- Installation of surface infiltration basin to provide the required recharge of groundwater.
- Installation of subsurface detention systems to provide mitigation of peak rates of runoff.
- Rip rap splash pads at storm drain outlets to provide energy dissipation and reduce flow velocity and scour potential.

In consideration of the foregoing, it is the ongoing responsibility of the landowner, their successors and assignees, to adequately maintain the on-site stormwater management BMPs. Adequate maintenance is herein defined as good working condition so that these BMPs are performing their design functions.

Based on this, the landowner, their successors, and assignees are required to create a Pollution Prevention Team (PPT) that will be responsible for implementing this Operations and Maintenance Plan.

Upon transfer of ownership of the property, the landowner is required to notify the new owner of the presence of the stormwater management system and the requirements of this Operations and Maintenance Plan.

It is anticipated the costs for maintenance to be between $10,000 and $15,000 annually.

Operation and Maintenance Plan
Grove Street Residences, Franklin Ma

Applicant: Fairfield Grove Street, LLC

Property Information

Address: 121 Grove Street
Franklin, MA 02038

Applicant and Pollution Prevention Team Leader

Applicant Name: Fairfield Grove Street, LLC
Applicant Contact: Robb Hewitt
Title: Applicant
Office Phone: (781) 881-2300
Email: rhewitt@ffres.com

Responsibilities: Coordinate all aspects of the Operations and Maintenance Plan, coordinate and hire the other Pollution Prevention team members in order to conduct inspections, keep all records, and coordinate with contractors for maintenance and repair of the stormwater management system.

Spill Prevention & Control Contractor
The following contacts shall be notified only in those instances identified within 310 CMR 40.00: Massachusetts Contingency Plan-Subpart C (see the Long-Term Pollution Prevention Plan, Appendix A).:

Primary Contact: TBD
Office Phone:

Emergency Contact: TBD
Company Name:
Contact Name:
Emergency Phone:

Consultant Contact: TBD
Company Name:
Contact Name:
Phone:

Department of Environmental Protection (DEP)
Hazardous Waste Incident Response Group
Contact Name:
Phone: 617-792-7653

Municipal Contacts

Franklin Fire Department
Contact Name: James McLaughlin, Chief
Phone: (508) 528-2323

Franklin Engineering Department
Contact Name: Mike Maglio, Town Engineer
Phone: (508) 520-4910

Franklin Conservation Commission
Contact Name: Breeka Li Goodlander, CWS, Conservation Agent
Phone: (508) 520-4847

Other Pollution Prevention Team Members

Member: Qualified Engineering and/or Environmental Consulting Firm(s).

Responsibilities: Conduct scheduled inspections, maintain records, advise the Team Leader of maintenance needs, ensure inspection maintenance and repairs are completed and keep and maintain all records and inspection reports.

Company Name(s): TBD
Address:
Office Phone:

Team Member Training

The Pollution Prevention Team Leader will coordinate an annual in-house training session with the qualified Engineering and/or Environmental Consulting Firm to discuss the Operations and Maintenance Plan, ongoing inspection and maintenance and preventative maintenance procedures.

Annual training session will generally include the following:

- Discuss the Operations and Maintenance Plan
  - What it is- identify potential sources of stormwater pollution and methods of reducing or eliminating that pollution
  - What it contains- emphasize good housekeeping measures and location of potential pollution sources.
  - Pollution Prevention Team- introduce the team and explain their responsibilities, explain the operations and continuous monitoring of the stormwater management system and encourage input and assistance from all.
- Review and explain the storm drainage system, how it works and its components, note the receiving resource area in which the storm drainage system discharges into and the role each component plays.
- Emphasize the importance of maintaining current and up-to-date inspection reports and maintenance records of BMPs. Documentation shall include any changes to the O&M Plan's procedures to accommodate changes and revisions to BMPs.

The components of the stormwater management system must be inspected, monitored and maintained in accordance with the following in order to ensure that the on-site stormwater management BMPs are functioning as designed. Routine inspection and proper maintenance of these individual components is essential to providing the long-term enhancement of both the quality and quantity of the runoff from the properties.

Sweeping and Site Clean-Up:

Routine sweeping of paved areas is an effective method to provide important nonpoint source pollution control and will be performed by mechanical sweepers. Most stormwater pollutants travel with the suspended solids contained in the stormwater runoff and regular sweeping will help reduce a portion of this load. Sweeping, especially during the period immediately following winter snowmelt (March/April) when road sand and other debris has accumulated on the pavement, will capture a peak sediment load before spring rains wash residual sand from winter applications into nearby resource areas.

Inspection: Paved areas will be inspected for litter on a weekly basis and picked up and disposed of immediately.

Maintenance: All parking areas, sidewalks, driveways and other impervious surfaces (except roofs) will be swept clean of sand, litter, trash, etc. on a monthly basis. A log of land/lot sweeping and cleanup will be kept. Housekeeping concerns noted by store leadership, PPT members, guests and others will be noted and acted upon. Separate cleanup services will be conducted at least twice a year, once between November 14 and December 15 (after leaf fall) and once during the month of April (after snow melt). Additional cleanup services will be conducted as necessary.

Deep Sump Catch Basins:

Stormwater runoff from pavement areas is directed to catch basins via site grading and curbing. Catch basins are equipped with a deep (4ft) sump and a hood. The sumps are designed to capture sediment and coarse particles and the hoods prevent hydrocarbons and other floatable debris from entering the drainage system. To ensure proper functioning of catch basins, each will be inspected and maintained as follows:

Inspection: Beginning of March, June, September and December and after major storm events. Structural damage and other malfunctions are to be noted and reported. Basins shall also be inspected during every major rain event (3.1 inches or greater in 24 hours) to ensure the grates are not clogged and are functioning properly.

Maintenance: Catch basins to be pumped and cleaned at a minimum once a year in the springtime, or when sump is half full. Cleaning shall be performed by a licensed contractor. Sediment and hydrocarbons will be properly handled and legally disposed of off-site in accordance with local, state, and federal guidelines and regulations. Any structural damage to catch basins and/or castings will be repaired upon discovery.

Hydrodynamic Oil/Particle Separators:

Hydrodynamic oil/particle separators are precast concrete structures designed to treat incoming stormwater runoff by removing suspended solids, thereby preventing the transfer of pollutants downstream. The oil/particle separators on the site are located and designed to collect and treat stormwater runoff prior to discharge. Oil/particle separators will be inspected and maintained as follows:

> Inspection: Inspect in accordance with manufacturer's recommendations and requirements per Appendix C. At a minimum, hydrodynamic particle separators shall be inspected in March and September.
>
> Maintenance: Jet vacuumed and power washed by a licensed contractor at least once per year or as recommended by the manufacturer. Accumulated sediment and hydrocarbons will be disposed of in accordance with applicable local, state, and federal guidelines and regulations. Oil/particle separators will also be cleaned when the level of sediment depth is within 12 inches of the outlet invert or as recommended by the manufacturer.

Subsurface Infiltration System

A subsurface infiltration system consists of either plastic polymer chambers or 5 to 10 foot diameter, perforated, corrugated metal pipes surrounded in crushed stone underground that temporarily retains a portion of stormwater runoff and allows it to infiltrate into the ground thereby recharging the groundwater. Infiltration systems require a minimum or 44% pre-treatment prior to accepting stormwater runoff to prevent sedimentation.

> Inspection: Inspect inlets twice annually for sediment accumulation, trash and clogging. Remove any sediment and/or debris buildup at the inlet and outlet of the system during each inspection.
>
> Maintenance: The subsurface infiltration system shall be maintained once a year. Remove any debris that might clog the system.

Subsurface Detention System

A subsurface retention system consists of plastic polymer chambers in crushed stone underground that temporarily detains a portion of stormwater runoff prior to discharging it to an infiltration system or an outlet to a designated design point.

> Inspection: Inspect inlets twice annually for sediment accumulation, trash and clogging. Remove any sediment and/or debris buildup at the inlet and outlet of the system during each inspection.
>
> Maintenance: The subsurface detention system shall be maintained once a year. Remove any debris that might clog the system.

Surface Infiltration Basin

Once the basin is in use, inspect after every major storm (a storm that is equal or greater than the 2 year - 24 hour storm of 3.4") for the first few months to ensure it is stabilized and functioning properly. Subsequently, inspect the infiltration basin at least twice per year. Important items to check during the inspection include cracking, erosion, leakage in the embankments, tree growth on the embankments, condition of riprap, sediment accumulation and the health of all grasses from the meadow mix.

Once a year in late fall (November) mow the basin bottom and side slopes. Remove clippings and accumulated organic matter to prevent an impervious organic mat from forming. For the remainder of the year, the side slopes can be left to grow and naturalize. Remove trash and debris at the same time. Use deep tilling to break up clogged surfaces along the bottom of slope and revegetate immediately.

Remove sediment from the basin as necessary but wait until the floor of the basin is thoroughly dry. Use light equipment to remove the top layer so as to not compact the underlying soil. Deeply till the remaining soil and revegetate as soon as possible.

The grassed areas immediately at the discharge point and down-slope of the rip-rap shall be inspected after major storm events, or at minimum twice per year. These locations will be subject to concentrated flows and therefore may be prone to erosion and the formation of gullies or channels. If any gullies or channels are observed, they should immediately be repaired by installing sod and reseeding with grass. These areas shall be reseeded until a stable groundcover is established.

Outlet Level Spreaders

Once the level spreaders are in use, inspect after every major storm (a storm that is equal or greater than the 2 year - 24 hour storm of 3.4") for the first few months to ensure it is stabilized and functioning properly. Subsequently, inspect the level spreaders at least twice per year. Important items to check during the inspection include cracking, erosion, leakage in the embankments, tree growth on the embankments, condition of riprap, sediment accumulation and the health of all grasses from the meadow mix.

Once a year in late fall (November) clean the basin bottom and side slopes. Remove accumulated organic matter to prevent an impervious organic mat from forming. Remove trash and debris at the same time. Use deep tilling to break up clogged surfaces along the bottom of slope and revegetate immediately.

Remove sediment from the level spreader as necessary but wait until the floor of the basin is thoroughly dry. Use light equipment to remove the top layer so as to not compact the underlying soil. Deeply till the remaining soil and revegetate as soon as possible.

The grassed areas immediately at the discharge point and down-slope of the rip-rap shall be inspected after major storm events, or at minimum twice per year. These locations will be subject to concentrated flows and therefore may be prone to erosion and the formation of gullies or channels. If any gullies or channels are observed, they should immediately be repaired by installing sod and reseeding with grass. These areas shall be reseeded until a stable groundcover is established.

Drainage Culvert:

Inspection: Culvert must be inspected annually. Check both ends of culvert for sediment and debris accumulation and any structural damage.

Maintenance: Accumulated sediment will be removed by methods that do not impact the wetlands and disposed in accordance with applicable local, state and federal guidelines and regulations.

Rip Rap Splash Pads and Outfall Structure

Rip rap splash pads provide energy dissipation and reduce scour at the outlet structure.

Inspection: inspect rip rap splash pads and outfall structure regularly, especially after major rainfall events

Maintenance: Note and repair any erosion or low spots on the splash pad.

Steep Slopes

Steep slopes shall be considered any slopes greater that 3:1.

Inspection: inspect steep slopes on the site regularly, especially after major rainfall events

Maintenance: Note and repair any slopes that are unstable, eroding and have any areas of bare soil. If there are only minor areas of erosion, fill in small rills or gullies with topsoil. If bare soil areas occur topsoil should be added, compacted and seed/mulched with appropriate seed mix.

Please refer to Appendix A for the Inspection Forms, which are to be used by the Pollution Prevention Team member responsible for conducting the scheduled inspections.

SECTION 2 - LONG TERM POLLUTION PREVENTION PLAN (LTPPP)

A. MATERIALS COVERED

The following materials or substances are expected to be present onsite after construction:

Cleaning solvents	Petroleum based products
Detergents	Pesticides/Insecticides
Paints/Solvents	Fertilizers/Herbicides
Acids	Contaminated Soil
Solid Waste	

B. MATERIALS MANAGEMENT PRACTICES

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. The Pollution Prevention Team Leader will be responsible for ensuring that these procedures are followed:

Good Housekeeping

The following good housekeeping practices will be followed onsite after construction:

a) An effort will be made to store only enough products required to do the job.
b) All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or in a containment area. At a minimum, all containers will be stored with their lids on when not in use. Drip pans shall be provided under all dispensers.
c) Products will be kept in their original containers with the original manufacturer's label in legible condition.
d) Substances will not be mixed with one another unless recommended by the manufacturer.
e) Whenever possible, all of a product will be used up before disposing of the container.
f) Manufacturer's recommendations for proper use and disposal will be followed.
g) A Pollution Prevention Team Member will be responsible for daily inspections to ensure proper use and disposal of materials.
h) The storage of all deicing materials on the site shall be covered and not be exposed to precipitation.

1. Hazardous Substances

These practices will be used to reduce the risks associated with hazardous substances. Material Safety Data Sheets (MSDS's) for each product with hazardous characteristics that are used on the property will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained on-site, in the management office. Each employee who must handle a hazardous substance will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.

a) Products will be kept in original containers with the original labels in legible condition.
b) Original labels and MSDS's will be procured and used for each product.
c) If surplus product must be disposed of, the manufacturer's and local/state/federal required methods for proper disposal must be followed.

2. Hazardous Waste

It is imperative that all hazardous waste be properly identified and handled in accordance with all applicable hazardous waste standards, including the storage, transport and disposal of the hazardous wastes. There are significant penalties for the improper handling of hazardous wastes. It is important that the Pollution Prevention Team Leader seeks appropriate assistance in making the determination of whether a substance or material is a hazardous waste. For example, hazardous waste may include certain hazardous substances, as well as pesticides, paints, paint solvents, cleaning solvents, contaminated soils, and other materials, substances or chemicals that have been discarded (or are to be discarded) as being out-of-date, contaminated, or otherwise unusable. The Pollution Prevention Team Leader is responsible for ensuring that all Pollution Prevention Team Members are instructed as to these hazardous waste requirements as well as that the requirements for handling and disposal are being followed.

3. Product Specific Practices

The following product specific practices will be followed on the job site:

a) Petroleum Products

Petroleum products will be stored in tightly sealed containers which are clearly labeled. Petroleum storage tanks shall be located a minimum of 100 linear feet from wetland resource areas, drainage ways, inlets and surface waters unless stored within a building. Any petroleum storage tanks stored onsite will be located within a containment area that is designed with an impervious surface between the tank and the ground. The secondary containment must be designed to provide a containment volume that is equal to 110% of the volume of the largest tank. Drip pans shall be provided for all dispensers. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations. The location of any fuel tanks and/or equipment storage areas must be identified on the Erosion Control Plan by the Contractor once the locations have been determined.

b) Fertilizers, Herbicides, Pesticides, and Insecticides

Fertilizers, herbicides, pesticides, and insecticides will be applied only in the minimum amounts recommended by the manufacturer. Once applied, they will be utilized so as to limit exposure to stormwater. Storage will be in a covered shed. The contents of any partially used bags or containers will be transferred to a sealable plastic bin to avoid spills.

Fertilizers shall not be applied within wetland buffer zones or other resource areas. Refer to Drawing C-2, Grading and Drainage Plan, for location of resource areas and buffer zones.

c) Paints, Paint Solvents, and Cleaning Solvents

All containers will be tightly sealed and stored when not in use. Excess paint and solvents will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and federal regulations.

4. Solid Waste

All waste materials will be collected and stored in an appropriately covered container and/or securely contained metal dumpster rented from a local waste management company which must be a licensed solid waste management company. The dumpster will comply with all local and state solid waste management regulations.

All trash and debris from the site will be deposited in dumpsters. The dumpsters will be emptied a minimum of once per week or more often if necessary. All personnel will be instructed regarding the correct procedures for waste disposal.

All waste dumpsters and roll-off containers shall be located in an area where the likelihood of the containers contributing to stormwater discharges is negligible.

5. Contaminated Soils

Any contaminated soils resulting from spills of hazardous substances or oil shall be contained and cleaned up immediately in accordance with the procedures given in the Materials Management Plan and in accordance with applicable state and federal regulations. If there is a release, it should be reported as a spill, if it otherwise meets the requirements for a reportable spill.

C. SPILL PREVENTION AND RESPONSE PROCEDURES

The Pollution Prevention Team Leader will train all personnel in the proper handling and cleanup of spilled hazardous substances or oil. No spilled hazardous substances or oil will be allowed to come in contact with stormwater discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the Pollution Prevention Team Leader to be properly trained, and to train all personnel in spill prevention and clean up procedures.

1. In order to prevent or minimize the potential for a spill of hazardous substances or oil to come into contact with stormwater, the following steps shall be implemented:

   a) All hazardous substances or oil (such as pesticides, petroleum products, fertilizers, detergents, acids, paints, paint solvents, cleaning solvents, etc.) shall be stored in a secure location, with their lids on, preferably under cover, when not in use.
   b) The minimum practical quantity of all such materials shall be kept on site.
   c) A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) shall be provided on site.
   d) Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be trained regarding these procedures and the location of the information and cleanup supplies.
   e) It is the Pollution Prevention Team Leader's responsibility to ensure that all hazardous waste on site is disposed of properly by a licensed hazardous material disposal company. The Pollution Prevention Team Leader is responsible for not exceeding hazardous waste storage requirements mandated by the EPA or state and local authority.

2. In the event of a spill of hazardous substances or oil, the following procedures must be followed:

   a) All measures must be taken to contain and abate the spill and to prevent the discharge of the hazardous substance or oil to stormwater or off-site. (The spill area must be kept well ventilated and personnel must wear appropriate protective clothing to prevent injury from contact with the hazardous substances.)
   b) For spills of less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.
   c) For spills greater than five (5) gallons of material immediately contact the MA DEP Emergency Response at (888) 304-1133, and an approved emergency response contractor. Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up as safely deemed necessary.

d) If there is a Reportable Quantity (RQ) release, then the National Response Center shall be notified immediately at (800) 424-8802; within 14 days a report will be submitted to the EPA regional office describing the release, the date and circumstances of the release and the steps taken to prevent another release. This Pollution Prevention Plan must be updated to reflect any such steps or actions taken and measures to prevent the same from reoccurring.

3. The Pollution Prevention Team Leader shall be the spill prevention and response coordinator. He/she will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and in the management office.

SECTION 3 - ILLICIT DISCHARGE STATEMENT

Certain types of discharges are allowable under the U.S. Environmental Protection Agency Construction General Permit, and it is the intent of this Long Term Pollution Prevention Plan (LTPPP) to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to, or after its discharge. The control measures which have been outlined previously in this LTPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. Illicit discharges, if they exist currently, shall be contained and eliminated in the manner specified by local, state and federal regulations, and will be prohibited in the proposed development.

Applicant: Fairfield Residential Company, LLC

SECTION 4 - SNOW MANAGEMENT AND DISPOSAL PLAN

Snow management will be overseen by a full-time Property Manager who will implement this plan and be authorized to utilize additional resources should unusual events occur. The Snow Management Contractor (SMC) shall be responsible for maintaining all roads, driveways, parking lots, sidewalks and pedestrian access areas for clear and safe travel. The SMC shall report directly to the Property Manager and maintain communication via cell phones 24 hours per day, 7 days per week. All roads, drives, entrances and exits are the first priority. During extreme events, the first priority will be to clear and maintain proper access for residents and public safety vehicles. The next priority is parking areas, sidewalks, fire hydrants, and delivery areas. Snow will not be piled around light bases and handicap parking areas shall be cleared frequently.

The anti-icing operations typically precede snow plowing and will be provided when conditions warrant. Within 12 months of concrete walks, pads, or other features being poured, no de-icers shall be placed on those surfaces. After the materials have cured for 12 months, a combination of calcium chloride de-icers and sand (washed, fine to medium grade) shall be utilized. Parking areas shall receive spot treatment only when and where needed in a similar manner. The sand/calcium chloride mixture shall consist of 20 parts calcium chloride to 80 parts sand.

Snow plowing shall commence upon accumulation of two inches (2”) or more. Snow shall be deposited in designated areas as depicted on RJ O’Connell Traffic and Parking Control Plans Sheets C-4A & C-4B. The SMC shall keep existing catch basins open for drainage or water resulting from melting. Snow shall not be stored in stormwater basins and shall not be stored in any areas outside of the designated storage areas. Snow storage shall not impact vehicle site distance at any intersections. Snow stored in designated areas shall have a maximum height limitation of seven (7’) feet. When snow designated areas reach their capacity, surplus snow will be disposed offsite as identified in the snow management contract. Prior to November 1 of each year, the SMC shall notify in writing the Property Manager the location that snow will be hauled to.

Once the storm is over, the SMC shall monitor all areas on-site for icy spots and snowdrifts. If needed, an application of sand and salt will be applied to all streets and roads so that the riding surface remains drivable. When the ambient temperature drops below 15 degrees F, all major areas will receive an application of pre-wetted salt with calcium chloride to maintain melting action and an ice-free surface for as long as possible. Salt loses its effectiveness at temperatures drop below 15 degrees F.

Deicing chemicals will be kept in original containers with the original product label in legible condition. When not in use, deicing materials will be stored in a neat, orderly manner under cover with their container lids on.

In the Spring, following the last snowfall of the season and the final melt, any designated snow storage areas located within grassed areas shall be cleaned of any debris or sediment build up.

Appendix A

Maintenance and Inspection Forms

121 Grove Street Franklin, MA
Operation and Maintenance Plan
Task Guide

The table below is a list of the minimum inspection and maintenance activities the Pollution Prevention Team needs to conduct for the Stormwater Operations and Management Plan and who is responsible for the activity. The task Guide is provided to assist the Pollution Prevention Team Leader and ensure that the activities are being conducted as scheduled.

Timing	**Task**	**Responsible Party**
Weekly	Inspect Lot/Land	PPT
Quarterly (March, June, September, December)	Inspect Catch Basins	PPT/Contractor
Semi-Annually (March and September)	Inspect Oil/Particle Separators Inspect Subsurface Systems Inlets, Outlets and overflow. Inspect sedimentation levels, remove as necessary Mow Surface Stormwater Basins Inspect Level Spreaders	PPT/Contractor PPT/Contractor PPT/Contractor PPT/Contractor
Annually	Pollution Prevention Team training Comprehensive Annual Stormwater Evaluation and Inspection Report Clean Oil/Particle Separator Unit Clean Catch Basins Clean Infiltration Basins and inspect sedimentation levels, Remove sedimentation as necessary Clean Level Spreaders, if necessary Inspect rip rap splash pads Inspect outlet control structure and power wash and jet vacuum	PPT Leader PPT Leader PPT/Contractor PPT/Contractor PPT/Contractor PPT/Contractor PPT/Contractor PPT/Contractor
April	Spring clean-up	PPT/Contractor
Between November 14 and December 15	Fall clean-up	PPT/Contractor

121 Grove Street Franklin, MA
Operations and Maintenance Plan
Comprehensive Annual Evaluation and Inspection Report

Once a year, the Pollution Prevention Team Leader must inspect and evaluate all aspects and provisions of the Operations and Maintenance Plan, complete the following report and keep a copy on file at the site.

Inspector/Reviewers:____

Date of Inspection/Review: ____

Note any changes to the Plan in the space below and in the appropriate section of the Plan.

1. Review the Pollution Prevention Team list and update if necessary. Does the Pollution Prevention Team list need updating:

   (circle one) Yes No

2. Review the Operations and Maintenance Plan (O&M Plan). Are there sections of the O&M Plan that need updating?

   (circle one) Yes No

3. Review Monthly and Weekly Checklists. Update these as necessary

   - Are there any updates needed to Spill and Leak History and/or the checklists?

   (circle one) Yes No

4. Review site drawings and update if necessary

   - Are there updates needed to any of the drawings?

   (circle one) Yes No

Requested Changes (attach revisions)

121 Grove Street Franklin, MA
Operations and Maintenance Plan
Annual Training Sign-off Sheet

For each Operations and Maintenance Plan training session, the Team Leader should keep records of all attending Team Members using the signoff sheet below, as well as the training agenda, notes, etc.

Training Date: ______________________________	**Topic**:
Trainer: ______________________________________	
Team Member Name	**Team Member Signature**

121 Grove Street Franklin, MA
Operations & Maintenance Plan
Weekly Task Checklist

The site will be checked each week for trash and debris by a member of the Pollution Prevention Team. If any trash or debris is observed in the specified area, write “yes” in the 2^{nd} column and note the problem and corrective measures taken in the appropriate space. Make a new copy of this checklist each week.

Date: ___________________________________ **Checklist completed by**: ____

GROUNDS AREA TO CHECK	TASK	DESCRIPTION OF PROBLEM	CORRECTIVE MEASURES TAKEN
Parking Lot & Roadways	Pickup and Dispose of Litter		
Landscaped Areas	Pickup and Dispose of Litter		
Compactor/Dumpster Areas	Check for Leaking Liquid Pickup and Dispose of Litter		
Perimeter of Property	Pickup and Dispose of Litter		

121 Grove Street Franklin, MA
Operations & Maintenance Plan
Monthly Task Checklist

The following will be checked each month for sources of pollutants by a member of the Pollution Prevention Team. If the condition in the "check for" column is observed, note the problem and corrective measures taken in the appropriate space. Make a new copy of the checklist each month.

Date: ___________________________________ **Checklist completed by**: ____

BMP	TASK	DESCRIPTION OF PROBLEM (IF PRESENT)	CORRECTIVE MEASURES TAKEN
Sweeping	Sweep Parking Lot and Paved Areas		
Steep Slope	Inspect steep slopes (greater than 3:1) throughout the site		

121 Grove Street Franklin, MA
Operations & Maintenance Plan
Quarterly Task Checklist (March, June, September, December)

The following will be checked each month for sources of pollutants by a member of the Pollution Prevention Team. If the condition in the “check for” column is observed, note the problem and corrective measures taken in the appropriate space. Make a new copy of the checklist each month.

Date: ___________________________________ **Checklist completed by**: ____

BMP	TASK	DESCRIPTION OF PROBLEM (IF PRESENT)	CORRECTIVE MEASURES TAKEN
Catch Basins	Inspect for Sediment, Trash, and Oil.		

121 Grove Street Franklin, MA
Operations & Maintenance Plan
Semi-Annual Task Checklist (March, September)

The site will be checked semi-annually four sources of pollutants by a member of the Pollution Prevention Team. If the condition in the "check for" column is observed, note the problem and corrective measures taken in the appropriate space. Make a new copy of the checklist each month.

Date: ___________________________________ **Checklist completed by**: ____

BMP	TASK	DESCRIPTION OF PROBLEM (IF PRESENT)	CORRECTIVE MEASURES TAKEN
Oil/Particle Separators	Inspect for Sediment, Trash, and Oil.		
Subsurface Systems	Inspect inlets, outlets, and overflow. Inspect sedimentation levels and remove as necessary.		
Surface Stormwater Basins	Inspect for Sediment.		
Level Spreader Outlets	Inspect for Sediment.		

121 Grove Street Franklin, MA
Operations & Maintenance Plan
Annual Task Checklist

The following will be check each year for sources of pollutant by a member of the Pollution Prevention Team. If a problem is observed, note the problem and corrective measures take in the appropriate space. Make a new copy of the checklist each year.

Date: ___________________________________ **Checklist completed by**: ____

BMP	TASK	DESCRIPTION OF PROBLEM (IF PRESENT)	CORRECTIVE MEASURES TAKEN
Pollution Prevention Team Training	Pollution Prevention Team Training.		
Oil/Particle Separators	Vacuum clean and Power wash.		
Catch Basins	Remove sediment and debris from sump and power wash.		
Subsurface Infiltration/Detention Basins	Inspect sedimentation levels, remove as necessary. Check stability of slopes, erosion and mow.		
Surface Stormwater Basins	Inspect for sediment and debris and structural integrity. Remove and repair as necessary.		
Rip rap Splash Pads	Inspect for sediment and debris and structural integrity. Remove and repair as necessary.		
Comprehensive Annual Stormwater Evaluation and Inspection Report	Compile the comprehensive annual stormwater evaluation and inspection report and file for future reference.		
Level Spreader Outlets	Inspect for sediment and debris and structural integrity. Remove and repair as necessary.		

121 Grove Street Franklin, MA

Long Term Pollution Prevention Plan

Spill and Leak History

(____ to _____)

Date	Spill	Leak	Location	Description				Response Procedures	Measures to Prevent Reoccurrence	Reporting Pollution Prevention Team Member
(MM/DD/YY)	*(check one)*		*(as indicated on Site Map)*	*Type of Material*	*Quantity*	*Source, if known*	*Reason*			

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Main\22016_C-2 Grading and Drainage Plan.dwg
Feb 12, 2024 - 17:33pm

RJOC

NO.	REVISION	DATE
3.	REVISED PER ZBA PEER REVIEW COMMENTS	02/12/2024
2.	REVISED PER ZBA PEER REVIEW COMMENTS	02/02/2024
1.	REVISED PER ONSITE SOIL TESTING RESULTS/NOI SUBMISSION	12/18/2023

DESIGNED BY:	MAC
DRAWN BY:	MCR
REVIEWED BY:	BJM
SCALE:	1" = 40'

PREPARED FOR:

FAIRFIELD GROVE STREET LLC
30 BRAINTREE HILL OFFICE PARK
SUITE 105
BRAINTREE, MA 02184

SEAL:

PREPARED BY:

RJO'CONNELL & ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
80 MONTVALE AVENUE, SUITE 201 STONEHAM, MA 02180
PHONE: 781.279.0180 RJOCONNELL.COM

PROJECT NAME:

GROVE STREET RESIDENCES
FRANKLIN, MA

DRAWING NAME:

GRADING AND DRAINAGE PLAN

DRAWING NUMBER:

C-2A

DATE: 10/30/2023 PROJECT NO.: 22016

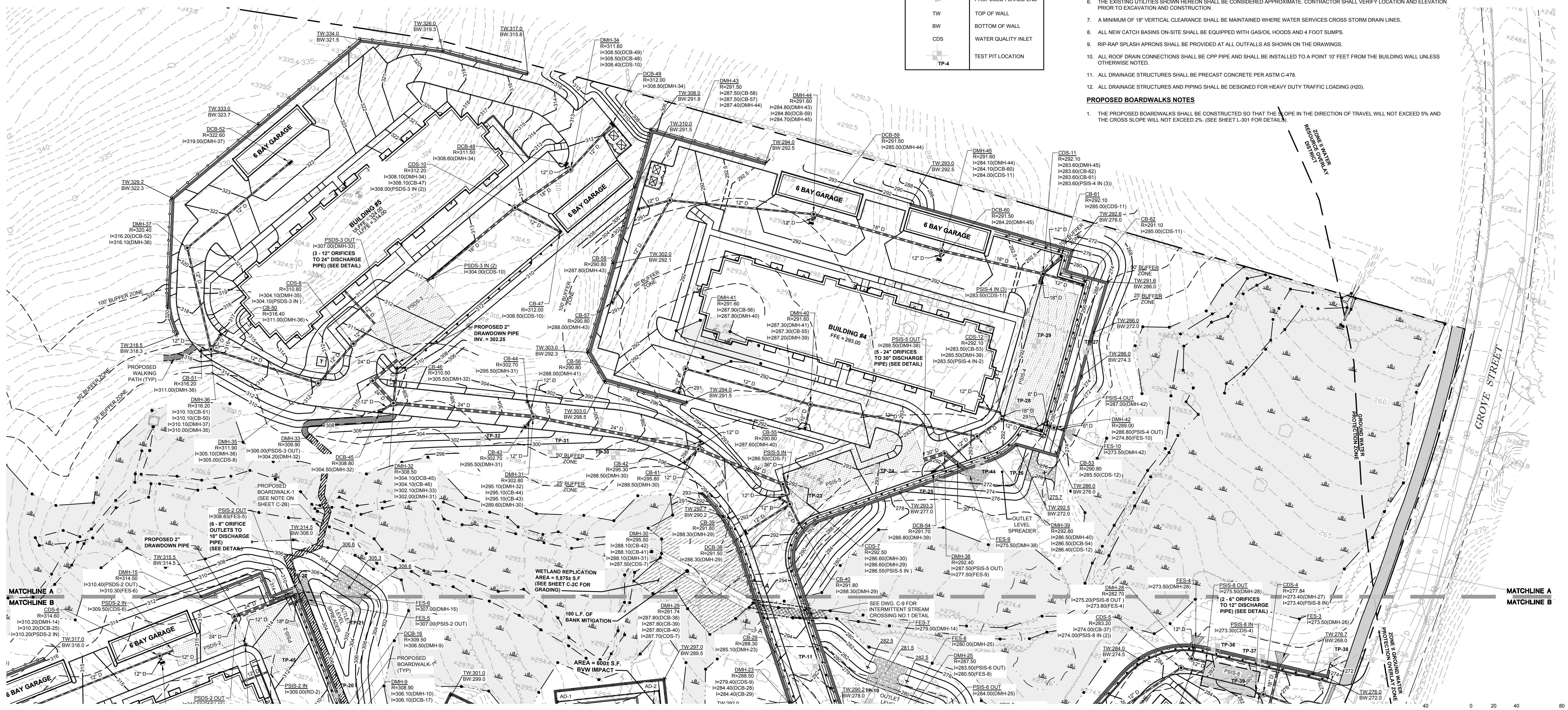
LEGEND	DESCRIPTION
CB	CATCH BASIN
290	CONTOUR
DMH	DRAIN MANHOLE
	DRAIN PIPE
	FIRE HYDRANT
	RETAINING WALL
PSIS	PROPOSED SUBSURFACE INFILTRATION SYSTEM
	PROPOSED FLARED END
TW	TOP OF WALL
BW	BOTTOM OF WALL
CDS	WATER QUALITY INLET
TP-4	TEST PIT LOCATION

GRADING AND DRAINAGE NOTES

1. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY, AND "DIG SAFE" AT LEAST 72 BUSINESS HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST EXACT FIELD LOCATION OF UTILITIES AND THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION TAKEN BEFORE PROCEEDING WITH THE WORK. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.
2. EXISTING SITE FEATURES AND TOPOGRAPHY SHOWN HEREON IS TAKEN FROM A SURVEY PLAN TITLED "EXISTING CONDITIONS SITE PLAN 121 GROVE STREET, FRANKLIN, MA" BY GUERRIERE & HANLON, INC. DATED 05/20/2022, REVISED THROUGH 11/09/2023.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING AND MAINTAINING ALL HORIZONTAL CONTROL POINTS AND ELEVATION BENCH MARKS NECESSARY FOR THE WORK.
4. ALL STORM DRAINAGE PIPING SHALL BE REINFORCED CONCRETE PIPE, UNLESS NOTED OTHERWISE IN STORMWATER INFILTRATION/DETENTION BASINS. REINFORCED CONCRETE PIPE (RCP) SHALL BE CLASS III IN ACCORDANCE WITH ASTM C-76. GASKETS SHALL BE O-RING TYPE IN ACCORDANCE WITH ASTM C-443. CLASS V RCP SHALL BE USED IN AREAS WITH LESS THAN 42" VERTICAL COVER FROM TOP OF PIPE TO FINISHED GRADE.
5. CORRUGATED PLASTIC PIPE (CPP) SHALL CONFORM WITH AASHTO DESIGNATIONS M294 AND M252, SHALL BE MANUFACTURED WITH HIGH DENSITY POLYETHYLENE PLASTIC AND SHALL BE ADS N-12 PIPE OR APPROVED EQUAL UNLESS OTHERWISE NOTED ON DETAILS.
6. THE EXISTING UTILITIES SHOWN HEREON SHALL BE CONSIDERED APPROXIMATE. CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION PRIOR TO EXCAVATION AND CONSTRUCTION.
7. A MINIMUM OF 18" VERTICAL CLEARANCE SHALL BE MAINTAINED WHERE WATER SERVICES CROSS STORM DRAIN LINES.
8. ALL NEW CATCH BASINS ON-SITE SHALL BE EQUIPPED WITH GAS/OIL HOODS AND 4 FOOT SUMPS.
9. RIP-RAP SPLASH APRONS SHALL BE PROVIDED AT ALL OUTFALLS AS SHOWN ON THE DRAWINGS.
10. ALL ROOF DRAIN CONNECTIONS SHALL BE CPP PIPE AND SHALL BE INSTALLED TO A POINT 10' FEET FROM THE BUILDING WALL UNLESS OTHERWISE NOTED.
11. ALL DRAINAGE STRUCTURES SHALL BE PRECAST CONCRETE PER ASTM C-478.
12. ALL DRAINAGE STRUCTURES AND PIPING SHALL BE DESIGNED FOR HEAVY DUTY TRAFFIC LOADING (H20).

PROPOSED BOARDWALKS NOTES

1. THE PROPOSED BOARDWALKS SHALL BE CONSTRUCTED SO THAT THE SLOPE IN THE DIRECTION OF TRAVEL WILL NOT EXCEED 5% AND THE CROSS SLOPE WILL NOT EXCEED 2%. (SEE SHEET L-301 FOR DETAILS).



NOT FOR CONSTRUCTION

40 0 20 40 80

GRAPHIC SCALE IN FEET

RJOC

NO.	REVISION	DATE
3.	REVISED PER ZBA PEER REVIEW COMMENTS	02/12/2024
2.	REVISED PER ZBA PEER REVIEW COMMENTS	02/02/2024
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PROJECT NAME:

GROVE STREET RESIDENCES
FRANKLIN, MA

DRAWING NAME:

GRADING AND DRAINAGE PLAN

DRAWING NUMBER:

C-2B

DATE: 10/30/2023 PROJECT NO.: 22016

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Main\22016_C-2 Grading and Drainage Plan.dwg
Feb 12, 2024 - 17:35pm

Appendix C

CDS Stormwater Treatment Unit
Operation and Maintenance Guidelines

OPERATIONS AND MAINTENANCE GUIDELINES

CDS Stormwater Treatment Unit

INTRODUCTION

The CDS unit is an important and effective component of your storm water management program and proper operation and maintenance of the unit are essential to demonstrate your compliance with local, state and federal water pollution control requirements.

The CDS technology features a patented non-blocking, indirect screening technique developed in Australia to treat water runoff. The unit is highly effective in the capture of suspended solids, fine sands and larger particles. Because of its non-blocking screening capacity, the CDS unit is un-matched in its ability to capture and retain gross pollutants such as trash and debris. In short, CDS units capture a very wide range of organic and in-organic solids and pollutants that typically result in tons of captured solids each year such as: Total suspended solids (TSS) and other sedimentitious materials, oil and greases, trash, and other debris (including floatables, neutrally buoyant, and negatively buoyant debris). These pollutants will be captured even under very high flow rate conditions.

CDS units are equipped with conventional oil baffles to capture and retain oil and grease. Laboratory evaluations show that the CDS units are capable of capturing up to 70% of the free oil and grease from storm water. CDS units can also accommodate the addition of oil sorbents within their separation chambers. The addition of the oil sorbents can ensure the permanent removal of 80% to 90% of the free oil and grease from the storm water runoff.

OPERATIONS

The CDS unit is a non-mechanical self-operating system and will function any time there is flow in the storm drainage system. The unit will continue to effectively capture pollutants in flows up to the design capacity even during extreme rainfall events when the design capacity may be exceeded. Pollutants captured in the CDS unit's separation chamber and sump will be retained even when the units design capacity is exceeded.

CDS UNIT INSPECTION

Access to the CDS unit is typically achieved through two manhole access covers – one allows inspection (and clean out) of the separation chamber (screen/cylinder) & sump and another allows inspection (and cleanout) of sediment captured and retained behind the screen.

The unit should be periodically inspected to determine the amount of accumulated pollutants and to ensure that the cleanout frequency is adequate to handle the predicted pollutant load being processed by the CDS unit. The unit should be periodically inspected for indications of vector infestation, as well. The recommended cleanout of solids within the CDS unit's sump should occur at 75% to 85% of the sump capacity. However, the sump may be completely full with no impact to the CDS unit's performance.

CONTECH Stormwater Solutions (previously CDS Technologies) recommends the following inspection guidelines: For new initial operation, check the condition of the unit after every runoff event for the first 30 days. For ongoing operations, the unit should be inspected after the first six inches of rainfall at the beginning of the rainfall season and at approximately 30-day intervals. The visual inspection should ascertain that the unit is functioning properly (no blockages or obstructions to inlet and/or separation screen), evidence of vector infestation, and to measure the amount of solid materials that have accumulated in the sump, fine sediment accumulated behind the screen, and floating trash and debris in the separation chamber. This can be done with a calibrated dipstick, tape measure or other measuring instrument so that the depth of deposition in the sump can be tracked.

CDS UNIT CLEANOUT

The frequency of cleaning the CDS unit will depend upon the generation of trash and debris and sediments in your application. Cleanout and preventive maintenance schedules will be determined based on operating experience unless precise pollutant loadings have been determined.

Access to the CDS unit is typically achieved through two manhole access covers – one allows cleanout of the separation chamber (screen/cylinder) & sump and another allows cleanout of sediment captured and retained behind the screen. For units possessing a sizable depth below grade (depth to pipe), a single manhole access point would allow both sump cleanout and access behind the screen.

CONTECH Stormwater Solutions Recommends The Following:

> <u>NEW INSTALLATIONS</u>: Check the condition of the unit after every runoff event for the first 30 days. The visual inspection should ascertain that the unit is functioning properly (no blockages or obstructions to inlet and/or separation screen), measuring the amount of solid materials that have accumulated in the sump, the amount of fine sediment accumulated behind the screen, and determining the amount of floating trash and debris in the separation chamber. This can be done with a calibrated "dip stick" so that the depth of deposition can be tracked. Refer to the "Cleanout Schematic" **(Appendix B) f**or allowable deposition depths and critical distances. Schedules for inspections and cleanout should be based on storm events and pollutant accumulation.
>
> <u>ONGOING OPERATION:</u> During the rainfall season, the unit should be inspected at least once every 30 days. The floatables should be removed and the sump cleaned when the sump is 75-85% full. If floatables accumulate more rapidly than the settleable solids, the floatables should be removed using a vactor truck or dip net before the layer thickness exceeds approximately one foot.
>
> Cleanout of the CDS unit at the end of a rainfall season is recommended because of the nature of pollutants collected and the potential for odor generation

from the decomposition of material collected and retained. This end of season cleanout will assist in preventing the discharge of pore water from the CDS ® unit during summer months.

USE OF SORBENTS –The addition of sorbents is **not a requirement** for CDS units to effectively control oil and grease from storm water. The conventional oil baffle within a unit assures satisfactory oil and grease removal. However, the addition of sorbents is a unique enhancement capability unique to CDS units, enabling increased oil and grease capture efficiencies beyond that obtainable by conventional oil baffle systems.

Under normal operations, CDS units will provide effluent concentrations of oil and grease that are less than 15 parts per million (ppm) for all dry weather spills where the volume is less than or equal to the spill capture volume of the CDS unit. During wet weather flows, the oil baffle system can be expected to remove between 40 and 70% of the free oil and grease from the storm water runoff.

CONTECH Stormwater Solutions only recommends the addition of sorbents to the separation chamber if there are specific land use activities in the catchment watershed that could produce exceptionally large concentrations of oil and grease in the runoff, concentration levels well above typical amounts. If site evaluations merit an increased control of free oil and grease then oil sorbents can be added to the CDS unit to thoroughly address these particular pollutants of concern.

Recommended Oil Sorbents

Rubberizer® Particulate 8-4 mesh or OARS ™ Particulate for Filtration, HPT4100 or equal. Rubberizer is supplied by Haz-Mat Response Technologies, Inc. 4626 Santa Fe Street, San Diego, CA 92109 (800) 542-3036. OARS is supplied by AbTech Industries, 4110 N. Scottsdale Road, Suite 235, Scottsdale, AZ 85251 (800) 545-8999.

The amount of sorbent to be added to the CDS separation chamber can be determined if sufficient information is known about the concentration of oil and grease in the runoff. Frequently the actual concentrations of oil and grease are too variable and the amount to be added and frequency of cleaning will be determined by periodic observation of the sorbent. As an initial application, CDS recommends that approximately 4 to 8 pounds of sorbent material be added to the separation chamber of the CDS units per acre of parking lot or road surface per year. Typically this amount of sorbent results in a ½ inch to one (1”) inch depth of sorbent material on the liquid surface of the separation chamber. The oil and grease loading of the sorbent material should be observed after major storm events. Oil Sorbent material may also be furnished in pillow or boom configurations.

The sorbent material should be replaced when it is fully discolored by skimming the sorbent from the surface. The sorbent may require disposal as a special or hazardous waste, but will depend on local and state regulatory requirements.

CLEANOUT AND DISPOSAL

A vactor truck is recommended for cleanout of the CDS unit and can be easily accomplished in less than 30-40 minutes for most installations. Standard vactor operations should be employed in the cleanout of the CDS unit. Disposal of material from the CDS unit should be in accordance with the local municipality's requirements. Disposal of the decant material to a POTW is recommended. Field decanting to the storm drainage system is not recommended. Solids can be disposed of in a similar fashion as those materials collected from street sweeping operations and catch-basin cleanouts.

MAINTENANCE

The CDS unit should be pumped down at least once a year and a thorough inspection of the separation chamber (inlet/cylinder and separation screen) and oil baffle performed. The unit's internal components should not show any signs of damage or any loosening of the bolts used to fasten the various components to the manhole structure and to each other. Ideally, the screen should be power washed for the inspection. If any of the internal components is damaged or if any fasteners appear to be damaged or missing, please contact CONTECH at 800.338.2211 to make arrangements to have the damaged items repaired or replaced.

The screen assembly is fabricated from Type 316 stainless steel and fastened with Type 316 stainless steel fasteners that are easily removed and/or replaced with conventional hand tools. The damaged screen assembly should be replaced with the new screen assembly placed in the same orientation as the one that was removed.

CONFINED SPACE

The CDS unit is a confined space environment and only properly trained personnel possessing the necessary safety equipment should enter the unit to perform particular maintenance and/or inspection activities beyond normal procedure. Inspections of the internal components can, in most cases, be accomplished by observations from the ground surface.

VECTOR CONTROL

Most CDS units do not readily facilitate vector infestation. However, for CDS units that may experience extended periods of non-operation (stagnant flow conditions for more than approximately one week) there may be the potential for vector infestation. In the event that these conditions exist, the CDS unit may be designed to minimize potential vector habitation through the use of physical barriers (such as seals, plugs and/or netting) to seal out potential vectors. The CDS unit may also be configured to allow drain-down under favorable soil conditions where infiltration of storm water runoff is permissible. For standard CDS units that show evidence of mosquito infestation, the application of larvicide is one control strategy that is recommended. Typical larvicide applications are as follows:

> SOLID B.t.i. LARVICIDE: ½ to 1 briquet (typically treats 50-100 sq. ft.) one time per month (30-days) or as directed by manufacturer.
>
> SOLID METHOPRENE LARVICIDE (not recommended for some locations): ½ to 1 briquet (typically treats 50-100 sq. ft.) one time per month (30-days) to once every 4-½ to 5-months (150-days) or as directed by manufacturer.

RECORDS OF OPERATION AND MAINTENANCE

CONTECH Stormwater Solutions recommends that the owner maintain annual records of the operation and maintenance of the CDS unit to document the effective maintenance of this important component of your storm water management program. The attached **Annual Record of Operations and Maintenance** form (see **Appendix A**) is suggested and should be retained for a minimum period of three years.

APPENDIX A

ANNUAL RECORDS OF OPERATIONS & MAINTENANCE AND INSPECTION CHECKLISTS

ANNUAL RECORD OF
OPERATION AND MAINTENANCE

OWNER ____
ADDRESS ____
OWNER REPRESENTATIVE ______________________ **PHONE** ______________________

INSTALLATION:
MODEL DESIGNATION ______ ___ _______ __ DATE ____________________
SITE LOCATION ____

INSPECTIONS:

DATE/ INSPECTOR	SCREEN/INLET INTEGRITY	FLOATABLES DEPTH	DEPTH TO SEDIMENT (inches)	SEDIMENT VOLUME* (CUYDS)	SORBENT DISCOLORATION

DEPTH FROM COVER TO BOTTOM OF SUMP (SUMP INVERT) __________________

DEPTH FROM COVER TO SUMP @ 75% FULL ________________________________

VOLUME OF SUMP @ 75% FULL =_______CUYD

VOLUME/INCH DEPTH _______________CUFT/IN OF SUMP

VOLUME/FOOT DEPTH_______________CUYD/FT OF SUMP

***Calculate Sediment Volume = (Depth to Sump Invert – Depth to Sediment)*(Volume/inch)**
OBSERVATIONS OF FUNCTION: ____
____
____

CLEANOUT:

DATE	VOLUME FLOATABLES	VOLUME SEDIMENTS	METHOD OF DISPOSAL OF FLOATABLES, SEDIMENTS, DECANT AND SORBENTS

OBSERVATIONS:
____
____
____
____

SCREEN MAINTENANCE:
DATE OF POWER WASHING, INSPECTION AND OBSERVATIONS:
____
____

CERTIFICATION:__________________ **TITLE:**_____________ **DATE:**_________

INSPECTION CHECKLIST

1. During the rainfall season, i nspect and check condition of unit at east once every 30 days ☐
2. Ascertain that the unit is funcioning properly (no blockages or obstructions to inlet and/or separation screen) ☐
3. Measure amount of solid material s that have accumulated in the sump (Unit should be cleaned when the sump is 75-85% full) ☐
4. Measure amount of fine sediment accumulated behind the screen ☐
5. Measure amount of floating trash and debris in the separation chamber ☐

MAINTENANCE CHECKLIST

1. Cleanout unit at the end and beginning of the rainfall season ☐
2. Pump down unit (at least once a year) and thoroughly inspect separation chamber, separation screen and oil baffle ☐
3. No visible signs of damage or loosening of bolts to internal components observed * ☐

*** If there is any damage to the internal components or any fasteners are damaged or missing please contact CONTECH (800.338.1122).**

UNIVERSITY OF MASSACHUSETTS
AT AMHERST
Water Resources Research Center
Blaisdell House, UMass
310 Hicks Way
Amherst, MA 01003

Massachusetts Stormwater Evaluation Project

(413) 545-5532
(413) 545-2304 FAX
www.mastep.net

MASTEP Technology Review

Technology Name: CDS (Continuous Deflective Separator) - Contech Stormwater Solutions, Inc.

Studies Reviewed:

- Independent Review of CDS 2015 Product Evaluation, FB Environmental Associates, 2009.
- NJCAT Technology Verification Addendum Report High Efficiency Continuous Deflective Separators CDS Technologies Inc. December 2004
- Continuous Deflection Separation (CDS) Unit For Sediment Control In Brevard County, Florida January, 2000

Date: 12/16/2009
Reviewer: Jerry Schoen

Rating: 2

Brief rationale for rating: MASTEP rating is based primarily on FB Environmental 2009 laboratory study. This study generally followed NJDEP-recommended laboratory test protocols, with some exceptions: no evidence of a Quality Assurance Project Plan, little discussion of quality control, higher than recommended particle size distribution, limited range of influent sediment concentration, sediments analyzed by SSC method but not TSS.

The Florida field study monitored 5 storm events and encountered sampling/equipment problems in four of them. The NJCAT lab study was conducted on a unit that was specially modified for testing in New Jersey, and is now being sold in NJ and NY.

Other Comments:

FB Environmental Associates study:

- OK-110 sediment mix used. This is recommended by Maine DEP, but produces sediments somewhat larger than those recommended by New Jersey DEP.
- Sediment analysis conducted with whole sample; essentially SSC method. SSC is generally regarded as more accurate than TSS method, but comparisons with other studies or products that use TSS data are problematic.
- Full range of flows were tested.
- Only one target sediment concentration was tested; average influent SSC was 313 mg/l, slightly outside of recommended 100-300 mg/l range.
- Scour test was performed; system produced no scour at flows up to 137% of capacity.

NJCAT Study

- Expectations of sediment removal performance comparable to this study should be confined to units that contain the sediment weir and a 2400 micron screen.
- The study did not include a scour test.
- A particularly fine sediment mix (Sil-Col-Sil 106, pre-washed to remove all particles > 100 microns), which makes sediment removal more difficult. Higher removal efficiencies may be obtained if sediment particle size range is larger.

- A narrow range of influent sediment (164 – 203 mg/l, average 184), was tested but this is within the NJDEP-recommended 100-300 mg/l range.
- TSS analysis appears to have been performed by a non- standardized method.
- No discussion of quality control.

Brevard County FL study

- This study was performed before release of the TARP Tier II Protocols and does not conform to them.
- The study states that "testing under higher flow conditions would be desirable."
- TSS, BOD, COD, pH, total phosphorus, and turbidity were monitored.