RJOC

Stormwater Management Report

Grove Street Residences
121 Grove Street
Franklin, Massachusetts

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I. STORMWATER REPORT NARRATIVE

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. A 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 44% 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-7 (PSIS-7) 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 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-6 (PSIS-6). PSIS-6 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-6 (PSIS-6). PSIS-6 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 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 1.12 (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 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 1.15 (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-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 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 proposed subsurface infiltration system-2 (PSIS-2) and stormwater basin-1 (SWB-1). PSIS-1 has been designed with a piped manifold overflow that will direct stormwater to SWB-1. SWB-1 has been designed with a drawdown outlet control structure and overflow 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 grassed areas. Stormwater runoff from this sub-catchment will be flow overland to stormwater basin-1 (SWB-1) that has a weir that outlets stormwater to DP-3 in larger storm events.

Proposed Sub-Catchment Area 3.6 (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	1.6	0.9	13,340	7,510
10-Year	8.8	5.6	51,286	33,295
25-Year	16.2	10.4	84,652	64,066
100-Year	30.3	30.1	145,650	130,014

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	56
10-Year	0.3	0.1	1,609	572
25-Year	0.7	0.3	3,119	1,289
100-Year	1.5	0.6	6,312	2,849

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	1,300	853
25-Year	0.2	0.2	5,061	3,539
100-Year	1.6	0.9	14,895	11,914

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	976	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 = 277,351 sf
- Rv = (1/12)(0.6)(277,351) = 13,868 cf

Hydrologic Soil Group B:

- x = 154,210 sf
- Rv = (1/12)(0.35)(154,210) = 4,498 cf

Total Rv = 18,366 cf

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

PSIS-1 = 3,108 cf
PSIS-2 = 2,652 cf
PSIS-3 = 19,475 cf
PSIS-4 = 34,610 cf
PSIS-5 = 8,471 cf
PSIS-6 = 12,168 cf
PSIS-7 = 2,984 cf

Total Recharge Storage Provided = 83,467 cf

(Note: PSWB-1 has not been included in the recharge volume calculations as the systems is within 50' of a wetland.)

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 = 3,108 *cf*

$$T_{DR} = \frac{\mathbf{3{,}108}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{3{,}427}\boldsymbol{sf})} = 1.3hrs$$

1.3*hrs* < 72*hrs*

PSIS-2:

Volume to Treat = 2,652 *cf*

$$T_{DR} = \frac{\mathbf{2{,}652}\boldsymbol{cf}}{\left(\frac{\mathbf{2.41}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{3{,}058}\boldsymbol{sf})} = 4.3hrs$$

4.3*hrs* < 72*hrs*

PSIS-3:

Volume to Treat = 19,475 *cf*

$$T_{DR} = \frac{\mathbf{19{,}475}\ \boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{6{,}068}\boldsymbol{sf})} = 4.7hrs$$

4.6*hrs* < 72*hrs*

PSIS-4:

Volume to Treat = 34,610 *cf*

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

37.8*hrs* < 72*hrs*

PSIS-5:

Volume to Treat = 8,471 *cf*

$$T_{DR} = \frac{\mathbf{8{,}471}\boldsymbol{cf}}{\left(\frac{\mathbf{2.41}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{2{,}982}\ \boldsymbol{sf})} = 14.1hrs$$

14.1*hrs* < 72*hrs*

PSIS-6:

Volume to Treat = 12,168 *cf*

$T_{DR} = \frac{\mathbf{12{,}168}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{n/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{2{,}911}\boldsymbol{sf})} = 6.1\mathit{hrs}$

5.9*hrs* < 72*hrs*

PSIS-7:

Volume to Treat = 2,984 *cf*

$T_{DR} = \frac{\mathbf{2{,}984}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{1{,}108}\boldsymbol{sf})} = 3.9\mathit{hrs}$

3.9*hrs* < 72*hrs*

PSWB-1:

Volume to Treat = 6,602 *cf*

$T_{DR} = \frac{\mathbf{6{,}602}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{2{,}613}\boldsymbol{sf})} = 3.7\mathit{hrs}$

3.7*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 =18,366 cf

2. Calculate the impervious area draining to recharge facilities:
   Area = 379,696 sf

3. Divide site total site impervious by the impervious area draining to recharge facilities:
   Total site impervious area = 431,561 sf
   431,561/379,696 = 1.14

4. Multiply quotient from step 3 by the original Rv to determine the adjusted minimum storage volume needed to meet the recharge requirement:
   1.14 x 18,366 = 20,937 cf
   Infiltration facilities provide 83,467 cf of storage

5. Ensure minimum of 65% of the site impervious area is being directed to the infiltration facilities:

379,696sf/431,561sf = 88.0%

In summary, the infiltration facilities onsite provide a total recharge storage volume of 84,731 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.

<u>Surface Infiltration Basin</u>
A surface infiltration basin is a stormwater runoff impoundment constructed over permeable soils which can provide storage and mitigation of stormwater peak flows as well as treatment of the required water quality volume. 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 = 431,561 sf

$$V_{WQ} = 1.0\ in * \left(\frac{1\ ft}{12\ in}\right) * 431{,}561\ sf\ = 35{,}963\ \boldsymbol{CF}$$

Water Quality Volume Provided:

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

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

PSIS-1 = 3,108 cf
PSIS-2 = 2,652 cf
PSIS-3 = 19,475 cf
PSIS-4 = 34,610 cf
PSIS-5 = 8,471 cf
PSIS-6 = 12,168 cf
PSIS-7 = 2,984 cf
PSWB-1 = 6,602 cf

<u>Total Water Quality Volume Provided = 90,070 cf</u>

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 = 33,556 sf
Required Volume for 1" Retention = 2,796 cf
Provided Volume under outlet = 3,108 cf

PSIS-2:
Impervious Area = 30,150 sf
Required Volume for 1" Retention = 2,513 cf
Provided Volume under outlet = 2,652 cf

PSIS-3:
Impervious Area = 105,191 sf
Required Volume for 1" Retention = 8,766 cf
Provided Volume under outlet = 19,475 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 = 8,471 cf

PSIS-6:

Impervious Area = 37,401 sf
Required Volume for 1” Retention = 3,117 cf
Provided Volume under outlet = 12,168 cf

PSIS-7:

Impervious Area = 16,532 sf
Required Volume for 1” Retention = 1,378 cf
Provided Volume under outlet = 2,984 cf

PSWB-1:

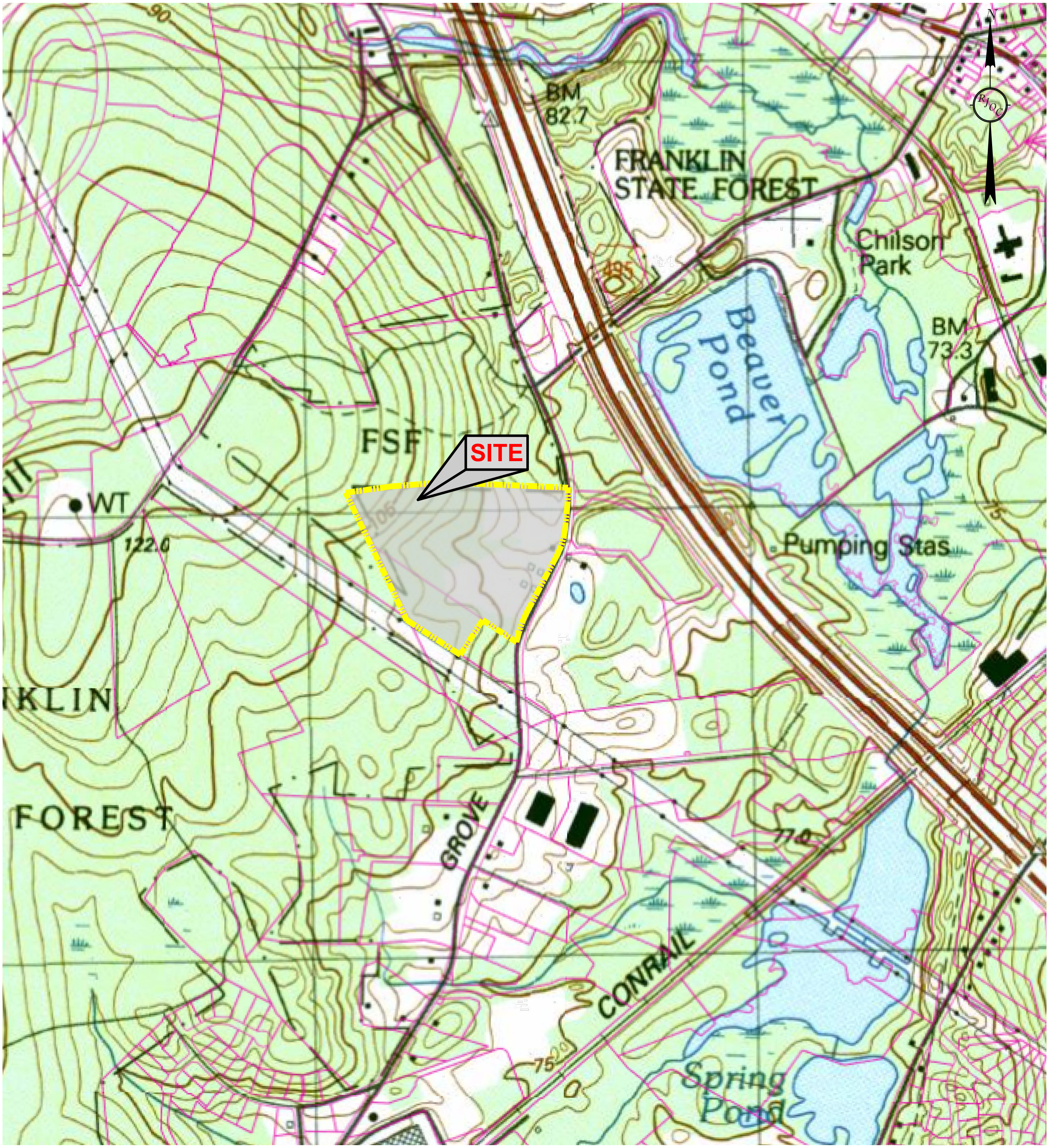
Impervious Area = 50,865 sf
Required Volume for 1” Retention = 4,239 cf
Provided Volume under outlet = 6,602 cf

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.

II. FIGURES

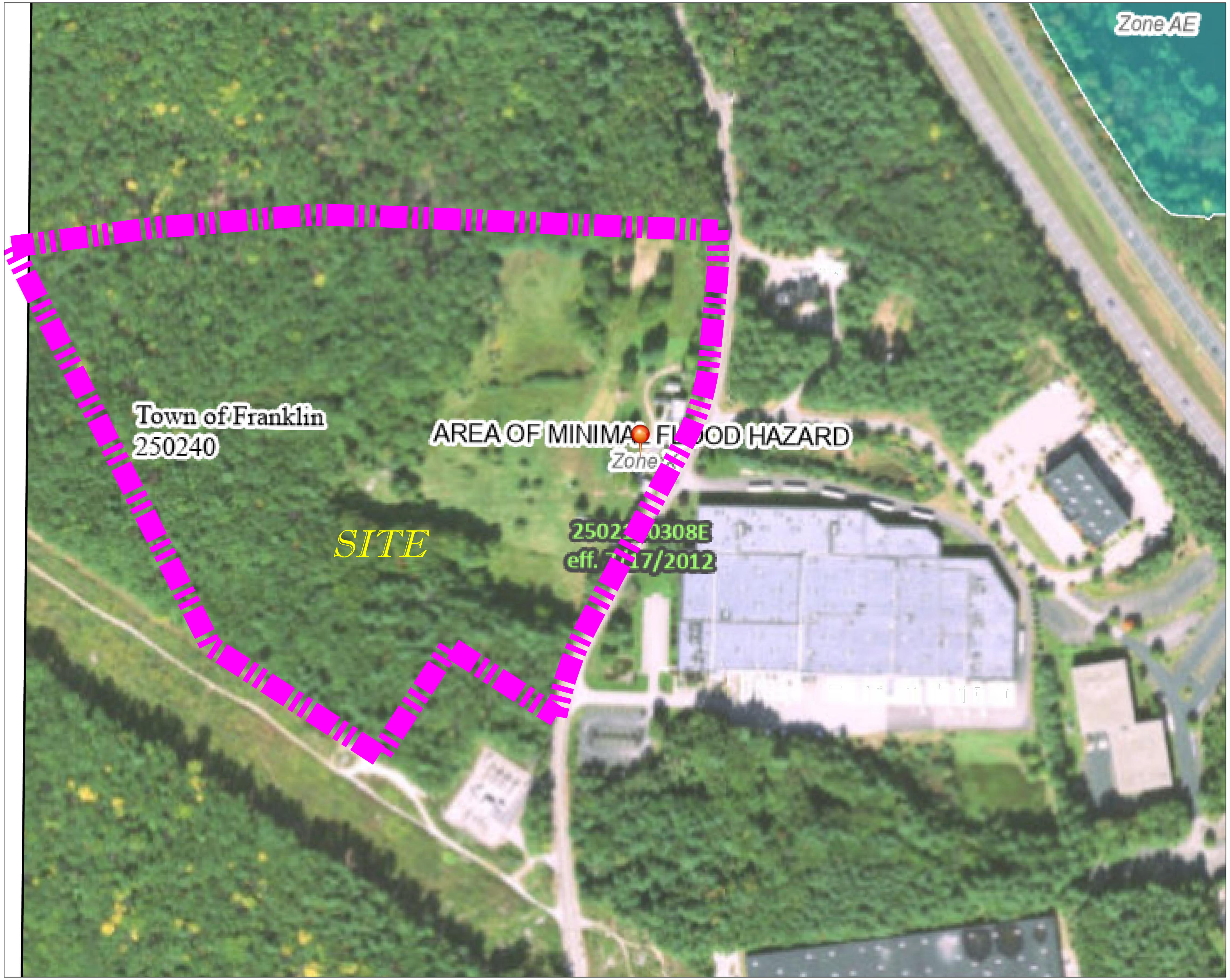


1,000 0 500 1,000 2,000

GRAPHIC SCALE IN FEET

DESIGNED BY: MAC DRAWN BY: MAC REVIEWED BY: BJM SCALE: 1" = 1,000' DATE: 05/10/2024 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
May 09, 2024 - 13:00pm



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RJOC

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8	Coastal Transect
	513	Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

N

250 0 125 250 500

GRAPHIC SCALE IN FEET

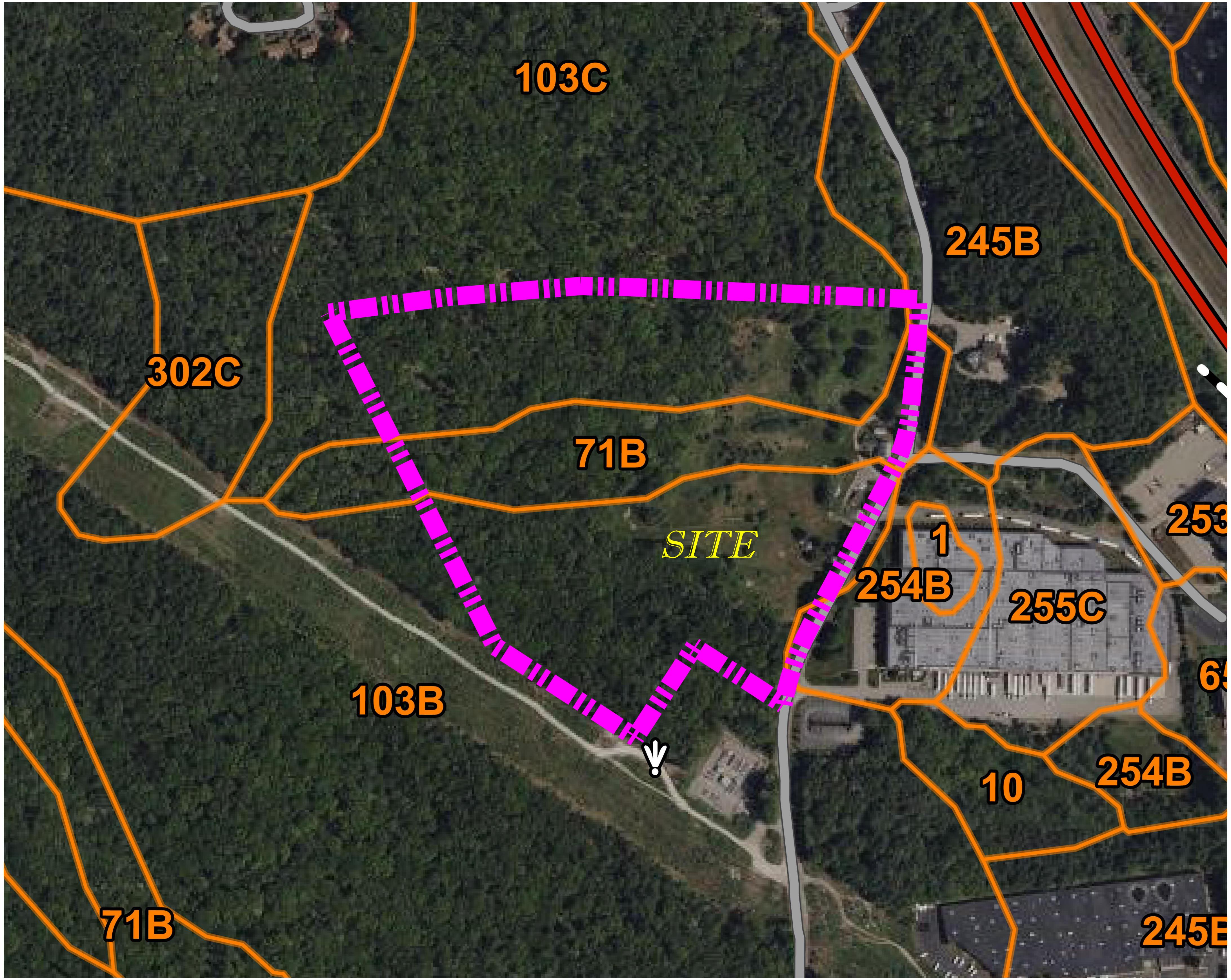
REFERENCE: FEMA FLOOD INSURANCE RATE MAP, MIDDLESEX COUNTY,
MAP NUMBER 25027C0662F EFFECTIVE DATE JULY 16, 2014

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

DATE: 05/10/2024 SCALE: 1"=250'

FIGURE 2
FEMA FLOOD INSURANCE RATE MAP
121 GROVE STREET
FRANKLIN, MA 02038

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Reports\Stormwater Report\Figures\22016_FIG-2 FEMA Firm Map.dwg
May 09, 2024 - 13:01pm



300 0 150 300 600

GRAPHIC SCALE IN FEET

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

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& ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS

DATE: 05/10/2024 SCALE: 1" = 300'

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

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Reports\Stormwater Report\Figures\22016_FIG-3 NRCS Soil Map.dwg
May 09, 2024 - 13:02pm

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

RJOC

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& ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS

DATE: 12/18/2023 SCALE: 1"=160'
REVISED: 2/2/24, 2/12/24, 3/28/24, 5/10/24

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-rev_B

RJOC

	SUBCATCHMENT BOUNDARY
PR-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

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

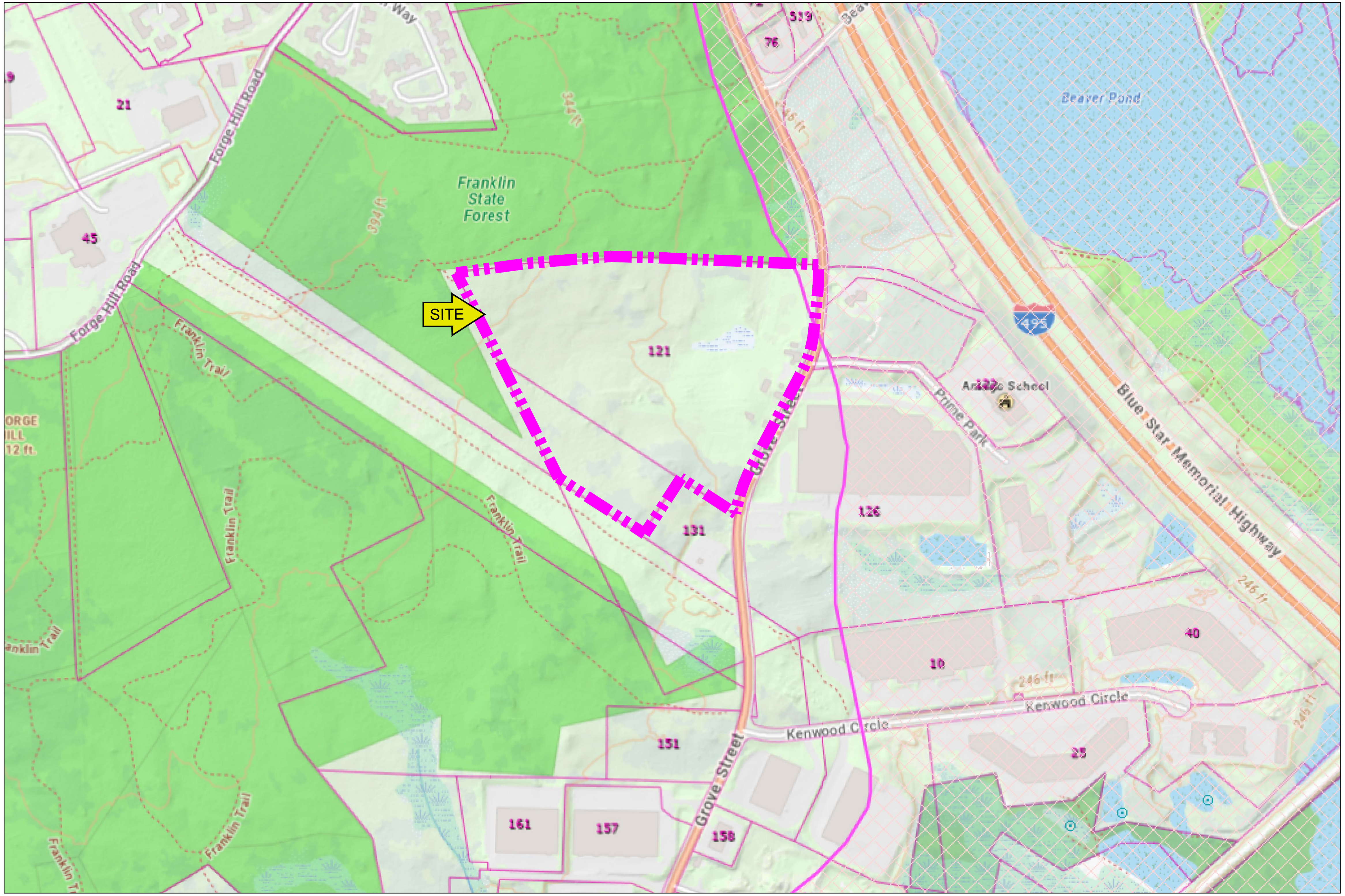
DATE: 12/18/2023 SCALE: 1"=160'
REVISED: 2/2/24, 02/12/24, 3/28/24, 5/10/24
FIGURE 5

PROPOSED WATERSHED PLAN

---

121 GROVE STREET
FRANKLIN, MA

N



RJOC

AUL Sites
Zone IIs
Zone Is
IWPAs
DEP Wetlands Detailed With Outlines
- Barrier Beach System
- Barrier Beach-Deep Marsh
- Barrier Beach-Wooded Swamp Mixed
- Barrier Beach-Coastal Beach
- Barrier Beach-Coastal Dune
- Barrier Beach-Marsh
- Barrier Beach-Salt Marsh
- Barrier Beach-Shrub Swamp
- Barrier Beach-Wooded Swamp Conife
- Barrier Beach-Wooded Swamp Decidu
- Bog
- Coastal Bank Bluff or Sea Cliff
- Coastal Beach
- Coastal Dune
- Cranberry Bog
- Deep Marsh
- Barrier Beach-Open Water
- Open Water
- Rocky Intertidal Shore
- Salt Marsh
- Shallow Marsh Meadow or Fen
- Shrub Swamp
- Tidal Flat
- Wooded Swamp Coniferous
- Wooded Swamp Deciduous
- Wooded Swamp Mixed Trees

NHESP Priority Habitats of Rare Species
NHESP Estimated Habitats of Rare Wildlife
Potential Vernal Pools
NHESP Certified Vernal Pools

500 0 250 500 1,000
GRAPHIC SCALE IN FEET

RJO'CONNELL
& ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
DATE: 05/10/2024 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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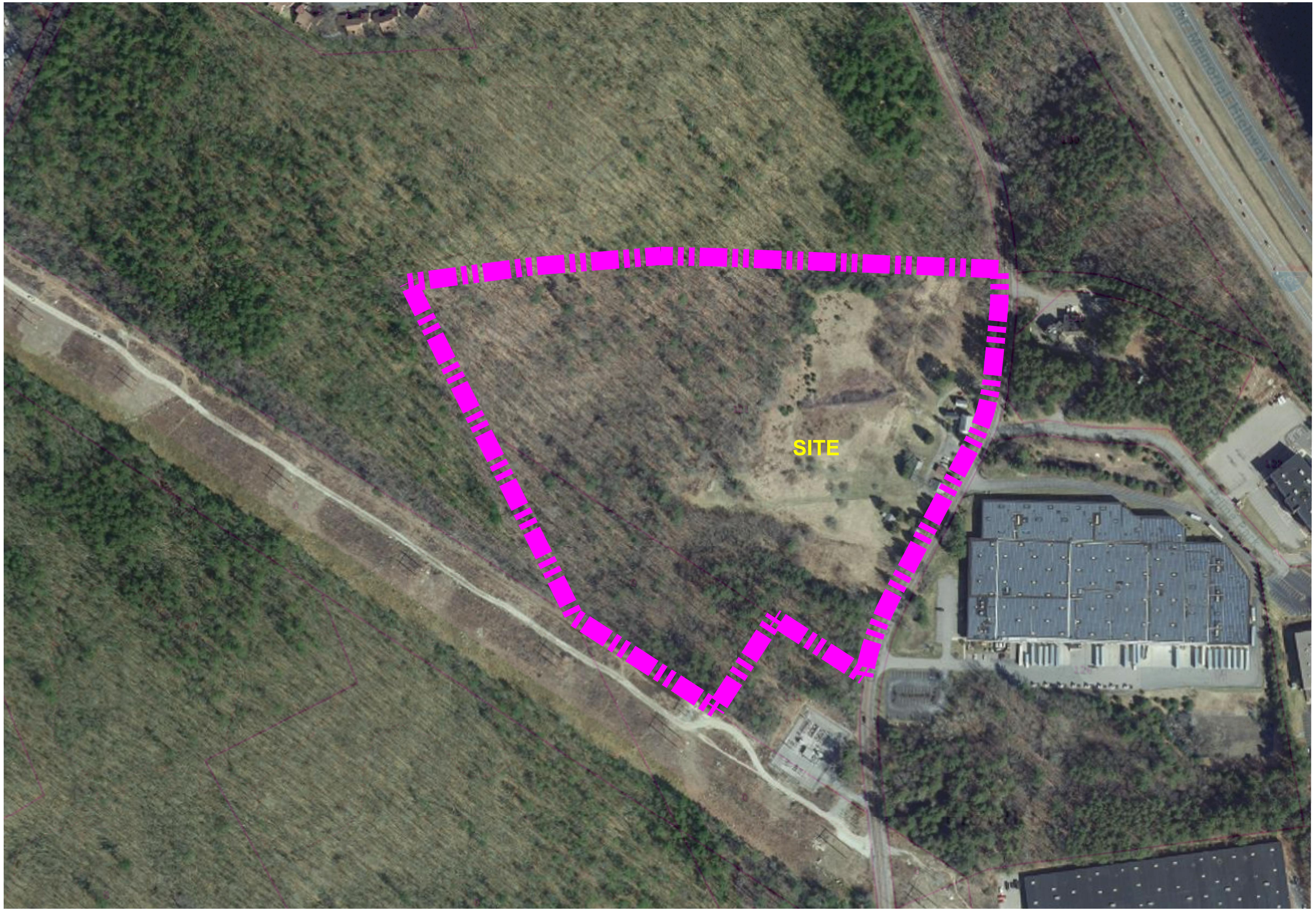


RJOC

N

300 0 150 300 600

GRAPHIC SCALE IN FEET

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Reports\Stormwater Report\Figures\22016_FIG-7 MassGIS Ortho Map.dwg
May 09, 2024 - 13:06pm

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

DATE: 05/10/2024 SCALE: 1"=300'

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

III.APPENDICIES

APPENDIX A
MassDEP Checklist for Stormwater Reports

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.

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

5-10-2024
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 (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

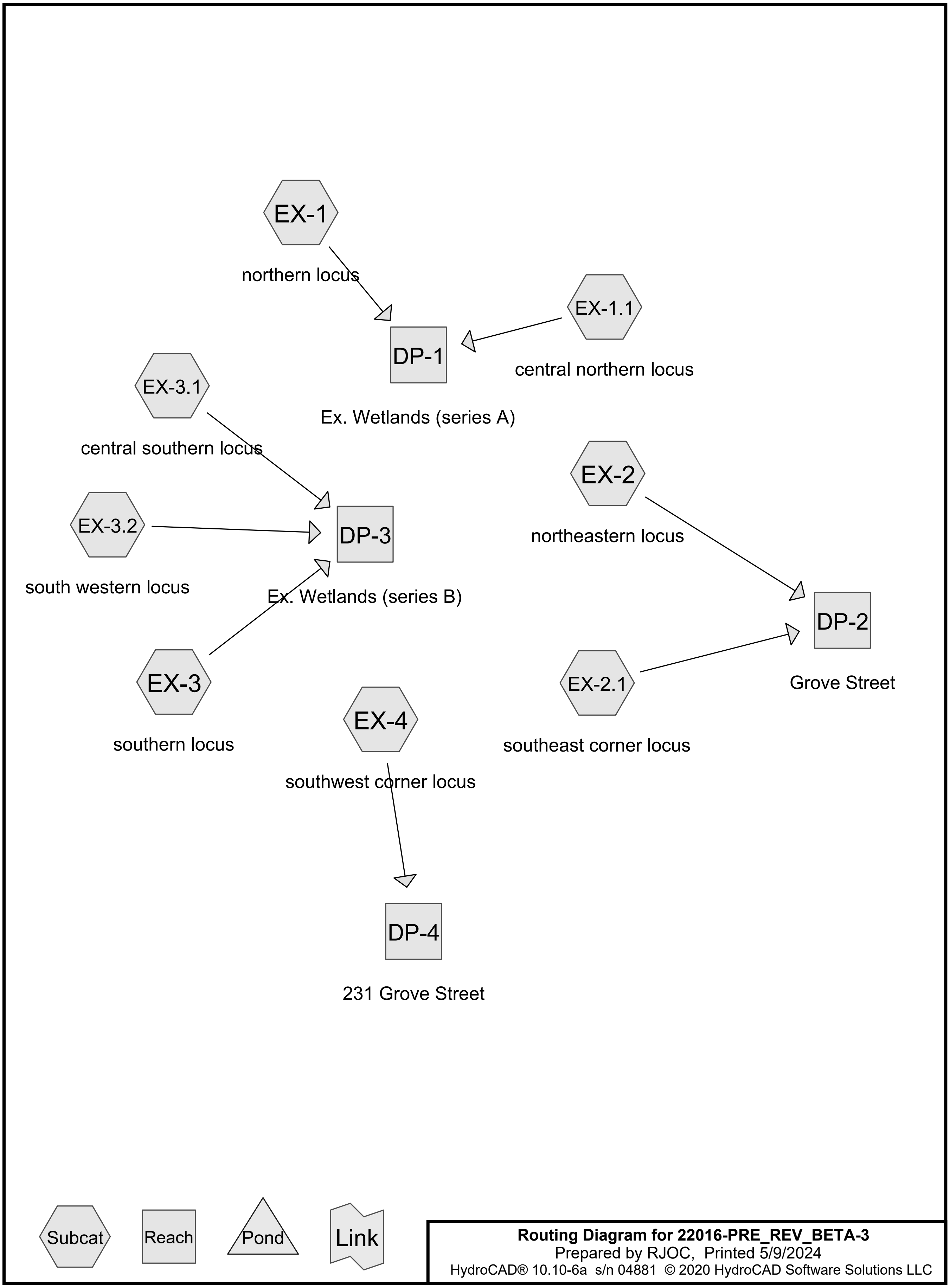
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ 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

Pre-Development Hydrological Computations



Routing Diagram for 22016-PRE_REV_BETA-3
Prepared by RJOC, Printed 5/9/2024
HydroCAD® 10.10-6a s/n 04881 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
184,663	39	>75% Grass cover, Good, HSG A (EX-1.1, EX-2, EX-2.1, EX-3, EX-3.1)
57,507	61	>75% Grass cover, Good, HSG B (EX-1, EX-1.1)
1,576	80	>75% Grass cover, Good, HSG D (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)
374,785	30	Woods, Good, HSG A (EX-1.1, EX-2, EX-2.1, EX-3, EX-3.1, EX-3.2, EX-4)
426,252	55	Woods, Good, HSG B (EX-1, EX-1.1)
1,074,628	**45**	**TOTAL AREA**

Summary for Subcatchment EX-1: northern locus

Runoff = 1.6 cfs @ 12.49 hrs, Volume= 13,276 cf, Depth> 0.33"
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	55	Woods, Good, HSG B
	43,817	61	>75% Grass cover, Good, HSG B
	8,664	61	>75% Grass cover, Good, HSG B
	369,499	55	Woods, Good, HSG B
*	7,032	72	Dirt Path
	484,498	56	Weighted Average
	484,498		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, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.8	182	0.1080	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	6	0.0200	2.9		**Shallow Concentrated Flow, overland (path)** Paved Kv= 20.3 fps
2.7	266	0.1100	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.9	218	0.0730	1.9		**Shallow Concentrated Flow, overland (GRASS)** Short Grass Pasture Kv= 7.0 fps
0.4	36	0.1100	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
18.9	758	Total			

Summary for Subcatchment EX-1.1: central northern locus

Runoff = 0.0 cfs @ 23.98 hrs, Volume= 64 cf, Depth> 0.00"
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	30	Woods, Good, HSG A
*	3,720	98	Roof Area
	49,482	39	>75% Grass cover, Good, HSG A
	37,541	39	>75% Grass cover, Good, HSG A
	70,163	30	Woods, Good, HSG A
*	7,912	98	Drive/Patios
	6,805	96	Gravel surface, HSG A
	5,026	61	>75% Grass cover, Good, HSG B
	1,267	55	Woods, Good, HSG B
	237,956	39	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
5.6	50	0.1400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
3.0	170	0.0350	0.9		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
4.7	327	0.0530	1.2		**Shallow Concentrated Flow, overland (woods) to Wetland Series** Woodland Kv= 5.0 fps
13.3	547	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
5.6	50	0.1400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.1	140	0.0500	1.1		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.8	92	0.1400	1.9		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
8.5	282	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
6.5	50	0.0950	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.1	190	0.0900	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.8	170	0.0450	3.4		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
9.4	410	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
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
5.8	245	0.0200	0.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.7	146	0.0790	1.4		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.8	366	0.0420	3.3		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
1.4	176	0.0170	2.1		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
0.4	71	0.0280	2.7		**Shallow Concentrated Flow, overland (woods)** Unpaved Kv= 16.1 fps
18.1	1,054	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"
2.5	159	0.0440	1.0		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.6	209	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
9.2	50	0.0400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.1	87	0.0750	1.4		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
10.3	137	Total			

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

Inflow Area = 722,454 sf, 1.61% Impervious, Inflow Depth > 0.22" for 2-Yr 24 Hr event
Inflow = 1.6 cfs @ 12.49 hrs, Volume= 13,340 cf
Outflow = 1.6 cfs @ 12.49 hrs, Volume= 13,340 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 = 8.7 cfs @ 12.31 hrs, Volume= 46,433 cf, Depth> 1.15"
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	55	Woods, Good, HSG B
	43,817	61	>75% Grass cover, Good, HSG B
	8,664	61	>75% Grass cover, Good, HSG B
	369,499	55	Woods, Good, HSG B
*	7,032	72	Dirt Path
	484,498	56	Weighted Average
	484,498		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, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.8	182	0.1080	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	6	0.0200	2.9		**Shallow Concentrated Flow, overland (path)** Paved Kv= 20.3 fps
2.7	266	0.1100	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.9	218	0.0730	1.9		**Shallow Concentrated Flow, overland (GRASS)** Short Grass Pasture Kv= 7.0 fps
0.4	36	0.1100	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
18.9	758	Total			

Summary for Subcatchment EX-1.1: central northern locus

Runoff = 0.3 cfs @ 12.55 hrs, Volume= 4,853 cf, Depth> 0.24"
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	30	Woods, Good, HSG A
*	3,720	98	Roof Area
	49,482	39	>75% Grass cover, Good, HSG A
	37,541	39	>75% Grass cover, Good, HSG A
	70,163	30	Woods, Good, HSG A
*	7,912	98	Drive/Patios
	6,805	96	Gravel surface, HSG A
	5,026	61	>75% Grass cover, Good, HSG B
	1,267	55	Woods, Good, HSG B
	237,956	39	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
5.6	50	0.1400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
3.0	170	0.0350	0.9		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
4.7	327	0.0530	1.2		**Shallow Concentrated Flow, overland (woods) to Wetland Series** Woodland Kv= 5.0 fps
13.3	547	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 @ 22.60 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
5.6	50	0.1400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.1	140	0.0500	1.1		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.8	92	0.1400	1.9		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
8.5	282	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
6.5	50	0.0950	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.1	190	0.0900	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.8	170	0.0450	3.4		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
9.4	410	Total			

Summary for Subcatchment EX-3.1: central southern locus

Runoff = 0.0 cfs @ 15.34 hrs, Volume= 856 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
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
5.8	245	0.0200	0.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.7	146	0.0790	1.4		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.8	366	0.0420	3.3		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
1.4	176	0.0170	2.1		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
0.4	71	0.0280	2.7		**Shallow Concentrated Flow, overland (woods)** Unpaved Kv= 16.1 fps
18.1	1,054	Total			

Summary for Subcatchment EX-3.2: south western locus

Runoff = 0.0 cfs @ 22.63 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"
2.5	159	0.0440	1.0		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.6	209	Total			

Summary for Subcatchment EX-4: southwest corner locus

Runoff = 0.0 cfs @ 22.58 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
9.2	50	0.0400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.1	87	0.0750	1.4		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
10.3	137	Total			

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

Inflow Area = 722,454 sf, 1.61% Impervious, Inflow Depth > 0.85" for 10-Yr 24 Hr event
Inflow = 8.8 cfs @ 12.31 hrs, Volume= 51,286 cf
Outflow = 8.8 cfs @ 12.31 hrs, Volume= 51,286 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 @ 15.63 hrs, Volume= 1,300 cf
Outflow = 0.0 cfs @ 15.63 hrs, Volume= 1,300 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 @ 22.58 hrs, Volume= 27 cf
Outflow = 0.0 cfs @ 22.58 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 = 15.1 cfs @ 12.29 hrs, Volume= 73,560 cf, Depth> 1.82"
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	55	Woods, Good, HSG B
	43,817	61	>75% Grass cover, Good, HSG B
	8,664	61	>75% Grass cover, Good, HSG B
	369,499	55	Woods, Good, HSG B
*	7,032	72	Dirt Path
	484,498	56	Weighted Average
	484,498		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, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.8	182	0.1080	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	6	0.0200	2.9		**Shallow Concentrated Flow, overland (path)** Paved Kv= 20.3 fps
2.7	266	0.1100	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.9	218	0.0730	1.9		**Shallow Concentrated Flow, overland (GRASS)** Short Grass Pasture Kv= 7.0 fps
0.4	36	0.1100	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
18.9	758	Total			

Summary for Subcatchment EX-1.1: central northern locus

Runoff = 1.3 cfs @ 12.43 hrs, Volume= 11,092 cf, Depth> 0.56"
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	30	Woods, Good, HSG A
*	3,720	98	Roof Area
	49,482	39	>75% Grass cover, Good, HSG A
	37,541	39	>75% Grass cover, Good, HSG A
	70,163	30	Woods, Good, HSG A
*	7,912	98	Drive/Patios
	6,805	96	Gravel surface, HSG A
	5,026	61	>75% Grass cover, Good, HSG B
	1,267	55	Woods, Good, HSG B
	237,956	39	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
5.6	50	0.1400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
3.0	170	0.0350	0.9		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
4.7	327	0.0530	1.2		**Shallow Concentrated Flow, overland (woods) to Wetland Series** Woodland Kv= 5.0 fps
13.3	547	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 @ 15.08 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
5.6	50	0.1400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.1	140	0.0500	1.1		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.8	92	0.1400	1.9		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
8.5	282	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
6.5	50	0.0950	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.1	190	0.0900	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.8	170	0.0450	3.4		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
9.4	410	Total			

Summary for Subcatchment EX-3.1: central southern locus

Runoff = 0.1 cfs @ 12.65 hrs, Volume= 2,865 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
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
5.8	245	0.0200	0.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.7	146	0.0790	1.4		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.8	366	0.0420	3.3		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
1.4	176	0.0170	2.1		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
0.4	71	0.0280	2.7		**Shallow Concentrated Flow, overland (woods)** Unpaved Kv= 16.1 fps
18.1	1,054	Total			

Summary for Subcatchment EX-3.2: south western locus

Runoff = 0.0 cfs @ 15.17 hrs, Volume= 256 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"
2.5	159	0.0440	1.0		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.6	209	Total			

Summary for Subcatchment EX-4: southwest corner locus

Runoff = 0.0 cfs @ 15.07 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
9.2	50	0.0400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.1	87	0.0750	1.4		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
10.3	137	Total			

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

Inflow Area = 722,454 sf, 1.61% Impervious, Inflow Depth > 1.41" for 25-Yr 24 Hr event
Inflow = 16.2 cfs @ 12.29 hrs, Volume= 84,652 cf
Outflow = 16.2 cfs @ 12.29 hrs, Volume= 84,652 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 @ 12.69 hrs, Volume= 5,061 cf
Outflow = 0.2 cfs @ 12.69 hrs, Volume= 5,061 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 @ 15.07 hrs, Volume= 251 cf
Outflow = 0.0 cfs @ 15.07 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 = 26.2 cfs @ 12.28 hrs, Volume= 121,314 cf, Depth> 3.00"
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	55	Woods, Good, HSG B
	43,817	61	>75% Grass cover, Good, HSG B
	8,664	61	>75% Grass cover, Good, HSG B
	369,499	55	Woods, Good, HSG B
*	7,032	72	Dirt Path
	484,498	56	Weighted Average
	484,498		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, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.8	182	0.1080	1.6		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.0	6	0.0200	2.9		**Shallow Concentrated Flow, overland (path)** Paved Kv= 20.3 fps
2.7	266	0.1100	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.9	218	0.0730	1.9		**Shallow Concentrated Flow, overland (GRASS)** Short Grass Pasture Kv= 7.0 fps
0.4	36	0.1100	1.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
18.9	758	Total			

Summary for Subcatchment EX-1.1: central northern locus

Runoff = 4.2 cfs @ 12.25 hrs, Volume= 24,336 cf, Depth> 1.23"
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	30	Woods, Good, HSG A
*	3,720	98	Roof Area
	49,482	39	>75% Grass cover, Good, HSG A
	37,541	39	>75% Grass cover, Good, HSG A
	70,163	30	Woods, Good, HSG A
*	7,912	98	Drive/Patios
	6,805	96	Gravel surface, HSG A
	5,026	61	>75% Grass cover, Good, HSG B
	1,267	55	Woods, Good, HSG B
	237,956	39	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
5.6	50	0.1400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
3.0	170	0.0350	0.9		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
4.7	327	0.0530	1.2		**Shallow Concentrated Flow, overland (woods) to Wetland Series** Woodland Kv= 5.0 fps
13.3	547	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 @ 12.44 hrs, Volume= 1,088 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
5.6	50	0.1400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.1	140	0.0500	1.1		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.8	92	0.1400	1.9		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
8.5	282	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
6.5	50	0.0950	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
2.1	190	0.0900	1.5		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
0.8	170	0.0450	3.4		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
9.4	410	Total			

Summary for Subcatchment EX-3.1: central southern locus

Runoff = 0.9 cfs @ 12.48 hrs, Volume= 7,805 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
7.0	50	0.0800	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
5.8	245	0.0200	0.7		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.7	146	0.0790	1.4		**Shallow Concentrated Flow, overland (woods)** Woodland Kv= 5.0 fps
1.8	366	0.0420	3.3		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
1.4	176	0.0170	2.1		**Shallow Concentrated Flow, overland (grass)** Unpaved Kv= 16.1 fps
0.4	71	0.0280	2.7		**Shallow Concentrated Flow, overland (woods)** Unpaved Kv= 16.1 fps
18.1	1,054	Total			

Summary for Subcatchment EX-3.2: south western locus

Runoff = 0.1 cfs @ 12.54 hrs, Volume= 999 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"
2.5	159	0.0440	1.0		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.6	209	Total			

Summary for Subcatchment EX-4: southwest corner locus

Runoff = 0.1 cfs @ 12.47 hrs, Volume= 976 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
9.2	50	0.0400	0.1		**Sheet Flow, overland (woods)** Woods: Light underbrush n= 0.400 P2= 3.32"
1.1	87	0.0750	1.4		**Shallow Concentrated Flow, overland (woods) to 131 Grove** Woodland Kv= 5.0 fps
10.3	137	Total			

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

Inflow Area = 722,454 sf, 1.61% Impervious, Inflow Depth > 2.42" for 100-Yr 24 Hr event
Inflow = 30.3 cfs @ 12.28 hrs, Volume= 145,650 cf
Outflow = 30.3 cfs @ 12.28 hrs, Volume= 145,650 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= 6,312 cf
Outflow = 1.5 cfs @ 12.10 hrs, Volume= 6,312 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 =	1.6 cfs @	12.44 hrs,	Volume=	14,895 cf		
Outflow =	1.6 cfs @	12.44 hrs,	Volume=	14,895 cf,	Atten= 0%,	Lag= 0.0 min

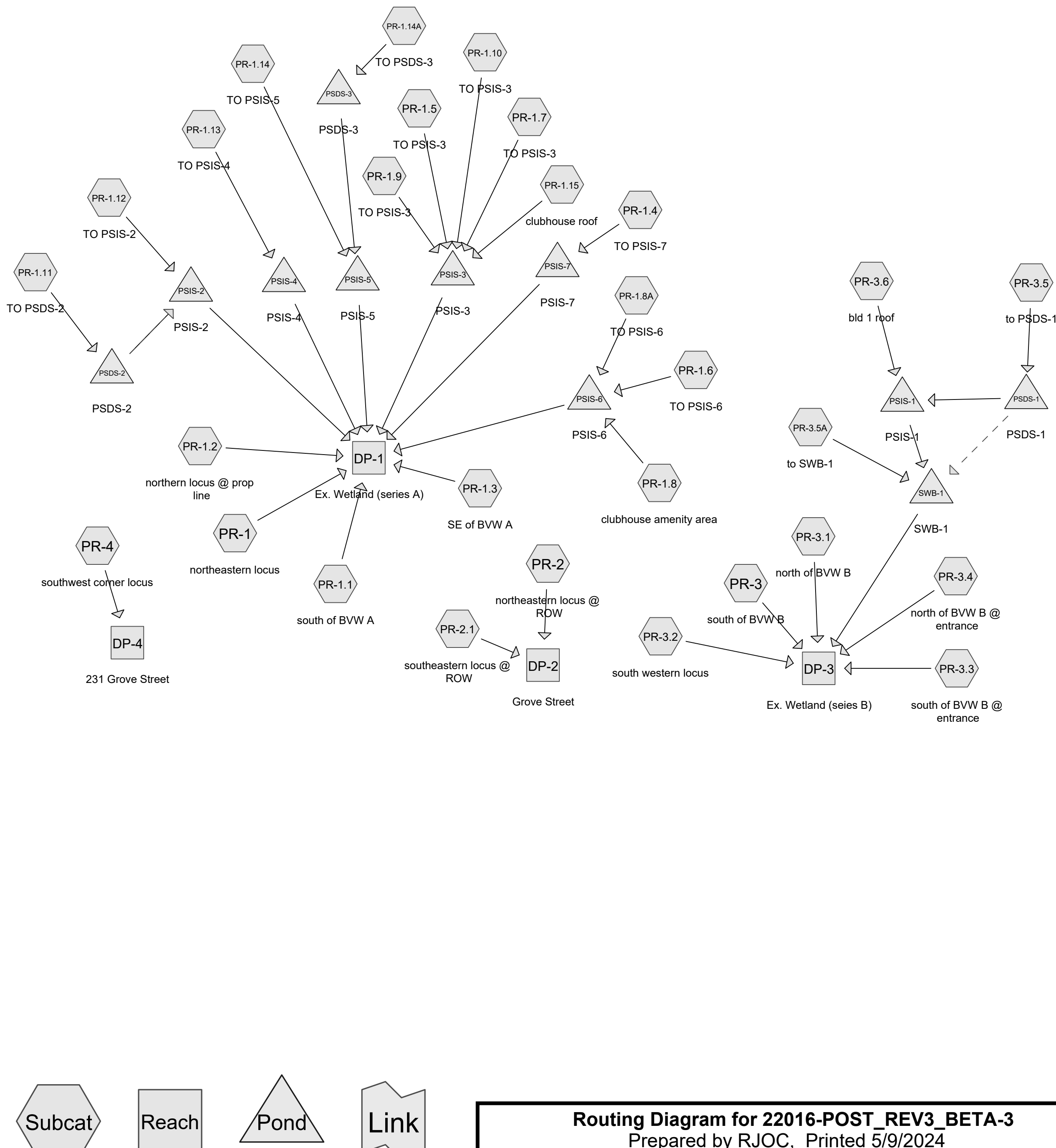
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

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 @	12.47 hrs,	Volume=	976 cf		
Outflow =	0.1 cfs @	12.47 hrs,	Volume=	976 cf,	Atten= 0%,	Lag= 0.0 min

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

Post-Development Hydrologic Computations



Routing Diagram for 22016-POST_REV3_BETA-3
Prepared by RJOC, Printed 5/9/2024
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
176,058	39	>75% Grass cover, Good, HSG A (PR-1.1, PR-1.10, PR-1.11, PR-1.12, PR-1.3, 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, PR-3.6)
106,842	61	>75% Grass cover, Good, HSG B (PR-1, PR-1.13, PR-1.14, PR-1.14A, PR-1.2, PR-1.3)
4,295	72	Dirt Path (PR-1)
337,378	98	Impervious Area (PR-1.10, PR-1.11, PR-1.12, 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-3.6)
94,183	98	Roof Area (PR-1.12, PR-1.13, PR-1.14A, PR-1.15, PR-1.5, PR-3.6)
132,446	30	Woods, Good, HSG A (PR-1.1, PR-1.3, PR-2.1, PR-3, PR-3.1, PR-3.2, PR-4)
223,426	55	Woods, Good, HSG B (PR-1, PR-1.14, PR-1.2)
1,074,628	**67**	**TOTAL AREA**

Summary for Subcatchment PR-1: northeastern locus

Runoff = 0.6 cfs @ 12.41 hrs, Volume= 5,454 cf, Depth> 0.30"
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	55	Woods, Good, HSG B
	813	61	>75% Grass cover, Good, HSG B
	162,557	55	Woods, Good, HSG B
*	4,295	72	Dirt Path
	219,482	55	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 = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
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 2-Yr 24 Hr Rainfall=3.36"

Area (sf)	CN	Description
21,801	30	Woods, Good, HSG A
603	39	>75% Grass cover, Good, HSG A
8,166	39	>75% Grass cover, Good, HSG A
20,582	30	Woods, Good, HSG A
51,152	32	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 = 1.6 cfs @ 12.09 hrs, Volume= 4,852 cf, Depth> 1.82"
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
*	24,307	98	Impervious Area
	7,772	39	>75% Grass cover, Good, HSG A
	32,079	84	Weighted Average
	7,772		24.23% Pervious Area
	24,307		75.77% 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 = 0.8 cfs @ 12.09 hrs, Volume= 2,573 cf, Depth> 2.14"
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
*	11,889	98	Impervious Area
	2,546	39	>75% Grass cover, Good, HSG A
	14,435	88	Weighted Average
	2,546		17.64% Pervious Area
	11,889		82.36% 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 = 1.4 cfs @ 12.08 hrs, Volume= 4,449 cf, Depth> 2.80"
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
*	1,892	98	Impervious Area
	812	39	>75% Grass cover, Good, HSG A
	19,073	95	Weighted Average
	812		4.26% Pervious Area
	18,261		95.74% 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	61	>75% Grass cover, Good, HSG B
	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-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
*	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 = 0.4 cfs @ 12.12 hrs, Volume= 1,886 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
	37,239	61	>75% Grass cover, Good, HSG B
	3,652	55	Woods, Good, HSG B
	3,492	61	>75% Grass cover, Good, HSG B
	44,383	61	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 = 0.0 cfs @ 14.98 hrs, Volume= 170 cf, Depth> 0.06"
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	39	>75% Grass cover, Good, HSG A
	649	30	Woods, Good, HSG A
	32,171	45	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-7

Runoff = 1.0 cfs @ 12.09 hrs, Volume= 3,015 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
*	16,532	98	Impervious Area
	6,483	39	>75% Grass cover, Good, HSG A
	723	39	>75% Grass cover, Good, HSG A
	23,738	80	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 = 1.4 cfs @ 12.09 hrs, Volume= 4,470 cf, Depth> 1.33"
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	39	>75% Grass cover, Good, HSG A
	10,533	39	>75% Grass cover, Good, HSG A
	40,464	77	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-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
*	5,928	98	Impervious Area
	124	39	>75% Grass cover, Good, HSG A
	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-6

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,034 cf, Depth> 1.52"
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
*	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= 1,466 cf, Depth> 2.31"
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	39	>75% Grass cover, Good, HSG A
	7,602	90	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 @ 13.78 hrs, Volume= 56 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
*	936	98	Impervious Area
	4,916	39	>75% Grass cover, Good, HSG A
	1,026	39	>75% Grass cover, Good, HSG A
	6,878	47	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 = 0.0 cfs @ 23.86 hrs, Volume= 2 cf, Depth> 0.00"
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
6,618	39	>75% Grass cover, Good, HSG A
6,618		100.00% Pervious 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 = 2.5 cfs @ 12.09 hrs, Volume= 7,982 cf, Depth> 2.60"
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
*	15,717	98	Impervious Area
	3,324	39	>75% Grass cover, Good, HSG A
	36,880	93	Weighted Average
	3,324		9.01% Pervious Area
	33,556		90.99% 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 > 0.11" for 2-Yr 24 Hr event
Inflow = 0.9 cfs @ 12.36 hrs, Volume= 7,510 cf
Outflow = 0.9 cfs @ 12.36 hrs, Volume= 7,510 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 > 0.02" for 2-Yr 24 Hr event
Inflow = 0.0 cfs @ 13.78 hrs, Volume= 56 cf
Outflow = 0.0 cfs @ 13.78 hrs, Volume= 56 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 @ 17.77 hrs, Volume= 3,364 cf, Atten= 98%, Lag= 340.7 min
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond PSIS-1 : PSIS-1
Secondary = 0.1 cfs @ 17.77 hrs, Volume= 3,364 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= 293.16' @ 17.77 hrs Surf.Area= 7,372 sf Storage= 7,963 cf

Plug-Flow detention time= 375.9 min calculated for 3,363 cf (31% of inflow)
Center-of-Mass det. time= 244.7 min (1,057.1 - 812.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	291.50'	11,793 cf	**55.75'W x 132.24'L x 6.75'H Field A** 49,764 cf Overall - 20,281 cf Embedded = 29,483 cf x 40.0% Voids
#2A	292.25'	20,281 cf	**ADS_StormTech MC-4500 b +Cap**x 186 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 186 Chambers in 6 Rows Cap Storage= 39.5 cf x 2 x 6 rows = 474.0 cf
		32,074 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	296.70'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	296.70'	**6.0" Round Culvert** L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 296.70' / 296.60' S= 0.0077 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#3	Device 4	291.50'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	291.50'	**6.0" Round Culvert** L= 75.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 291.50' / 286.00' S= 0.0733 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=291.50' TW=293.67' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**1=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.1 cfs @ 17.77 hrs HW=293.16' TW=288.09' (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.1 cfs of 1.0 cfs potential flow)
  └─**3=Orifice/Grate** (Orifice Controls 0.1 cfs @ 6.1 fps)

Summary for Pond PSDS-2: PSDS-2

Inflow Area = 14,435 sf, 82.36% Impervious, Inflow Depth > 2.14" for 2-Yr 24 Hr event
Inflow = 0.8 cfs @ 12.09 hrs, Volume= 2,573 cf
Outflow = 0.1 cfs @ 12.66 hrs, Volume= 2,538 cf, Atten= 87%, Lag= 34.1 min
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond PSIS-2 : PSIS-2
Secondary = 0.1 cfs @ 12.66 hrs, Volume= 2,538 cf
Routed to Pond PSIS-2 : PSIS-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 309.99' @ 12.66 hrs Surf.Area= 1,066 sf Storage= 1,038 cf

Plug-Flow detention time= 103.6 min calculated for 2,537 cf (99% of inflow)
Center-of-Mass det. time= 95.3 min (907.7 - 812.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	308.50'	997 cf	**15.75'W x 67.70'L x 3.50'H Field A** 3,732 cf Overall - 1,240 cf Embedded = 2,491 cf x 40.0% Voids
#2A	309.00'	1,240 cf	**ADS_StormTech SC-740 +Cap** x 27 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 27 Chambers in 3 Rows
		2,237 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	311.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	311.00'	**18.0" Round Culvert** L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 311.00' / 310.90' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 4	308.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	308.50'	**2.0" Round Culvert** L= 8.5' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 308.50' / 307.00' S= 0.1765 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=308.50' TW=305.50' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**1=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.1 cfs @ 12.66 hrs HW=309.99' TW=306.48' (Dynamic Tailwater)
└─**4=Culvert** (Inlet Controls 0.1 cfs @ 5.0 fps)
  └─**3=Orifice/Grate** (Passes 0.1 cfs of 0.1 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 = 0.1 cfs @ 17.40 hrs, Volume= 4,333 cf, Atten= 98%, Lag= 318.9 min
Primary = 0.1 cfs @ 17.40 hrs, Volume= 4,333 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= 305.07' @ 17.40 hrs Surf.Area= 4,894 sf Storage= 9,559 cf

Plug-Flow detention time= 371.8 min calculated for 4,333 cf (33% of inflow)
Center-of-Mass det. time= 238.8 min (1,038.9 - 800.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	302.25'	8,372 cf	**120.33'W x 40.67'L x 6.75'H Field A** 33,031 cf Overall - 12,102 cf Embedded = 20,929 cf x 40.0% Voids
#2A	303.00'	12,102 cf	**ADS_StormTech MC-4500 b +Cap**x 104 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 104 Chambers in 13 Rows Cap Storage= 39.5 cf x 2 x 13 rows = 1,027.0 cf
		20,474 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	307.75'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	307.75'	**18.0" Round Culvert** L= 28.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.75' / 306.00' S= 0.0616 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 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=0.1 cfs @ 17.40 hrs HW=305.07' TW=287.47' (Dynamic Tailwater)
2=Culvert (Controls 0.0 cfs)
1=Orifice/Grate (Controls 0.0 cfs)
4=Culvert (Barrel Controls 0.1 cfs @ 4.3 fps)
3=Orifice/Grate (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSIS-1: PSIS-1

Inflow Area = 97,708 sf, 86.40% Impervious, Inflow Depth > 0.98" for 2-Yr 24 Hr event
Inflow = 2.5 cfs @ 12.09 hrs, Volume= 7,982 cf
Outflow = 0.7 cfs @ 11.90 hrs, Volume= 7,987 cf, Atten= 74%, Lag= 0.0 min
Discarded = 0.7 cfs @ 11.90 hrs, Volume= 7,987 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= 294.48' @ 12.45 hrs Surf.Area= 3,427 sf Storage= 1,516 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 10.9 min (801.3 - 790.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	293.67'	2,443 cf	**108.17'W x 31.68'L x 2.33'H Field A** 7,996 cf Overall - 1,887 cf Embedded = 6,109 cf x 40.0% Voids
#2A	294.17'	1,887 cf	**ADS_StormTech SC-310 +Cap** x 128 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 128 Chambers in 32 Rows
		4,330 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	293.67'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	295.17'	**4.0" Vert. Orifice/Grate X 32.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	295.17'	**36.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 295.17' / 294.80' S= 0.0740 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 7.07 sf

Discarded OutFlow Max=0.7 cfs @ 11.90 hrs HW=293.72' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.7 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=293.67' TW=287.50' (Dynamic Tailwater)
└─**3=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond PSIS-2: PSIS-2

Inflow Area = 33,508 sf, 89.98% Impervious, Inflow Depth > 2.50" for 2-Yr 24 Hr event
Inflow = 1.4 cfs @ 12.09 hrs, Volume= 6,987 cf
Outflow = 0.2 cfs @ 11.72 hrs, Volume= 6,988 cf, Atten= 88%, Lag= 0.0 min
Discarded = 0.2 cfs @ 11.72 hrs, Volume= 6,988 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= 306.57' @ 14.11 hrs Surf.Area= 3,058 sf Storage= 1,907 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 101.6 min (927.2 - 825.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	305.50'	2,205 cf	**76.83'W x 39.80'L x 2.33'H Field A** 7,135 cf Overall - 1,622 cf Embedded = 5,514 cf x 40.0% Voids
#2A	306.00'	1,622 cf	**ADS_StormTech SC-310 +Cap** x 110 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 110 Chambers in 22 Rows
		3,827 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	305.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	306.95'	**4.0" Vert. Orifice/Grate X 22.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	306.95'	**36.0" Round Culvert** L= 13.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 306.95' / 306.50' S= 0.0333 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 7.07 sf

Discarded OutFlow Max=0.2 cfs @ 11.72 hrs HW=305.55' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=305.50' 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 = 126,596 sf, 83.09% Impervious, Inflow Depth > 2.17" for 2-Yr 24 Hr event
Inflow = 7.3 cfs @ 12.09 hrs, Volume= 22,884 cf
Outflow = 1.2 cfs @ 11.80 hrs, Volume= 22,898 cf, Atten= 84%, Lag= 0.0 min
Discarded = 1.2 cfs @ 11.80 hrs, Volume= 22,898 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= 279.45' @ 12.58 hrs Surf.Area= 6,068 sf Storage= 6,536 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 35.1 min (842.9 - 807.9)

Volume	Invert	Avail.Storage	Storage Description
#1	277.70'	8,201 cf	**37.00'W x 164.00'L x 6.00'H Prismatoid** 36,408 cf Overall - 15,904 cf Embedded = 20,504 cf x 40.0% Voids
#2	278.00'	15,904 cf	**60.0" Round Pipe Storage** x 5 Inside #1 L= 162.0'
		24,106 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.70'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	282.20'	**12.0" Vert. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	282.20'	**24.0" Round Culvert** L= 67.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 282.20' / 278.60' S= 0.0537 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf

Discarded OutFlow Max=1.2 cfs @ 11.80 hrs HW=277.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.70' 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 > 1.15" for 2-Yr 24 Hr event
Inflow = 2.6 cfs @ 12.09 hrs, Volume= 12,312 cf
Outflow = 0.2 cfs @ 11.69 hrs, Volume= 8,199 cf, Atten= 94%, Lag= 0.0 min
Discarded = 0.2 cfs @ 11.69 hrs, Volume= 8,199 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= 287.47' @ 17.31 hrs Surf.Area= 2,982 sf Storage= 4,762 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 117.9 min (1,027.6 - 909.7)

Volume	Invert	Avail.Storage	Storage Description
#1	285.50'	8,247 cf	**60.0" Round Pipe Storage** x 3 Inside #2 L= 140.0'
#2	285.00'	3,858 cf	**21.00'W x 142.00'L x 6.00'H Prismatoid** 17,892 cf Overall - 8,247 cf Embedded = 9,645 cf x 40.0% Voids
		12,105 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	285.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	289.00'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	289.00'	**30.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 289.00' / 288.50' S= 0.0500 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 4.91 sf

Discarded OutFlow Max=0.2 cfs @ 11.69 hrs HW=285.07' (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 = 63,967 sf, 58.47% Impervious, Inflow Depth > 1.16" for 2-Yr 24 Hr event
Inflow = 1.9 cfs @ 12.09 hrs, Volume= 6,208 cf
Outflow = 0.6 cfs @ 12.02 hrs, Volume= 6,211 cf, Atten= 71%, Lag= 0.0 min
Discarded = 0.6 cfs @ 12.02 hrs, Volume= 6,211 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= 278.34' @ 12.49 hrs Surf.Area= 2,911 sf Storage= 1,079 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 9.5 min (862.9 - 853.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	277.50'	4,989 cf	**92.08'W x 31.62'L x 6.75'H Field A** 19,652 cf Overall - 7,179 cf Embedded = 12,472 cf x 40.0% Voids
#2A	278.25'	7,179 cf	**ADS_StormTech MC-4500 b +Cap** x 60 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 60 Chambers in 10 Rows Cap Storage= 39.5 cf x 2 x 10 rows = 790.0 cf
		12,168 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	284.50'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	284.50'	**6.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 284.50' / 283.50' S= 0.0513 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.6 cfs @ 12.02 hrs HW=277.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.6 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 = 23,738 sf, 69.64% Impervious, Inflow Depth > 1.52" for 2-Yr 24 Hr event
Inflow = 1.0 cfs @ 12.09 hrs, Volume= 3,015 cf
Outflow = 0.2 cfs @ 11.93 hrs, Volume= 3,016 cf, Atten= 78%, Lag= 0.0 min
Discarded = 0.2 cfs @ 11.93 hrs, Volume= 3,016 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= 273.15' @ 12.53 hrs Surf.Area= 1,108 sf Storage= 700 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 18.6 min (858.1 - 839.5)

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** C= 0.600 Limited to weir flow at low heads
#3	Primary	276.00'	**12.0" Round Culvert**
			L= 19.5' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 276.00' / 275.20' S= 0.0410 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.93 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 > 0.39" for 2-Yr 24 Hr event
Inflow = 0.1 cfs @ 17.77 hrs, Volume= 3,366 cf
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
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= 288.60' @ 24.00 hrs Surf.Area= 3,375 sf Storage= 3,365 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	287.50'	8,603 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)
287.50	2,613	225.0	0	0	2,613
288.00	3,066	254.0	1,418	1,418	3,725
290.00	4,146	345.0	7,185	8,603	8,104

Device	Routing	Invert	Outlet Devices
#1	Primary	289.50'	**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

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=287.50' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Summary for Subcatchment PR-1: northeastern locus

Runoff = 4.2 cfs @ 12.20 hrs, Volume= 19,884 cf, Depth> 1.09"
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	55	Woods, Good, HSG B
	813	61	>75% Grass cover, Good, HSG B
	162,557	55	Woods, Good, HSG B
*	4,295	72	Dirt Path
	219,482	55	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 = 0.0 cfs @ 16.94 hrs, Volume= 179 cf, Depth> 0.04"
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	30	Woods, Good, HSG A
603	39	>75% Grass cover, Good, HSG A
8,166	39	>75% Grass cover, Good, HSG A
20,582	30	Woods, Good, HSG A
51,152	32	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 = 3.0 cfs @ 12.09 hrs, Volume= 9,273 cf, Depth> 3.47"
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
*	24,307	98	Impervious Area
	7,772	39	>75% Grass cover, Good, HSG A
	32,079	84	Weighted Average
	7,772		24.23% Pervious Area
	24,307		75.77% 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= 4,661 cf, Depth> 3.87"
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
*	11,889	98	Impervious Area
	2,546	39	>75% Grass cover, Good, HSG A
	14,435	88	Weighted Average
	2,546		17.64% Pervious Area
	11,889		82.36% 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 = 2.2 cfs @ 12.08 hrs, Volume= 7,365 cf, Depth> 4.63"
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
*	1,892	98	Impervious Area
	812	39	>75% Grass cover, Good, HSG A
	19,073	95	Weighted Average
	812		4.26% Pervious Area
	18,261		95.74% 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	61	>75% Grass cover, Good, HSG B
	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-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
*	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 = 1.6 cfs @ 12.10 hrs, Volume= 5,550 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
37,239	61	>75% Grass cover, Good, HSG B
3,652	55	Woods, Good, HSG B
3,492	61	>75% Grass cover, Good, HSG B
44,383	61	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 = 0.2 cfs @ 12.27 hrs, Volume= 1,374 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 10-Yr 24 Hr Rainfall=5.22"

Area (sf)	CN	Description
9,167	61	>75% Grass cover, Good, HSG B
22,355	39	>75% Grass cover, Good, HSG A
649	30	Woods, Good, HSG A
32,171	45	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-7

Runoff = 2.0 cfs @ 12.09 hrs, Volume= 6,097 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
*	16,532	98	Impervious Area
	6,483	39	>75% Grass cover, Good, HSG A
	723	39	>75% Grass cover, Good, HSG A
	23,738	80	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 = 3.1 cfs @ 12.09 hrs, Volume= 9,458 cf, Depth> 2.80"
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	39	>75% Grass cover, Good, HSG A
	10,533	39	>75% Grass cover, Good, HSG A
	40,464	77	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-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
*	5,928	98	Impervious Area
	124	39	>75% Grass cover, Good, HSG A
	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-6

Runoff = 0.7 cfs @ 12.09 hrs, Volume= 2,091 cf, Depth> 3.08"
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
*	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= 2,588 cf, Depth> 4.08"
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	39	>75% Grass cover, Good, HSG A
	7,602	90	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 @ 12.13 hrs, Volume= 353 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
*	936	98	Impervious Area
	4,916	39	>75% Grass cover, Good, HSG A
	1,026	39	>75% Grass cover, Good, HSG A
	6,878	47	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 = 0.0 cfs @ 12.44 hrs, Volume= 136 cf, Depth> 0.25"
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
6,618	39	>75% Grass cover, Good, HSG A
6,618		100.00% Pervious 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 = 4.1 cfs @ 12.08 hrs, Volume= 13,554 cf, Depth> 4.41"
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
*	15,717	98	Impervious Area
	3,324	39	>75% Grass cover, Good, HSG A
	36,880	93	Weighted Average
	3,324		9.01% Pervious Area
	33,556		90.99% 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 > 0.49" for 10-Yr 24 Hr event
Inflow = 5.6 cfs @ 12.18 hrs, Volume= 33,295 cf
Outflow = 5.6 cfs @ 12.18 hrs, Volume= 33,295 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 > 0.23" for 10-Yr 24 Hr event
Inflow = 0.1 cfs @ 12.13 hrs, Volume= 572 cf
Outflow = 0.1 cfs @ 12.13 hrs, Volume= 572 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 @ 19.30 hrs, Volume= 4,656 cf, Atten= 98%, Lag= 433.2 min
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond PSIS-1 : PSIS-1
Secondary = 0.1 cfs @ 19.30 hrs, Volume= 4,656 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= 294.36' @ 19.30 hrs Surf.Area= 7,372 sf Storage= 15,319 cf

Plug-Flow detention time= 399.7 min calculated for 4,654 cf (24% of inflow)
Center-of-Mass det. time= 242.1 min (1,037.8 - 795.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	291.50'	11,793 cf	**55.75'W x 132.24'L x 6.75'H Field A** 49,764 cf Overall - 20,281 cf Embedded = 29,483 cf x 40.0% Voids
#2A	292.25'	20,281 cf	**ADS_StormTech MC-4500 b +Cap**x 186 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 186 Chambers in 6 Rows Cap Storage= 39.5 cf x 2 x 6 rows = 474.0 cf
		32,074 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	296.70'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	296.70'	**6.0" Round Culvert** L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 296.70' / 296.60' S= 0.0077 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#3	Device 4	291.50'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	291.50'	**6.0" Round Culvert** L= 75.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 291.50' / 286.00' S= 0.0733 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=291.50' TW=293.67' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**1=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.1 cfs @ 19.30 hrs HW=294.36' TW=288.63' (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.1 cfs of 1.3 cfs potential flow)
  └─**3=Orifice/Grate** (Orifice Controls 0.1 cfs @ 8.1 fps)

Summary for Pond PSDS-2: PSDS-2

Inflow Area = 14,435 sf, 82.36% Impervious, Inflow Depth > 3.87" for 10-Yr 24 Hr event
Inflow = 1.5 cfs @ 12.09 hrs, Volume= 4,661 cf
Outflow = 0.4 cfs @ 12.46 hrs, Volume= 4,613 cf, Atten= 75%, Lag= 22.7 min
Primary = 0.2 cfs @ 12.46 hrs, Volume= 261 cf
Routed to Pond PSIS-2 : PSIS-2
Secondary = 0.2 cfs @ 12.46 hrs, Volume= 4,352 cf
Routed to Pond PSIS-2 : PSIS-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 311.23' @ 12.46 hrs Surf.Area= 1,066 sf Storage= 1,897 cf

Plug-Flow detention time= 132.1 min calculated for 4,613 cf (99% of inflow)
Center-of-Mass det. time= 125.7 min (921.4 - 795.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	308.50'	997 cf	**15.75'W x 67.70'L x 3.50'H Field A** 3,732 cf Overall - 1,240 cf Embedded = 2,491 cf x 40.0% Voids
#2A	309.00'	1,240 cf	**ADS_StormTech SC-740 +Cap** x 27 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 27 Chambers in 3 Rows
		2,237 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	311.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	311.00'	**18.0" Round Culvert** L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 311.00' / 310.90' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 4	308.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	308.50'	**2.0" Round Culvert** L= 8.5' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 308.50' / 307.00' S= 0.1765 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=0.2 cfs @ 12.46 hrs HW=311.23' TW=307.20' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 0.2 cfs @ 1.3 fps)
  └─**1=Orifice/Grate** (Passes 0.2 cfs of 0.4 cfs potential flow)

Secondary OutFlow Max=0.2 cfs @ 12.46 hrs HW=311.23' TW=307.20' (Dynamic Tailwater)
└─**4=Culvert** (Inlet Controls 0.2 cfs @ 6.9 fps)
  └─**3=Orifice/Grate** (Passes 0.2 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 = 0.1 cfs @ 17.99 hrs, Volume= 6,108 cf, Atten= 98%, Lag= 354.1 min
Primary = 0.1 cfs @ 17.99 hrs, Volume= 6,108 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= 307.53' @ 17.99 hrs Surf.Area= 4,894 sf Storage= 17,515 cf

Plug-Flow detention time= 397.1 min calculated for 6,106 cf (27% of inflow)
Center-of-Mass det. time= 237.5 min (1,022.3 - 784.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	302.25'	8,372 cf	**120.33'W x 40.67'L x 6.75'H Field A** 33,031 cf Overall - 12,102 cf Embedded = 20,929 cf x 40.0% Voids
#2A	303.00'	12,102 cf	**ADS_StormTech MC-4500 b +Cap** x 104 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 104 Chambers in 13 Rows Cap Storage= 39.5 cf x 2 x 13 rows = 1,027.0 cf
		20,474 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	307.75'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	307.75'	**18.0" Round Culvert** L= 28.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.75' / 306.00' S= 0.0616 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 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=0.1 cfs @ 17.99 hrs HW=307.53' TW=289.12' (Dynamic Tailwater)
- **2=Culvert** (Controls 0.0 cfs)
  - **1=Orifice/Grate** (Controls 0.0 cfs)
- **4=Culvert** (Barrel Controls 0.1 cfs @ 5.8 fps)
  - **3=Orifice/Grate** (Passes 0.1 cfs of 0.2 cfs potential flow)

Summary for Pond PSIS-1: PSIS-1

Inflow Area = 97,708 sf, 86.40% Impervious, Inflow Depth > 1.66" for 10-Yr 24 Hr event
Inflow = 4.1 cfs @ 12.08 hrs, Volume= 13,554 cf
Outflow = 1.0 cfs @ 12.46 hrs, Volume= 13,562 cf, Atten= 75%, Lag= 22.5 min
Discarded = 0.7 cfs @ 11.75 hrs, Volume= 13,195 cf
Primary = 0.4 cfs @ 12.46 hrs, Volume= 367 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= 295.41' @ 12.46 hrs Surf.Area= 3,427 sf Storage= 3,519 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 28.2 min (804.6 - 776.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	293.67'	2,443 cf	**108.17'W x 31.68'L x 2.33'H Field A**
			7,996 cf Overall - 1,887 cf Embedded = 6,109 cf x 40.0% Voids
#2A	294.17'	1,887 cf	**ADS_StormTech SC-310 +Cap** x 128 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
			128 Chambers in 32 Rows
		4,330 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	293.67'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	295.17'	**4.0" Vert. Orifice/Grate X 32.00** C= 0.600
			Limited to weir flow at low heads
#3	Primary	295.17'	**36.0" Round Culvert**
			L= 5.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 295.17' / 294.80' S= 0.0740 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 7.07 sf

Discarded OutFlow Max=0.7 cfs @ 11.75 hrs HW=293.72' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.7 cfs)

Primary OutFlow Max=0.4 cfs @ 12.46 hrs HW=295.41' TW=287.78' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.4 cfs @ 1.3 fps)
  └─**2=Orifice/Grate** (Passes 0.4 cfs of 3.7 cfs potential flow)

Summary for Pond PSIS-2: PSIS-2

Inflow Area = 33,508 sf, 89.98% Impervious, Inflow Depth > 4.29" for 10-Yr 24 Hr event
Inflow = 2.3 cfs @ 12.08 hrs, Volume= 11,978 cf
Outflow = 0.7 cfs @ 12.56 hrs, Volume= 11,405 cf, Atten= 71%, Lag= 28.3 min
Discarded = 0.2 cfs @ 11.23 hrs, Volume= 9,581 cf
Primary = 0.5 cfs @ 12.56 hrs, Volume= 1,824 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= 307.24' @ 12.56 hrs Surf.Area= 3,058 sf Storage= 3,093 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 113.7 min (939.9 - 826.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	305.50'	2,205 cf	**76.83'W x 39.80'L x 2.33'H Field A**
			7,135 cf Overall - 1,622 cf Embedded = 5,514 cf x 40.0% Voids
#2A	306.00'	1,622 cf	**ADS_StormTech SC-310 +Cap** x 110 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
			110 Chambers in 22 Rows
		3,827 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	305.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	306.95'	**4.0" Vert. Orifice/Grate X 22.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	306.95'	**36.0" Round Culvert** L= 13.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 306.95' / 306.50' S= 0.0333 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 7.07 sf

Discarded OutFlow Max=0.2 cfs @ 11.23 hrs HW=305.55' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.5 cfs @ 12.56 hrs HW=307.24' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.5 cfs @ 1.4 fps)
  └─**2=Orifice/Grate** (Passes 0.5 cfs of 3.2 cfs potential flow)

Summary for Pond PSIS-3: PSIS-3

Inflow Area = 126,596 sf, 83.09% Impervious, Inflow Depth > 3.90" for 10-Yr 24 Hr event
Inflow = 12.9 cfs @ 12.09 hrs, Volume= 41,161 cf
Outflow = 1.2 cfs @ 11.65 hrs, Volume= 41,169 cf, Atten= 91%, Lag= 0.0 min
Discarded = 1.2 cfs @ 11.65 hrs, Volume= 41,169 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= 281.25' @ 12.99 hrs Surf.Area= 6,068 sf Storage= 15,176 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 99.9 min (892.5 - 792.6)

Volume	Invert	Avail.Storage	Storage Description
#1	277.70'	8,201 cf	**37.00'W x 164.00'L x 6.00'H Prismatoid** 36,408 cf Overall - 15,904 cf Embedded = 20,504 cf x 40.0% Voids
#2	278.00'	15,904 cf	**60.0" Round Pipe Storage** x 5 Inside #1 L= 162.0'
		24,106 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.70'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	282.20'	**12.0" Vert. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	282.20'	**24.0" Round Culvert** L= 67.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 282.20' / 278.60' S= 0.0537 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf

Discarded OutFlow Max=1.2 cfs @ 11.65 hrs HW=277.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=277.70' 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 > 2.08" for 10-Yr 24 Hr event
Inflow = 5.3 cfs @ 12.09 hrs, Volume= 22,244 cf
Outflow = 0.5 cfs @ 13.65 hrs, Volume= 13,628 cf, Atten= 91%, Lag= 93.5 min
Discarded = 0.2 cfs @ 10.76 hrs, Volume= 9,142 cf
Primary = 0.3 cfs @ 13.65 hrs, Volume= 4,486 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= 289.24' @ 13.65 hrs Surf.Area= 2,982 sf Storage= 9,038 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 102.0 min (977.0 - 875.0)

Volume	Invert	Avail.Storage	Storage Description
#1	285.50'	8,247 cf	**60.0" Round Pipe Storage** x 3 Inside #2 L= 140.0'
#2	285.00'	3,858 cf	**21.00'W x 142.00'L x 6.00'H Prismatoid** 17,892 cf Overall - 8,247 cf Embedded = 9,645 cf x 40.0% Voids
		12,105 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	285.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	289.00'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	289.00'	**30.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 289.00' / 288.50' S= 0.0500 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 4.91 sf

Discarded OutFlow Max=0.2 cfs @ 10.76 hrs HW=285.07' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.3 cfs @ 13.65 hrs HW=289.24' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.3 cfs @ 1.3 fps)
  └─**2=Orifice/Grate** (Passes 0.3 cfs of 0.6 cfs potential flow)

Summary for Pond PSIS-6: PSIS-6

Inflow Area = 63,967 sf, 58.47% Impervious, Inflow Depth > 2.54" for 10-Yr 24 Hr event
Inflow = 4.3 cfs @ 12.09 hrs, Volume= 13,563 cf
Outflow = 0.6 cfs @ 11.80 hrs, Volume= 13,566 cf, Atten= 87%, Lag= 0.0 min
Discarded = 0.6 cfs @ 11.80 hrs, Volume= 13,566 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= 279.73' @ 12.78 hrs Surf.Area= 2,911 sf Storage= 4,354 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 58.2 min (889.8 - 831.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	277.50'	4,989 cf	**92.08'W x 31.62'L x 6.75'H Field A** 19,652 cf Overall - 7,179 cf Embedded = 12,472 cf x 40.0% Voids
#2A	278.25'	7,179 cf	**ADS_StormTech MC-4500 b +Cap** x 60 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 60 Chambers in 10 Rows Cap Storage= 39.5 cf x 2 x 10 rows = 790.0 cf
		12,168 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	284.50'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	284.50'	**6.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 284.50' / 283.50' S= 0.0513 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.6 cfs @ 11.80 hrs HW=277.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.6 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 = 23,738 sf, 69.64% Impervious, Inflow Depth > 3.08" for 10-Yr 24 Hr event
Inflow = 2.0 cfs @ 12.09 hrs, Volume= 6,097 cf
Outflow = 0.2 cfs @ 11.72 hrs, Volume= 6,100 cf, Atten= 89%, Lag= 0.0 min
Discarded = 0.2 cfs @ 11.72 hrs, Volume= 6,100 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= 274.83' @ 12.90 hrs Surf.Area= 1,108 sf Storage= 2,146 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 78.8 min (898.0 - 819.2)

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** C= 0.600 Limited to weir flow at low heads
#3	Primary	276.00'	**12.0" Round Culvert**
			L= 19.5' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 276.00' / 275.20' S= 0.0410 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.72 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 > 0.59" for 10-Yr 24 Hr event
Inflow = 0.5 cfs @ 12.46 hrs, Volume= 5,158 cf
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
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= 289.11' @ 24.00 hrs Surf.Area= 3,648 sf Storage= 5,156 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	287.50'	8,603 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)
287.50	2,613	225.0	0	0	2,613
288.00	3,066	254.0	1,418	1,418	3,725
290.00	4,146	345.0	7,185	8,603	8,104

Device	Routing	Invert	Outlet Devices
#1	Primary	289.50'	**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

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=287.50' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Subcatchment PR-1: northeastern locus

Runoff = 7.5 cfs @ 12.19 hrs, Volume= 31,836 cf, Depth> 1.74"
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	55	Woods, Good, HSG B
	813	61	>75% Grass cover, Good, HSG B
	162,557	55	Woods, Good, HSG B
*	4,295	72	Dirt Path
	219,482	55	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 = 0.0 cfs @ 13.74 hrs, Volume= 831 cf, Depth> 0.19"
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	30	Woods, Good, HSG A
603	39	>75% Grass cover, Good, HSG A
8,166	39	>75% Grass cover, Good, HSG A
20,582	30	Woods, Good, HSG A
51,152	32	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 = 3.9 cfs @ 12.09 hrs, Volume= 12,185 cf, Depth> 4.56"
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
*	24,307	98	Impervious Area
	7,772	39	>75% Grass cover, Good, HSG A
	32,079	84	Weighted Average
	7,772		24.23% Pervious Area
	24,307		75.77% 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 = 1.9 cfs @ 12.08 hrs, Volume= 6,012 cf, Depth> 5.00"
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
*	11,889	98	Impervious Area
	2,546	39	>75% Grass cover, Good, HSG A
	14,435	88	Weighted Average
	2,546		17.64% Pervious Area
	11,889		82.36% 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 = 2.7 cfs @ 12.08 hrs, Volume= 9,210 cf, Depth> 5.79"
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
*	1,892	98	Impervious Area
	812	39	>75% Grass cover, Good, HSG A
	19,073	95	Weighted Average
	812		4.26% Pervious Area
	18,261		95.74% 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	61	>75% Grass cover, Good, HSG B
	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-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
*	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 = 2.6 cfs @ 12.10 hrs, Volume= 8,386 cf, Depth> 2.27"
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	61	>75% Grass cover, Good, HSG B
	44,383	61	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 = 0.6 cfs @ 12.12 hrs, Volume= 2,576 cf, Depth> 0.96"
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	39	>75% Grass cover, Good, HSG A
	649	30	Woods, Good, HSG A
	32,171	45	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-7

Runoff = 2.6 cfs @ 12.09 hrs, Volume= 8,171 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
*	16,532	98	Impervious Area
	6,483	39	>75% Grass cover, Good, HSG A
	723	39	>75% Grass cover, Good, HSG A
	23,738	80	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 = 4.2 cfs @ 12.09 hrs, Volume= 12,873 cf, Depth> 3.82"
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	39	>75% Grass cover, Good, HSG A
	10,533	39	>75% Grass cover, Good, HSG A
	40,464	77	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-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
*	5,928	98	Impervious Area
	124	39	>75% Grass cover, Good, HSG A
	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-6

Runoff = 0.9 cfs @ 12.09 hrs, Volume= 2,802 cf, Depth> 4.13"
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
*	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 = 1.0 cfs @ 12.08 hrs, Volume= 3,308 cf, Depth> 5.22"
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	39	>75% Grass cover, Good, HSG A
	7,602	90	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 = 0.2 cfs @ 12.11 hrs, Volume= 635 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
*	936	98	Impervious Area
	4,916	39	>75% Grass cover, Good, HSG A
	1,026	39	>75% Grass cover, Good, HSG A
	6,878	47	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 = 0.0 cfs @ 12.30 hrs, Volume= 310 cf, Depth> 0.56"
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
6,618	39	>75% Grass cover, Good, HSG A
6,618		100.00% Pervious 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 = 5.1 cfs @ 12.08 hrs, Volume= 17,097 cf, Depth> 5.56"
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
*	15,717	98	Impervious Area
	3,324	39	>75% Grass cover, Good, HSG A
	36,880	93	Weighted Average
	3,324		9.01% Pervious Area
	33,556		90.99% 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 > 0.95" for 25-Yr 24 Hr event
Inflow = 10.4 cfs @ 12.22 hrs, Volume= 64,066 cf
Outflow = 10.4 cfs @ 12.22 hrs, Volume= 64,066 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 > 0.51" for 25-Yr 24 Hr event
Inflow = 0.2 cfs @ 12.11 hrs, Volume= 1,289 cf
Outflow = 0.2 cfs @ 12.11 hrs, Volume= 1,289 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 > 0.20" for 25-Yr 24 Hr event
Inflow = 0.2 cfs @ 12.39 hrs, Volume= 3,539 cf
Outflow = 0.2 cfs @ 12.39 hrs, Volume= 3,539 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 = 0.1 cfs @ 20.07 hrs, Volume= 5,404 cf, Atten= 99%, Lag= 479.2 min
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond PSIS-1 : PSIS-1
Secondary = 0.1 cfs @ 20.07 hrs, Volume= 5,404 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= 295.22' @ 20.07 hrs Surf.Area= 7,372 sf Storage= 20,196 cf

Plug-Flow detention time= 415.4 min calculated for 5,404 cf (21% of inflow)
Center-of-Mass det. time= 240.4 min (1,029.1 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	291.50'	11,793 cf	**55.75'W x 132.24'L x 6.75'H Field A**
			49,764 cf Overall - 20,281 cf Embedded = 29,483 cf x 40.0% Voids
#2A	292.25'	20,281 cf	**ADS_StormTech MC-4500 b +Cap**x 186 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
			186 Chambers in 6 Rows
			Cap Storage= 39.5 cf x 2 x 6 rows = 474.0 cf
		32,074 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	296.70'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	296.70'	**6.0" Round Culvert**
			L= 13.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 296.70' / 296.60' S= 0.0077 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#3	Device 4	291.50'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	291.50'	**6.0" Round Culvert**
			L= 75.0' CPP, mitered to conform to fill, Ke= 0.700
			Inlet / Outlet Invert= 291.50' / 286.00' S= 0.0733 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=291.50' TW=293.67' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**1=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.1 cfs @ 20.07 hrs HW=295.22' TW=289.32' (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.1 cfs of 1.6 cfs potential flow)
  └─**3=Orifice/Grate** (Orifice Controls 0.1 cfs @ 9.2 fps)

Summary for Pond PSDS-2: PSDS-2

Inflow Area = 14,435 sf, 82.36% Impervious, Inflow Depth > 5.00" for 25-Yr 24 Hr event
Inflow = 1.9 cfs @ 12.08 hrs, Volume= 6,012 cf
Outflow = 1.0 cfs @ 12.23 hrs, Volume= 5,953 cf, Atten= 49%, Lag= 8.4 min
Primary = 0.8 cfs @ 12.23 hrs, Volume= 1,025 cf
Routed to Pond PSIS-2 : PSIS-2
Secondary = 0.2 cfs @ 12.23 hrs, Volume= 4,928 cf
Routed to Pond PSIS-2 : PSIS-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 311.46' @ 12.23 hrs Surf.Area= 1,066 sf Storage= 2,004 cf

Plug-Flow detention time= 118.6 min calculated for 5,953 cf (99% of inflow)
Center-of-Mass det. time= 112.4 min (901.2 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	308.50'	997 cf	**15.75'W x 67.70'L x 3.50'H Field A** 3,732 cf Overall - 1,240 cf Embedded = 2,491 cf x 40.0% Voids
#2A	309.00'	1,240 cf	**ADS_StormTech SC-740 +Cap** x 27 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 27 Chambers in 3 Rows
		2,237 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	311.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	311.00'	**18.0" Round Culvert** L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 311.00' / 310.90' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 4	308.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	308.50'	**2.0" Round Culvert** L= 8.5' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 308.50' / 307.00' S= 0.1765 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=0.8 cfs @ 12.23 hrs HW=311.46' TW=307.38' (Dynamic Tailwater)
↑—**2=Culvert** (Barrel Controls 0.8 cfs @ 2.6 fps)
↑—**1=Orifice/Grate** (Passes 0.8 cfs of 1.3 cfs potential flow)

Secondary OutFlow Max=0.2 cfs @ 12.23 hrs HW=311.46' TW=307.38' (Dynamic Tailwater)
↑—**4=Culvert** (Inlet Controls 0.2 cfs @ 7.2 fps)
↑—**3=Orifice/Grate** (Passes 0.2 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 = 0.7 cfs @ 13.19 hrs, Volume= 11,459 cf, Atten= 93%, Lag= 66.3 min
Primary = 0.7 cfs @ 13.19 hrs, Volume= 11,459 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= 308.11' @ 13.19 hrs Surf.Area= 4,894 sf Storage= 18,736 cf

Plug-Flow detention time= 306.5 min calculated for 11,459 cf (39% of inflow)
Center-of-Mass det. time= 173.8 min (952.4 - 778.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	302.25'	8,372 cf	**120.33'W x 40.67'L x 6.75'H Field A** 33,031 cf Overall - 12,102 cf Embedded = 20,929 cf x 40.0% Voids
#2A	303.00'	12,102 cf	**ADS_StormTech MC-4500 b +Cap**x 104 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 104 Chambers in 13 Rows Cap Storage= 39.5 cf x 2 x 13 rows = 1,027.0 cf
		20,474 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	307.75'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	307.75'	**18.0" Round Culvert** L= 28.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.75' / 306.00' S= 0.0616 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 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=0.7 cfs @ 13.19 hrs HW=308.11' TW=289.45' (Dynamic Tailwater)
├─**2=Culvert** (Inlet Controls 0.5 cfs @ 1.6 fps)
│ └─**1=Orifice/Grate** (Passes 0.5 cfs of 1.2 cfs potential flow)
└─**4=Culvert** (Barrel Controls 0.1 cfs @ 6.1 fps)
  └─**3=Orifice/Grate** (Passes 0.1 cfs of 0.3 cfs potential flow)

Summary for Pond PSIS-1: PSIS-1

Inflow Area = 97,708 sf, 86.40% Impervious, Inflow Depth > 2.10" for 25-Yr 24 Hr event
Inflow = 5.1 cfs @ 12.08 hrs, Volume= 17,097 cf
Outflow = 2.2 cfs @ 12.28 hrs, Volume= 17,099 cf, Atten= 58%, Lag= 11.6 min
Discarded = 0.7 cfs @ 11.69 hrs, Volume= 15,245 cf
Primary = 1.5 cfs @ 12.28 hrs, Volume= 1,855 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= 295.68' @ 12.28 hrs Surf.Area= 3,427 sf Storage= 3,883 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 26.7 min (797.3 - 770.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	293.67'	2,443 cf	**108.17'W x 31.68'L x 2.33'H Field A** 7,996 cf Overall - 1,887 cf Embedded = 6,109 cf x 40.0% Voids
#2A	294.17'	1,887 cf	**ADS_StormTech SC-310 +Cap** x 128 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 128 Chambers in 32 Rows
		4,330 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	293.67'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	295.17'	**4.0" Vert. Orifice/Grate X 32.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	295.17'	**36.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 295.17' / 294.80' S= 0.0740 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 7.07 sf

Discarded OutFlow Max=0.7 cfs @ 11.69 hrs HW=293.72' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.7 cfs)

Primary OutFlow Max=1.5 cfs @ 12.28 hrs HW=295.68' TW=287.95' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 1.5 cfs @ 1.9 fps)
  └─**2=Orifice/Grate** (Passes 1.5 cfs of 7.8 cfs potential flow)

Summary for Pond PSIS-2: PSIS-2

Inflow Area = 33,508 sf, 89.98% Impervious, Inflow Depth > 5.43" for 25-Yr 24 Hr event
Inflow = 2.8 cfs @ 12.08 hrs, Volume= 15,163 cf
Outflow = 1.8 cfs @ 12.31 hrs, Volume= 14,119 cf, Atten= 35%, Lag= 13.8 min
Discarded = 0.2 cfs @ 10.69 hrs, Volume= 10,043 cf
Primary = 1.7 cfs @ 12.31 hrs, Volume= 4,075 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= 307.48' @ 12.31 hrs Surf.Area= 3,058 sf Storage= 3,400 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 81.2 min (897.6 - 816.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	305.50'	2,205 cf	**76.83'W x 39.80'L x 2.33'H Field A** 7,135 cf Overall - 1,622 cf Embedded = 5,514 cf x 40.0% Voids
#2A	306.00'	1,622 cf	**ADS_StormTech SC-310 +Cap** x 110 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 110 Chambers in 22 Rows
		3,827 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	305.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	306.95'	**4.0" Vert. Orifice/Grate X 22.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	306.95'	**36.0" Round Culvert** L= 13.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 306.95' / 306.50' S= 0.0333 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 7.07 sf

Discarded OutFlow Max=0.2 cfs @ 10.69 hrs HW=305.55' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=1.7 cfs @ 12.31 hrs HW=307.48' TW=0.00' (Dynamic Tailwater)
└—**3=Culvert** (Inlet Controls 1.7 cfs @ 2.0 fps)
  └—**2=Orifice/Grate** (Passes 1.7 cfs of 5.6 cfs potential flow)

Summary for Pond PSIS-3: PSIS-3

Inflow Area = 126,596 sf, 83.09% Impervious, Inflow Depth > 5.02" for 25-Yr 24 Hr event
Inflow = 16.4 cfs @ 12.08 hrs, Volume= 52,991 cf
Outflow = 1.6 cfs @ 12.90 hrs, Volume= 52,989 cf, Atten= 90%, Lag= 48.6 min
Discarded = 1.2 cfs @ 11.44 hrs, Volume= 51,631 cf
Primary = 0.4 cfs @ 12.90 hrs, Volume= 1,358 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= 282.50' @ 12.90 hrs Surf.Area= 6,068 sf Storage= 20,714 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 137.3 min (923.3 - 786.1)

Volume	Invert	Avail.Storage	Storage Description
#1	277.70'	8,201 cf	**37.00'W x 164.00'L x 6.00'H Prismatoid** 36,408 cf Overall - 15,904 cf Embedded = 20,504 cf x 40.0% Voids
#2	278.00'	15,904 cf	**60.0" Round Pipe Storage** x 5 Inside #1 L= 162.0'
		24,106 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.70'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	282.20'	**12.0" Vert. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	282.20'	**24.0" Round Culvert** L= 67.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 282.20' / 278.60' S= 0.0537 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf

Discarded OutFlow Max=1.2 cfs @ 11.44 hrs HW=277.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.4 cfs @ 12.90 hrs HW=282.50' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.4 cfs @ 1.5 fps)
  └─**2=Orifice/Grate** (Passes 0.4 cfs of 1.9 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 > 3.09" for 25-Yr 24 Hr event
Inflow = 7.0 cfs @ 12.09 hrs, Volume= 33,082 cf
Outflow = 1.9 cfs @ 12.47 hrs, Volume= 24,412 cf, Atten= 73%, Lag= 22.8 min
Discarded = 0.2 cfs @ 10.09 hrs, Volume= 9,619 cf
Primary = 1.8 cfs @ 12.47 hrs, Volume= 14,793 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= 289.58' @ 12.47 hrs Surf.Area= 2,982 sf Storage= 9,782 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 61.6 min (921.5 - 859.9)

Volume	Invert	Avail.Storage	Storage Description
#1	285.50'	8,247 cf	**60.0" Round Pipe Storage** x 3 Inside #2 L= 140.0'
#2	285.00'	3,858 cf	**21.00'W x 142.00'L x 6.00'H Prismatoid** 17,892 cf Overall - 8,247 cf Embedded = 9,645 cf x 40.0% Voids
		12,105 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	285.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	289.00'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	289.00'	**30.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 289.00' / 288.50' S= 0.0500 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 4.91 sf

Discarded OutFlow Max=0.2 cfs @ 10.09 hrs HW=285.07' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=1.8 cfs @ 12.47 hrs HW=289.58' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 1.8 cfs @ 2.0 fps)
  └─**2=Orifice/Grate** (Passes 1.8 cfs of 2.9 cfs potential flow)

Summary for Pond PSIS-6: PSIS-6

Inflow Area = 63,967 sf, 58.47% Impervious, Inflow Depth > 3.51" for 25-Yr 24 Hr event
Inflow = 6.0 cfs @ 12.09 hrs, Volume= 18,694 cf
Outflow = 0.6 cfs @ 11.71 hrs, Volume= 18,699 cf, Atten= 91%, Lag= 0.0 min
Discarded = 0.6 cfs @ 11.71 hrs, Volume= 18,699 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= 280.93' @ 13.07 hrs Surf.Area= 2,911 sf Storage= 6,996 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 104.9 min (927.6 - 822.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	277.50'	4,989 cf	**92.08'W x 31.62'L x 6.75'H Field A** 19,652 cf Overall - 7,179 cf Embedded = 12,472 cf x 40.0% Voids
#2A	278.25'	7,179 cf	**ADS_StormTech MC-4500 b +Cap**x 60 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 60 Chambers in 10 Rows Cap Storage= 39.5 cf x 2 x 10 rows = 790.0 cf
		12,168 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	284.50'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	284.50'	**6.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 284.50' / 283.50' S= 0.0513 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.6 cfs @ 11.71 hrs HW=277.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.6 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 = 23,738 sf, 69.64% Impervious, Inflow Depth > 4.13" for 25-Yr 24 Hr event
Inflow = 2.6 cfs @ 12.09 hrs, Volume= 8,171 cf
Outflow = 0.3 cfs @ 12.73 hrs, Volume= 8,174 cf, Atten= 88%, Lag= 38.8 min
Discarded = 0.2 cfs @ 11.64 hrs, Volume= 7,964 cf
Primary = 0.1 cfs @ 12.73 hrs, Volume= 210 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= 276.20' @ 12.73 hrs Surf.Area= 1,108 sf Storage= 3,092 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 117.0 min (928.0 - 810.9)

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** C= 0.600 Limited to weir flow at low heads
#3	Primary	276.00'	**12.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 276.00' / 275.20' S= 0.0410 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.64 hrs HW=272.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.1 cfs @ 12.73 hrs HW=276.20' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.1 cfs of 0.1 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.1 cfs @ 1.5 fps)

Summary for Pond SWB-1: SWB-1

Inflow Area = 104,326 sf, 80.92% Impervious, Inflow Depth > 0.87" for 25-Yr 24 Hr event
Inflow = 1.6 cfs @ 12.28 hrs, Volume= 7,569 cf
Outflow = 0.1 cfs @ 22.59 hrs, Volume= 899 cf, Atten= 93%, Lag= 618.7 min
Primary = 0.1 cfs @ 22.59 hrs, Volume= 899 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= 289.52' @ 22.59 hrs Surf.Area= 3,871 sf Storage= 6,670 cf

Plug-Flow detention time= 736.9 min calculated for 899 cf (12% of inflow)
Center-of-Mass det. time= 419.5 min (1,375.2 - 955.7)

Volume	Invert	Avail.Storage	Storage Description
#1	287.50'	8,603 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)
287.50	2,613	225.0	0	0	2,613
288.00	3,066	254.0	1,418	1,418	3,725
290.00	4,146	345.0	7,185	8,603	8,104

Device	Routing	Invert	Outlet Devices
#1	Primary	289.50'	**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

Primary OutFlow Max=0.1 cfs @ 22.59 hrs HW=289.52' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.1 cfs @ 0.3 fps)

Summary for Subcatchment PR-1: northeastern locus

Runoff = 13.3 cfs @ 12.19 hrs, Volume= 53,015 cf, Depth> 2.90"
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	55	Woods, Good, HSG B
	813	61	>75% Grass cover, Good, HSG B
	162,557	55	Woods, Good, HSG B
*	4,295	72	Dirt Path
	219,482	55	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 @ 12.34 hrs, Volume= 2,607 cf, Depth> 0.61"
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 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
21,801	30	Woods, Good, HSG A
603	39	>75% Grass cover, Good, HSG A
8,166	39	>75% Grass cover, Good, HSG A
20,582	30	Woods, Good, HSG A
51,152	32	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 = 5.2 cfs @ 12.09 hrs, Volume= 16,741 cf, Depth> 6.26"
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
*	24,307	98	Impervious Area
	7,772	39	>75% Grass cover, Good, HSG A
	32,079	84	Weighted Average
	7,772		24.23% Pervious Area
	24,307		75.77% 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 = 2.5 cfs @ 12.08 hrs, Volume= 8,105 cf, Depth> 6.74"
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
*	11,889	98	Impervious Area
	2,546	39	>75% Grass cover, Good, HSG A
	14,435	88	Weighted Average
	2,546		17.64% Pervious Area
	11,889		82.36% 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 = 3.5 cfs @ 12.08 hrs, Volume= 12,039 cf, Depth> 7.57"
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
*	1,892	98	Impervious Area
	812	39	>75% Grass cover, Good, HSG A
	19,073	95	Weighted Average
	812		4.26% Pervious Area
	18,261		95.74% 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	61	>75% Grass cover, Good, HSG B
	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-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
*	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 = 4.2 cfs @ 12.10 hrs, Volume= 13,231 cf, Depth> 3.58"
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	61	>75% Grass cover, Good, HSG B
44,383	61	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 = 1.3 cfs @ 12.10 hrs, Volume= 4,902 cf, Depth> 1.83"
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	39	>75% Grass cover, Good, HSG A
649	30	Woods, Good, HSG A
32,171	45	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-7

Runoff = 3.6 cfs @ 12.09 hrs, Volume= 11,450 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
*	16,532	98	Impervious Area
	6,483	39	>75% Grass cover, Good, HSG A
	723	39	>75% Grass cover, Good, HSG A
	23,738	80	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 = 5.9 cfs @ 12.09 hrs, Volume= 18,324 cf, Depth> 5.43"
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	39	>75% Grass cover, Good, HSG A
	10,533	39	>75% Grass cover, Good, HSG A
	40,464	77	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-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
*	5,928	98	Impervious Area
	124	39	>75% Grass cover, Good, HSG A
	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-6

Runoff = 1.2 cfs @ 12.09 hrs, Volume= 3,926 cf, Depth> 5.79"
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
*	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 = 1.3 cfs @ 12.08 hrs, Volume= 4,420 cf, Depth> 6.98"
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 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	39	>75% Grass cover, Good, HSG A
	7,602	90	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= 1,168 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
*	936	98	Impervious Area
	4,916	39	>75% Grass cover, Good, HSG A
	1,026	39	>75% Grass cover, Good, HSG A
	6,878	47	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 = 0.1 cfs @ 12.12 hrs, Volume= 679 cf, Depth> 1.23"
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
	6,618	39	>75% Grass cover, Good, HSG A
	6,618		100.00% Pervious 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 = 6.6 cfs @ 12.08 hrs, Volume= 22,543 cf, Depth> 7.34"
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
*	15,717	98	Impervious Area
	3,324	39	>75% Grass cover, Good, HSG A
	36,880	93	Weighted Average
	3,324		9.01% Pervious Area
	33,556		90.99% 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 > 1.92" for 100-Yr 24 Hr event
Inflow = 30.1 cfs @ 12.28 hrs, Volume= 130,014 cf
Outflow = 30.1 cfs @ 12.28 hrs, Volume= 130,014 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 > 1.13" for 100-Yr 24 Hr event
Inflow = 0.6 cfs @ 12.12 hrs, Volume= 2,849 cf
Outflow = 0.6 cfs @ 12.12 hrs, Volume= 2,849 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 > 0.66" for 100-Yr 24 Hr event
Inflow = 0.9 cfs @ 12.14 hrs, Volume= 11,914 cf
Outflow = 0.9 cfs @ 12.14 hrs, Volume= 11,914 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 = 0.2 cfs @ 19.52 hrs, Volume= 6,817 cf, Atten= 99%, Lag= 445.9 min
Primary = 0.0 cfs @ 19.52 hrs, Volume= 285 cf
Routed to Pond PSIS-1 : PSIS-1
Secondary = 0.1 cfs @ 19.52 hrs, Volume= 6,532 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= 296.79' @ 19.52 hrs Surf.Area= 7,372 sf Storage= 27,661 cf

Plug-Flow detention time= 441.2 min calculated for 6,817 cf (20% of inflow)
Center-of-Mass det. time= 247.0 min (1,027.8 - 780.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	291.50'	11,793 cf	**55.75'W x 132.24'L x 6.75'H Field A** 49,764 cf Overall - 20,281 cf Embedded = 29,483 cf x 40.0% Voids
#2A	292.25'	20,281 cf	**ADS_StormTech MC-4500 b +Cap**x 186 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 186 Chambers in 6 Rows Cap Storage= 39.5 cf x 2 x 6 rows = 474.0 cf
		32,074 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	296.70'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	296.70'	**6.0" Round Culvert** L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 296.70' / 296.60' S= 0.0077 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#3	Device 4	291.50'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	291.50'	**6.0" Round Culvert** L= 75.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 291.50' / 286.00' S= 0.0733 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.0 cfs @ 19.52 hrs HW=296.79' TW=293.67' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 0.0 cfs @ 0.8 fps)
  └─**1=Orifice/Grate** (Passes 0.0 cfs of 0.0 cfs potential flow)

Secondary OutFlow Max=0.1 cfs @ 19.52 hrs HW=296.79' TW=289.52' (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.1 cfs of 1.9 cfs potential flow)
  └─**3=Orifice/Grate** (Orifice Controls 0.1 cfs @ 11.0 fps)

Summary for Pond PSDS-2: PSDS-2

Inflow Area = 14,435 sf, 82.36% Impervious, Inflow Depth > 6.74" for 100-Yr 24 Hr event
Inflow = 2.5 cfs @ 12.08 hrs, Volume= 8,105 cf
Outflow = 2.2 cfs @ 12.13 hrs, Volume= 8,003 cf, Atten= 12%, Lag= 2.6 min
Primary = 2.0 cfs @ 12.13 hrs, Volume= 2,322 cf
Routed to Pond PSIS-2 : PSIS-2
Secondary = 0.2 cfs @ 12.13 hrs, Volume= 5,680 cf
Routed to Pond PSIS-2 : PSIS-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 311.79' @ 12.13 hrs Surf.Area= 1,066 sf Storage= 2,146 cf

Plug-Flow detention time= 105.2 min calculated for 7,999 cf (99% of inflow)
Center-of-Mass det. time= 97.2 min (878.0 - 780.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	308.50'	997 cf	**15.75'W x 67.70'L x 3.50'H Field A** 3,732 cf Overall - 1,240 cf Embedded = 2,491 cf x 40.0% Voids
#2A	309.00'	1,240 cf	**ADS_StormTech SC-740 +Cap** x 27 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 27 Chambers in 3 Rows
		2,237 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	311.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	311.00'	**18.0" Round Culvert** L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 311.00' / 310.90' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 4	308.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	308.50'	**2.0" Round Culvert** L= 8.5' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 308.50' / 307.00' S= 0.1765 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

Primary OutFlow Max=2.0 cfs @ 12.13 hrs HW=311.79' TW=307.76' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 2.0 cfs @ 3.1 fps)
  └─**1=Orifice/Grate** (Passes 2.0 cfs of 2.1 cfs potential flow)

Secondary OutFlow Max=0.2 cfs @ 12.13 hrs HW=311.79' TW=307.76' (Dynamic Tailwater)
└─**4=Culvert** (Inlet Controls 0.2 cfs @ 7.6 fps)
  └─**3=Orifice/Grate** (Passes 0.2 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 = 3.7 cfs @ 12.38 hrs, Volume= 20,790 cf, Atten= 68%, Lag= 17.9 min
Primary = 3.7 cfs @ 12.38 hrs, Volume= 20,790 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= 308.88' @ 12.38 hrs Surf.Area= 4,894 sf Storage= 20,231 cf

Plug-Flow detention time= 223.1 min calculated for 20,790 cf (54% of inflow)
Center-of-Mass det. time= 110.7 min (882.1 - 771.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	302.25'	8,372 cf	**120.33'W x 40.67'L x 6.75'H Field A** 33,031 cf Overall - 12,102 cf Embedded = 20,929 cf x 40.0% Voids
#2A	303.00'	12,102 cf	**ADS_StormTech MC-4500 b +Cap**x 104 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 104 Chambers in 13 Rows Cap Storage= 39.5 cf x 2 x 13 rows = 1,027.0 cf
		20,474 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	307.75'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	307.75'	**18.0" Round Culvert** L= 28.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.75' / 306.00' S= 0.0616 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 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=3.7 cfs @ 12.38 hrs HW=308.88' TW=290.21' (Dynamic Tailwater)
—**2=Culvert** (Passes 3.5 cfs of 4.1 cfs potential flow)
  —**1=Orifice/Grate** (Orifice Controls 3.5 cfs @ 4.5 fps)
—**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 = 97,708 sf, 86.40% Impervious, Inflow Depth > 2.80" for 100-Yr 24 Hr event
Inflow = 6.6 cfs @ 12.08 hrs, Volume= 22,829 cf
Outflow = 4.5 cfs @ 12.17 hrs, Volume= 22,836 cf, Atten= 32%, Lag= 5.0 min
Discarded = 0.7 cfs @ 11.61 hrs, Volume= 18,532 cf
Primary = 3.9 cfs @ 12.17 hrs, Volume= 4,303 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= 295.99' @ 12.17 hrs Surf.Area= 3,427 sf Storage= 4,319 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 24.7 min (794.4 - 769.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	293.67'	2,443 cf	**108.17'W x 31.68'L x 2.33'H Field A** 7,996 cf Overall - 1,887 cf Embedded = 6,109 cf x 40.0% Voids
#2A	294.17'	1,887 cf	**ADS_StormTech SC-310 +Cap** x 128 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 128 Chambers in 32 Rows
		4,330 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	293.67'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	295.17'	**4.0" Vert. Orifice/Grate X 32.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	295.17'	**36.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 295.17' / 294.80' S= 0.0740 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 7.07 sf

Discarded OutFlow Max=0.7 cfs @ 11.61 hrs HW=293.72' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.7 cfs)

Primary OutFlow Max=3.8 cfs @ 12.17 hrs HW=295.99' TW=288.13' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 3.8 cfs @ 2.4 fps)
  └─**2=Orifice/Grate** (Passes 3.8 cfs of 10.9 cfs potential flow)

Summary for Pond PSIS-2: PSIS-2

Inflow Area = 33,508 sf, 89.98% Impervious, Inflow Depth > 7.18" for 100-Yr 24 Hr event
Inflow = 5.4 cfs @ 12.11 hrs, Volume= 20,042 cf
Outflow = 4.4 cfs @ 12.16 hrs, Volume= 18,427 cf, Atten= 18%, Lag= 3.3 min
Discarded = 0.2 cfs @ 9.88 hrs, Volume= 10,632 cf
Primary = 4.3 cfs @ 12.16 hrs, Volume= 7,795 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= 307.82' @ 12.16 hrs Surf.Area= 3,058 sf Storage= 3,812 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 51.6 min (856.3 - 804.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	305.50'	2,205 cf	**76.83'W x 39.80'L x 2.33'H Field A** 7,135 cf Overall - 1,622 cf Embedded = 5,514 cf x 40.0% Voids
#2A	306.00'	1,622 cf	**ADS_StormTech SC-310 +Cap** x 110 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 110 Chambers in 22 Rows
		3,827 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	305.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	306.95'	**4.0" Vert. Orifice/Grate X 22.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	306.95'	**36.0" Round Culvert** L= 13.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 306.95' / 306.50' S= 0.0333 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 7.07 sf

Discarded OutFlow Max=0.2 cfs @ 9.88 hrs HW=305.55' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=4.3 cfs @ 12.16 hrs HW=307.82' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 4.3 cfs @ 2.5 fps)
  └─**2=Orifice/Grate** (Passes 4.3 cfs of 7.8 cfs potential flow)

Summary for Pond PSIS-3: PSIS-3

Inflow Area = 126,596 sf, 83.09% Impervious, Inflow Depth > 6.76" for 100-Yr 24 Hr event
Inflow = 21.7 cfs @ 12.08 hrs, Volume= 71,333 cf
Outflow = 7.4 cfs @ 12.36 hrs, Volume= 71,330 cf, Atten= 66%, Lag= 16.6 min
Discarded = 1.2 cfs @ 11.04 hrs, Volume= 59,105 cf
Primary = 6.2 cfs @ 12.36 hrs, Volume= 12,225 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= 283.45' @ 12.36 hrs Surf.Area= 6,068 sf Storage= 23,511 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 121.9 min (900.5 - 778.6)

Volume	Invert	Avail.Storage	Storage Description
#1	277.70'	8,201 cf	**37.00'W x 164.00'L x 6.00'H Prismatoid** 36,408 cf Overall - 15,904 cf Embedded = 20,504 cf x 40.0% Voids
#2	278.00'	15,904 cf	**60.0" Round Pipe Storage** x 5 Inside #1 L= 162.0'
		24,106 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.70'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	282.20'	**12.0" Vert. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	282.20'	**24.0" Round Culvert** L= 67.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 282.20' / 278.60' S= 0.0537 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf

Discarded OutFlow Max=1.2 cfs @ 11.04 hrs HW=277.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=6.2 cfs @ 12.36 hrs HW=283.45' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 6.2 cfs @ 3.0 fps)
  └─**2=Orifice/Grate** (Passes 6.2 cfs of 16.4 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 > 4.77" for 100-Yr 24 Hr event
Inflow = 9.7 cfs @ 12.09 hrs, Volume= 51,092 cf
Outflow = 7.4 cfs @ 12.32 hrs, Volume= 42,363 cf, Atten= 24%, Lag= 14.2 min
Discarded = 0.2 cfs @ 9.18 hrs, Volume= 10,211 cf
Primary = 7.2 cfs @ 12.32 hrs, Volume= 32,152 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= 290.23' @ 12.32 hrs Surf.Area= 2,982 sf Storage= 11,087 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 36.5 min (870.8 - 834.2)

Volume	Invert	Avail.Storage	Storage Description
#1	285.50'	8,247 cf	**60.0" Round Pipe Storage** x 3 Inside #2 L= 140.0'
#2	285.00'	3,858 cf	**21.00'W x 142.00'L x 6.00'H Prismatoid** 17,892 cf Overall - 8,247 cf Embedded = 9,645 cf x 40.0% Voids
		12,105 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	285.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	289.00'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	289.00'	**30.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 289.00' / 288.50' S= 0.0500 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 4.91 sf

Discarded OutFlow Max=0.2 cfs @ 9.18 hrs HW=285.07' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=7.2 cfs @ 12.32 hrs HW=290.23' TW=0.00' (Dynamic Tailwater)
└—**3=Culvert** (Inlet Controls 7.2 cfs @ 3.0 fps)
  └—**2=Orifice/Grate** (Passes 7.2 cfs of 9.3 cfs potential flow)

Summary for Pond PSIS-6: PSIS-6

Inflow Area = 63,967 sf, 58.47% Impervious, Inflow Depth > 5.06" for 100-Yr 24 Hr event
Inflow = 8.6 cfs @ 12.09 hrs, Volume= 26,976 cf
Outflow = 0.6 cfs @ 11.55 hrs, Volume= 26,981 cf, Atten= 94%, Lag= 0.0 min
Discarded = 0.6 cfs @ 11.55 hrs, Volume= 26,981 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= 283.89' @ 13.88 hrs Surf.Area= 2,911 sf Storage= 11,749 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 191.1 min (1,003.9 - 812.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	277.50'	4,989 cf	**92.08'W x 31.62'L x 6.75'H Field A** 19,652 cf Overall - 7,179 cf Embedded = 12,472 cf x 40.0% Voids
#2A	278.25'	7,179 cf	**ADS_StormTech MC-4500 b +Cap** x 60 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 60 Chambers in 10 Rows Cap Storage= 39.5 cf x 2 x 10 rows = 790.0 cf
		12,168 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	284.50'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	284.50'	**6.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 284.50' / 283.50' S= 0.0513 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.6 cfs @ 11.55 hrs HW=277.58' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.6 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 = 23,738 sf, 69.64% Impervious, Inflow Depth > 5.79" for 100-Yr 24 Hr event
Inflow = 3.6 cfs @ 12.09 hrs, Volume= 11,450 cf
Outflow = 1.2 cfs @ 12.39 hrs, Volume= 11,450 cf, Atten= 67%, Lag= 18.1 min
Discarded = 0.2 cfs @ 11.34 hrs, Volume= 9,305 cf
Primary = 1.0 cfs @ 12.39 hrs, Volume= 2,145 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= 277.33' @ 12.39 hrs Surf.Area= 1,108 sf Storage= 3,604 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 102.4 min (903.8 - 801.4)

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** C= 0.600 Limited to weir flow at low heads
#3	Primary	276.00'	**12.0" Round Culvert** L= 19.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 276.00' / 275.20' S= 0.0410 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.2 cfs @ 11.34 hrs HW=272.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=1.0 cfs @ 12.39 hrs HW=277.33' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Passes 1.0 cfs of 2.7 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 1.0 cfs @ 5.0 fps)

Summary for Pond SWB-1: SWB-1

Inflow Area = 104,326 sf, 80.92% Impervious, Inflow Depth > 1.32" for 100-Yr 24 Hr event
Inflow = 4.1 cfs @ 12.17 hrs, Volume= 11,514 cf
Outflow = 0.1 cfs @ 15.23 hrs, Volume= 4,836 cf, Atten= 96%, Lag= 183.8 min
Primary = 0.1 cfs @ 15.23 hrs, Volume= 4,836 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= 289.52' @ 15.23 hrs Surf.Area= 3,872 sf Storage= 6,681 cf

Plug-Flow detention time= 447.5 min calculated for 4,836 cf (42% of inflow)
Center-of-Mass det. time= 246.2 min (1,155.0 - 908.8)

Volume	Invert	Avail.Storage	Storage Description
#1	287.50'	8,603 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)
287.50	2,613	225.0	0	0	2,613
288.00	3,066	254.0	1,418	1,418	3,725
290.00	4,146	345.0	7,185	8,603	8,104

Device	Routing	Invert	Outlet Devices
#1	Primary	289.50'	**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

Primary OutFlow Max=0.1 cfs @ 15.23 hrs HW=289.52' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.1 cfs @ 0.4 fps)

TSS Removal Train Calculations

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 (Pretreatment)

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	44%	0.75	0.33	0.42

Total TSS Removal = 58.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 5/10/2024

*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 CB CDS Unit (Pretreatment)

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
CDS Unit	44%	1.00	0.44	0.56

Total TSS Removal = 44.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 5/10/2024

*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, PSIS-1/SWB-1, FES-1

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proposed Subsurface Infiltration System (PSIS)/Proposed Stormwater Basin-1 (SWB-1)	80%	1.00	0.80	0.20

Total TSS Removal = 80.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 5/10/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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, PSIS-2, FES-4

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proposed Subsurface Infiltration System-2 (PSIS-2)	80%	1.00	0.80	0.20

Total TSS Removal = 80.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 5/10/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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, PSIS-3, WO-2

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proposed Subsurface Infiltration System-3 (PSIS-3)	80%	1.00	0.80	0.20

Total TSS Removal = 80.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 5/10/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

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, PSIS-7, WO-3

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proposed Subsurface Infiltration System-7 (PSIS-7)	80%	1.00	0.80	0.20

Total TSS Removal = 80.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 5/10/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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, PSIS-6, WO-5

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proposed Subsurface Infiltration System-6 (PSIS-6)	80%	1.00	0.80	0.20

Total TSS Removal = 80.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 5/10/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

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, PSIS-5, WO-6

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proposed Subsurface Infiltration System-5 (PSIS-5)	80%	1.00	0.80	0.20

Total TSS Removal = 80.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 5/10/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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, PSIS-4, WO-7

TSS Removal Calculation

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proposed Subsurface Infiltration System-4 (PSIS-4)	80%	1.00	0.80	0.20

Total TSS Removal = 80.0%

Project: 22016
Prepared By: RJ O'Connell & Associates, Inc.
Date: 5/10/2024

*Equals remaining load from previous BMP(E) which enters the BMP

** See portion of STEP Fact Sheet for removal rate

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Project: Grove Street Residences
Location: Franklin, MA
Prepared For: RJ O'Connell

CONTECH ENGINEERED SOLUTIONS

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**

CONTECH ENGINEERED SOLUTIONS

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

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.

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.

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.

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.

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.

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.

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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Evaluation Project

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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.

Performance Evaluation

Back to Profile

StormTech Isolator Row :: A product from STORMTECH LLC **::**

Performance information: (This product was evaluated in at least one third-party study. See MASTEP Evaluation Summary.)

The StormTech Isolator Row was tested several times at a laboratory at Tennessee Tech University and also in the field by the UNH Stormwater Center (initially reported on in 2008, expanded and updated in a 2010 report). UNH analyzed runoff from a 9 acre parking lot for TSS, TPH, nitrogen as nitrate (DIN), TZn, and TP. Samples were collected during 23 events (13.2" rainfall) from 2007- 2009. The following pollutants were monitored, with results obtained: TSS (81% Efficiency Ratio (ER), 69% mean Removal Efficiency (RE), 83% median RE); SSC (only 5 storms monitored (94% ER, 93% mean RE, 91% median RE); Zinc (61% ER, 60% mean RE, 57% median RE); Total Phosphorus (53% ER, 29% mean RE, 33% median RE); Dissolved Inorganic Nitrogen(-74% ER, -97% mean RE, -80% median RE); Total Petroleum Hydrocarbons (79% ER, 81% mean RE, 91% median RE). A full scale StormTech SC-740 isolator Row was tested in the laboratory at Tennessee Tech University. Three different influent mixes were used in the testing including a SIL-CO-SIL 106, SIL-CO-SIL250 and US Silica OK-110. The SIL-CO-SIL106 had a median particle size of 22 microns and was tested at a hydraulic loading rate of 3.2gpm/ft2 of filter area. The SIL-CO-SIL 250 had a median particle size of 45 microns and was tested at 3.2 and 1.7 gpm/ft2 of filter area. The OK-110 influent slurry had a median particle size of 110 microns and was tested at rates up to 4.8 and 8.1 gpm/ft2 in the four and two chamber configurations. Five runs were done with the SIL-CO-SIL 106 influent at 3.2gpm/ft2 (125% of treatment operating rate). One run was done with the SIL-CO-SIL 250 slurry at each of the two hydraulic loading rates (3.2, 1.7gpm/ft2-62.5% of treatment operating rate). Each run lasted 15 detention times, allowing 3 detention times prior to collecting samples. OK-110 tests were run for 11 treatment flows from 44.9-539gpm (0.1-1.2cfs) or hydraulic loading rates of 0.4-4.8gpm/ft2 with a four chamber Isolator row. They also ran tests with a two chamber model at 0.4, 1.0, and 1.2 cfs, up to a hydraulic loading rate of 8.1gpm/ft2. Results of SIL-CO-SIL 106 runs show an average influent of 270 +/-59mg/l (range 139-361mg/l). This influent was higher than expected and due to recirculation of sediments that were not trapped in the filter sock at the outlet. Average removal efficiency was 60% across all samples but average removal by sample number (1-5) shows that removal efficiency decreased with increasing detention time from 66% at sample 1 to 58% at sample 5. Results for the SIL-CO-SIL 250 test at 3.2gpm/ft2 an average removal of 71%. Recirculation in these tests would have reduced the D50 below 45microns in the influent but a PSD was not done as it was with the SIL-CO-SIL 106 influent mix. Results for SIL-CO-SIL 250 at 1.7gpm/ft2 found an average removal of 88%. Compared to the demonstrated results for the SIL-CO-SIL106, these values appear reasonable since higher removal efficiencies are expected when the particle size distribution is greater. Results from OK-110 testing demonstrated an average removal of 99.14% from discrete samples and 98.06% from the grab samples across all flow rates tested.

Pollutants addressed	Manufacturer's Removal Efficiency claim	Minimum particle size	Tested removal efficiency (*)	Test Data Status (**)	Notes
Suspended sediment concentration	60-95%	-	60-95 %	2	average removal for all rates and influent types from Tenn Tech studies verified by NJCAT
Total suspended solids	66%	-	69-83 %	2	UNH Stormwater Center field studies, removal efficiency and efficiency ratio methods.
Zinc	50%	-	57-61 %	2	UNH Stormwater Center field studies, removal efficiency and efficiency ratio methods.
Hydrocarbons	78%	-	79-91 %	2	UNH Stormwater Center field studies, removal efficiency and efficiency ratio methods.
Total Phosphorus	37%	-	29-53 %	2	UNH Stormwater Center field studies, removal efficiency and efficiency ratio methods.

***** - Pollution removal efficiency evaluated by MASTEP staff based on review of available performance evaluation reports.

****** - **1** = sufficient credible data to be able to evaluate pollution removal efficiency claims. **2** = sound field or laboratory performance studies exist for this technology. Some caveats exist regarding use of the study information. **3** = performance studies with some scientific merit exist for this technology. Significant caveats exist regarding use of the study information. **4** = There is insufficient reliable data available to evaluate the performance of this technology. **0** = data review not yet conducted.

Test reports: (click on link to view a summary of a test, click on disk icon to download the full report)

Title	Author/ Agency	Date	TARP compliancy	Test protocol compliancy	Documents
Hydraulic Performance and Sediment Trap Efficiency for the StormTech SC-740 Isolator Row	Andrew Christensen and Vince Neary	02/23/2005	No	-	Hydraulic_Perf_Sed_Trap_Eff_StormTech_Isolator.pdf
PERFORMANCE EVALUATION OF SEDIMENT REMOVAL EFFICIENCY STORMTECH ISOLATOR ROW	Vincent Neary	10/20/2006	No	-	Tenn Tech Oct 2006 Report.pdf
NJCAT Technology Verification of the StormTech Isolotor Row	-	08/01/2007	No	-	NJCAT_Verification_StormTech_081507finalbdapprov-doc1.pdf
FINAL REPORT ON FIELD VERIFICATION TESTING OF THE STORMTECH ISOLATOR ROW TREATMENT UNIT	University of New Hampshire Stormwater Center	06/01/2008	No	The UNHSC QAPP was designed tobsubstantially comply with TARP and TAPE guidelines	UNHSC_StormTech Isolator Row_Final Report_6_08.pdf
Performance Evaluation Report of the StormTech Isolator Row Treatment Unit	Roseen et al	09/01/2010	No	TARP and TAPE	UNHSC_Stormtech PER_9_9_10-Final.pdf

Return to the Home Page

Total Phosphorous Removal Calculations

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: 5/10/2024
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	0.77	2.32	1.00	1.79
Credit #2	SWB-1	1.17	2.32	1.00	2.71
Credit #3	PSIS-2	0.69	2.32	0.98	1.57
Credit #4	PSIS-3	2.04	2.32	1.00	4.73
Credit #5	PSIS-4	1.58	2.32	1.00	3.67
Credit #6	PSIS-5	1.96	2.32	1.00	4.55
Credit #7	PSIS-6	0.86	2.32	1.00	2.00
Credit #8	PSIS-7	0.38	2.32	1.00	0.88
			Total BMP Phosphorous Removal:		21.89
			Total Phosphorous Removal Rate:		**96%**

(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

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

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: **5/10/2024**
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-20	0.25	0.90	0.23	0.23	6.0	6.3	1.42	5.18	0.012	12	0.024	5.98	7.61
	CB-14A	CDS-2	0.20	0.90	0.18	0.18	6.0	6.3	1.13	4.35	0.012	12	0.018	5.18	6.59
	CB-14B	CDS-2	0.15	0.90	0.14	0.14	6.0	6.3	0.85	5.98	0.012	12	0.067	9.99	12.72
	DMH-20	CDS-2	-	-	-	0.54	6.0	6.3	3.40	9.03	0.012	12	0.057	9.21	11.73
	CDS-2	PSDS-1	-	-	-	0.54	6.0	6.3	3.40	6.94	0.012	12	0.027	6.34	8.08
To PSDS-1 (IN #2)	CB-10	DMH-16	0.21	0.90	0.19	0.19	6.0	6.3	1.19	5.09	0.012	12	0.027	6.34	8.08
	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	4.20	0.012	18	0.007	9.52	5.39
	DCB-12A	DMH-17	0.20	0.90	0.18	0.18	6.0	6.3	1.13	3.36	0.012	12	0.008	3.47	4.42
	CB-12B	CDS-1	0.14	0.90	0.13	0.13	6.0	6.3	0.79	2.96	0.012	12	0.008	3.47	4.42
	DMH-17	CDS-1	-	-	-	0.76	6.0	6.3	4.76	4.29	0.012	18	0.006	8.81	4.99
	CDS-1	PSDS-1	-	-	-	0.88	6.0	6.3	5.56	4.23	0.012	18	0.005	8.05	4.55
To PSDS-1 (IN #3)	BLDG-1	PSIS-1	0.41	0.90	0.37	0.37	6.0	6.3	2.32	4.04	0.012	12	0.008	3.45	4.40
To PSIS-1	PSIS-1	CDS-14	-	-	-	-	6.0	6.3	0.1	3.50	0.012	6	0.08	1.72	8.76
	DCB-15A	CDS-14	0.25	0.90	0.23	0.23	6.0	6.3	1.4	2.95	0.012	12	0.005	2.73	3.48
	CB-15B	CDS-14	0.08	0.90	0.07	0.07	6.0	6.3	0.5	2.25	0.012	12	0.006	2.99	3.81
	CDS-14	PSIS-1	-	-	-	0.30	6.0	6.3	3.5	4.05	0.012	15	0.0061	5.47	4.45
Outlet to FES-1	PSDS-1	DMH-18	-	-	-	-	6.0	6.3	1.6	7.75	0.012	6	0.058	1.46	7.46
	PSIS-1	DMH-18	-	-	-	-	6.0	6.3	1.5	4.80	0.012	36	0.058	174.02	24.62

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: **5/10/2024**
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-18	DMH-19	-	-	-	-	6.0	6.3	3.1	3.49	0.012	36	0.009	68.55	9.70
	DMH-19	FES-1	-	-	-	-	6.0	6.3	3.1	4.13	0.012	36	0.015	88.50	12.52

80 Montvale Ave
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Storm Drainage Computations

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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-2 (IN#1)	DCB-24	DMH-14	0.21	0.90	0.19	0.19	6.0	6.3	1.19	4.21	0.012	12	0.015	4.73	6.02
	DMH-14	CDS-6	-	-	-	0.19	6.0	6.3	1.19	3.76	0.012	12	0.011	4.05	5.15
	DCB-25	CDS-6	0.13	0.90	0.12	0.12	6.0	6.3	0.74	3.55	0.012	12	0.015	4.73	6.02
	CDS-6	PSDS-2	-	-	-	0.31	6.0	6.3	1.93	7.68	0.012	12	0.056	9.13	11.63
To PSIS-2 (IN#2)	CB-26	PSIS-2	0.03	0.90	0.03	0.03	6.0	6.3	0.17	2.55	0.012	12	0.032	6.90	8.79
	BLDG-2	PSIS-2	0.37	0.90	0.33	0.33	6.0	6.3	2.10	6.71	0.012	12	0.035	7.22	9.19
	PSDS-2	PSIS-2	-	-	-	-	6.0	6.3	1.00	3.99	0.012	18	0.024	17.63	9.98
PSIS-2 to FES-4	PSIS-2	FES-4	-	-	-	-	6.0	6.3	1.70	3.83	0.012	36	0.029	123.05	17.41

Storm Drainage Computations

RJOC & Associates, Inc.
80 Montvale Ave
Stoneham MA 02180
P 781.279.0173

Name: Fairfield at Grove Street

Client: Fairfield Grove Street LLC

Proj. No.: **22016**
Date: **5/10/2024**
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-6 (IN#1)	DCB-30	DMH-24	0.13	0.90	0.12	0.12	6.0	6.3	0.74	5.05	0.012	12	0.044	8.10	10.31
	3 BG #1	DMH-24	0.04	0.90	0.04	0.04	6.0	6.3	0.23	3.15	0.012	12	0.049	8.54	10.88
	DMH-24	CDS-9	-	-	-	0.15	6.0	6.3	0.96	4.58	0.012	12	0.025	6.10	7.77
	DCB-31	CDS-9	0.12	0.90	0.11	0.11	6.0	6.3	0.68	4.37	0.012	12	0.033	7.01	8.93
	CDS-9	PSIS-6	-	-	-	0.11	6.0	6.3	0.68	4.95	0.012	12	0.046	8.28	10.54
To PSIS-6 (IN#2)	CB-27	DMH-22	0.26	0.90	0.23	0.23	6.0	6.3	1.47	4.42	0.012	12	0.014	4.57	5.81
	AD-5	DMH-22	0.21	0.90	0.19	0.19	6.0	6.3	1.19	2.34	0.012	12	0.003	2.11	2.69
	DMH-22	DMH-23	-	-	-	0.42	6.0	6.3	2.66	6.29	0.012	12	0.025	6.10	7.77
	DMH-23	CDS-13	-	-	-	0.42	6.0	6.3	2.66	7.47	0.012	12	0.039	7.62	9.71
	DCB-28	CDS-13	0.10	0.90	0.09	0.09	6.0	6.3	0.57	3.73	0.012	12	0.024	5.98	7.61
	CB-29	CDS-13	0.13	0.90	0.12	0.12	6.0	6.3	0.74	5.83	0.012	12	0.076	10.64	13.55
	CDS-13	PSIS-6	-	-	-	0.63	6.0	6.3	3.97	5.72	0.012	12	0.013	4.40	5.60
To PSIS-6 (IN#3)	6 BG#1	PSIS-6	0.04	0.90	0.04	0.04	6.0	6.3	0.23	2.24	0.012	12	0.013	4.40	5.60
Outlet to WO-5	PSIS-6	DMH-25	-	-	-	-	6.0	6.3	0.00	0.00	0.012	36	0.026	116.51	16.48
	DMH-25	WO-5	-	-	-	-	6.0	6.3	0.00	0.00	0.012	36	0.046	154.97	21.92
To PSIS-3 (IN#1)	CB-23	DMH-13	0.07	0.90	0.06	0.06	6.0	6.3	0.40	2.13	0.012	12	0.006	2.99	3.81
	CB-22	DMH-13	0.11	0.90	0.10	0.10	6.0	6.3	0.62	4.50	0.012	12	0.038	7.52	9.58
	DMH-13	DMH-12	0.04	0.90	0.04	0.16	6.0	6.3	1.02	5.81	0.012	12	0.048	8.46	10.77

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: **5/10/2024**
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Design Parameters:
25 Year Storm

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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
	CB-20	DMH-12	0.08	0.90	0.07	0.07	6.0	6.3	0.45	6.28	0.012	12	0.15	14.95	19.03
	CB-21	DMH-12	0.04	0.90	0.04	0.04	6.0	6.3	0.23	3.90	0.012	12	0.075	10.57	13.46
	DMH-12	DMH-11	-	-	-	0.27	6.0	6.3	4.00	7.61	0.012	12	0.031	6.80	8.65
	CB-19	DMH-11	0.12	0.90	0.11	0.38	6.0	6.3	2.38	8.65	0.012	12	0.065	9.84	12.53
	DMH-11	DMH-10	-	-	-	0.38	6.0	6.3	2.38	3.51	0.012	12	0.005	2.73	3.48
	CB-18	DMH-10	0.05	0.90	0.05	0.42	6.0	6.3	2.66	7.83	0.012	12	0.044	8.10	10.31
	DMH-10	DMH-9	-	-	-	0.42	6.0	6.3	2.66	3.23	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	-	-	-	0.71	6.0	6.3	4.48	9.25	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	-	-	-	0.84	6.0	6.3	5.27	9.27	0.012	12	0.043	8.00	10.19
	BLDG CLB H	DMH-7	0.18	0.90	0.16	0.16	6.0	6.3	1.02	3.90	0.012	12	0.014	4.57	5.81
	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	-	-	-	1.10	6.0	6.3	6.92	8.55	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

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: **5/10/2024**
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
	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
	DMH-6	DMH-5	-	-	-	1.13	6.0	6.3	7.14	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	-	-	-	1.21	6.0	6.3	7.60	7.75	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	-	-	-	1.31	6.0	6.3	8.22	4.74	0.012	18	0.005	8.05	4.55
	CB-33	DMH-3	0.12	0.90	0.11	1.41	6.0	6.3	8.90	9.77	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	-	-	-	1.41	6.0	6.3	8.90	8.99	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	-	-	-	1.76	6.0	6.3	11.11	7.03	0.012	24	0.013	27.94	8.89
	CB-35	CDS-3	0.16	0.90	0.14	0.14	6.0	6.3	0.91	3.45	0.012	12	0.011	4.05	5.15
	CDS-3	PSIS-3	-	-	-	1.91	6.0	6.3	12.02	9.54	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	6.80	0.012	12	0.038	7.52	9.58
Outlet to WO-2	PSIS-3	DMH-26	-	-	-	-	6.0	6.3	0.60	3.54	0.012	24	0.0425	50.52	16.08
	DHM-26	WO-2	-	-	-	-	6.0	6.3	0.60	4.57	0.012	24	0.06	60.03	19.11

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Storm Drainage Computations

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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-4 (IN#1)	CB-58	DMH-45	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-59	DMH-45	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-45	DMH-46	-	-	-	0.27	6.0	6.3	1.70	5.21	0.012	12	0.020	5.46	6.95
	DCB-60	DMH-46	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-46	DMH-47	-	-	-	0.50	6.0	6.3	3.12	3.55	0.012	18	0.005	8.05	4.55
	DCB-61	DMH-47	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-47	CDS-11	-	-	-	0.72	6.0	6.3	4.54	3.67	0.012	18	0.004	7.20	4.07
	CB-62	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-63	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
	CDS-11	PSIS-4	-	-	-	1.04	6.0	6.3	6.52	5.81	0.012	18	0.011	11.94	6.75
To PSIS-4 (IN#2)	CB-57	DMH-43	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-43	DMH-42	-	-	-	0.14	6.0	6.3	0.85	2.39	0.012	12	0.004	2.44	3.11
	CB-56	DMH-42	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-42	DMH-41	-	-	-	0.31	6.0	6.3	1.93	3.96	0.012	12	0.009	3.66	4.66
	DMH-41	DMH-40	-	-	-	0.31	6.0	6.3	1.93	3.13	0.012	12	0.005	2.59	3.30
	DCB-55	DMH-40	0.08	0.90	0.07	0.07	6.0	6.3	0.43	2.75	0.012	12	0.013	4.40	5.60

Storm Drainage Computations

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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-40	CDS-12	-	-	-	0.37	6.0	6.3	2.35	6.87	0.012	12	0.033	7.01	8.93
	CB-54	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
	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 WO-7	PSIS-4	DMH-44	-	-	-	-	6.0	6.3	0.1	2.32	0.012	6	0.02	0.86	4.38
	DMH-44	WO-7	-	-	-	-	6.0	6.3	0.1	2.50	0.012	6	0.0272	1.00	5.11

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80 Montvale Ave
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Storm Drainage Computations

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Date: **5/10/2024**
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-3 (IN#1)	DCB-53	DMH-38	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-38	DMH-37	-	-	-	0.15	6.0	6.3	0.96	6.14	0.012	12	0.065	9.84	12.53
	CB-52	DMH-37	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-51	DMH-37	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-37	DMH-36	-	-	-	0.33	6.0	6.3	2.10	7.51	0.012	12	0.049	8.54	10.88
	DMH-36	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-49	DMH-34	0.06	0.90	0.05	0.05	6.0	6.3	0.34	3.63	0.012	12	0.050	8.63	10.99
	DCB-50	DMH-34	0.14	0.90	0.13	0.13	6.0	6.3	0.79	4.69	0.012	12	0.035	7.22	9.19
	DMH-34	DMH-35	-	-	-	0.18	6.0	6.3	1.13	3.17	0.012	12	0.007	3.23	4.11
	CB-48	DMH-35	0.20	0.90	0.18	0.18	6.0	6.3	1.13	4.29	0.012	12	0.017	5.03	6.41
	DMH-35	CDS-10	0.09	0.90	0.08	0.36	6.0	6.3	2.27	3.44	0.012	12	0.005	2.73	3.48
	CB-47	CDS-10	0.07	0.90	0.06	0.06	6.0	6.3	0.40	2.38	0.012	12	0.009	3.66	4.66
	CDS-10	PSDS-3	-	-	-	0.42	6.0	6.3	2.66	9.93	0.012	12	0.088	11.47	14.60
To PSDS-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

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Date: **5/10/2024**
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-5	PSDS-3	DMH-33	-	-	-	-	6.0	6.3	0.70	3.98	0.012	18	0.035	21.29	12.05
											0.011				
	DMH-33	DMH-32					6.0	6.3	0.70	5.69	0.011	18	0.078	34.67	19.62
	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
											0.011				
	DMH-32	DMH-31	-	-	-	0.15	6.0	6.3	1.66	6.65	0.011	18	0.056	29.38	16.62
	CB-44	DMH-31	0.24	0.90	0.22	0.22	6.0	6.3	1.36	5.75	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	-	-	-	0.41	6.0	6.3	3.25	4.99	0.011	18	0.01	12.41	7.03
	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	-	-	-	0.48	6.0	6.3	3.71	5.31	0.011	18	0.011	13.02	7.37
											0.011				
	CDS-7	PSIS-5				0.65	6.0	6.3	4.78	5.93	0.011	18	0.012	13.60	7.70
Outlet to HWO-6	PSIS-5	DMH-38	-	-	-	-	6.0	6.3	3.4	9.32	0.011	12	0.051	9.51	12.11
	DMH-38	WO-6	-	-	-	-	6.0	6.3	3.4	10.42	0.011	12	0.069	11.06	14.08

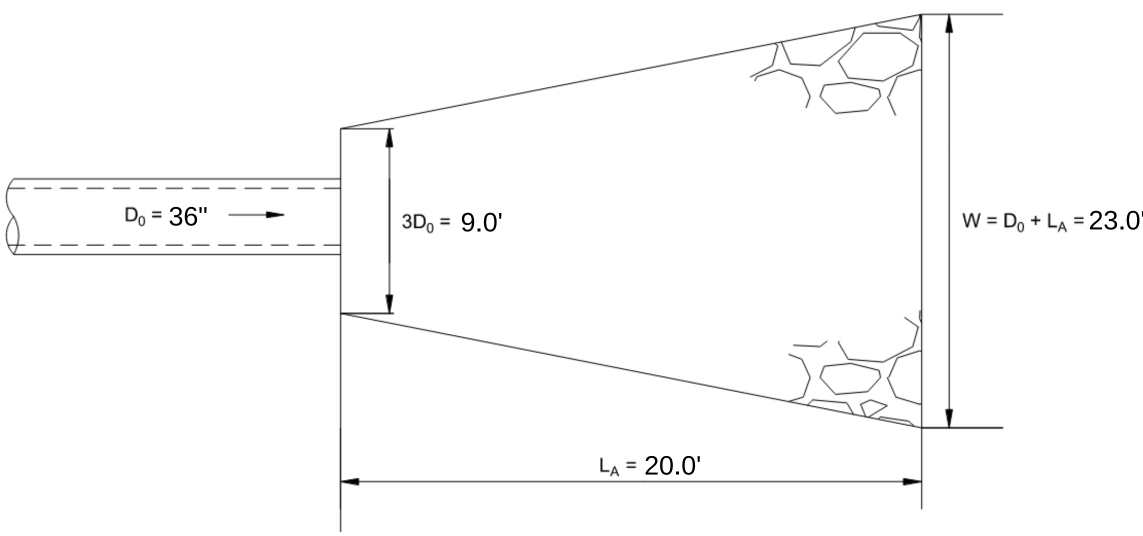
Rip-Rap Apron Design

RJOC & ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
80 Montvale Ave., Suite 201
Stoneham, MA 02180
781-279-0180 www.rjoconnell.com

RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-1

- **Outlet Pipe Diameter:** D_0 = 36" in (3.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 3.1 cfs
- **25-Year Design Storm Velocity:** V_{25} = 4.13 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (1.0)/(3(3.0)(4.13)

  T_w = 0.03 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

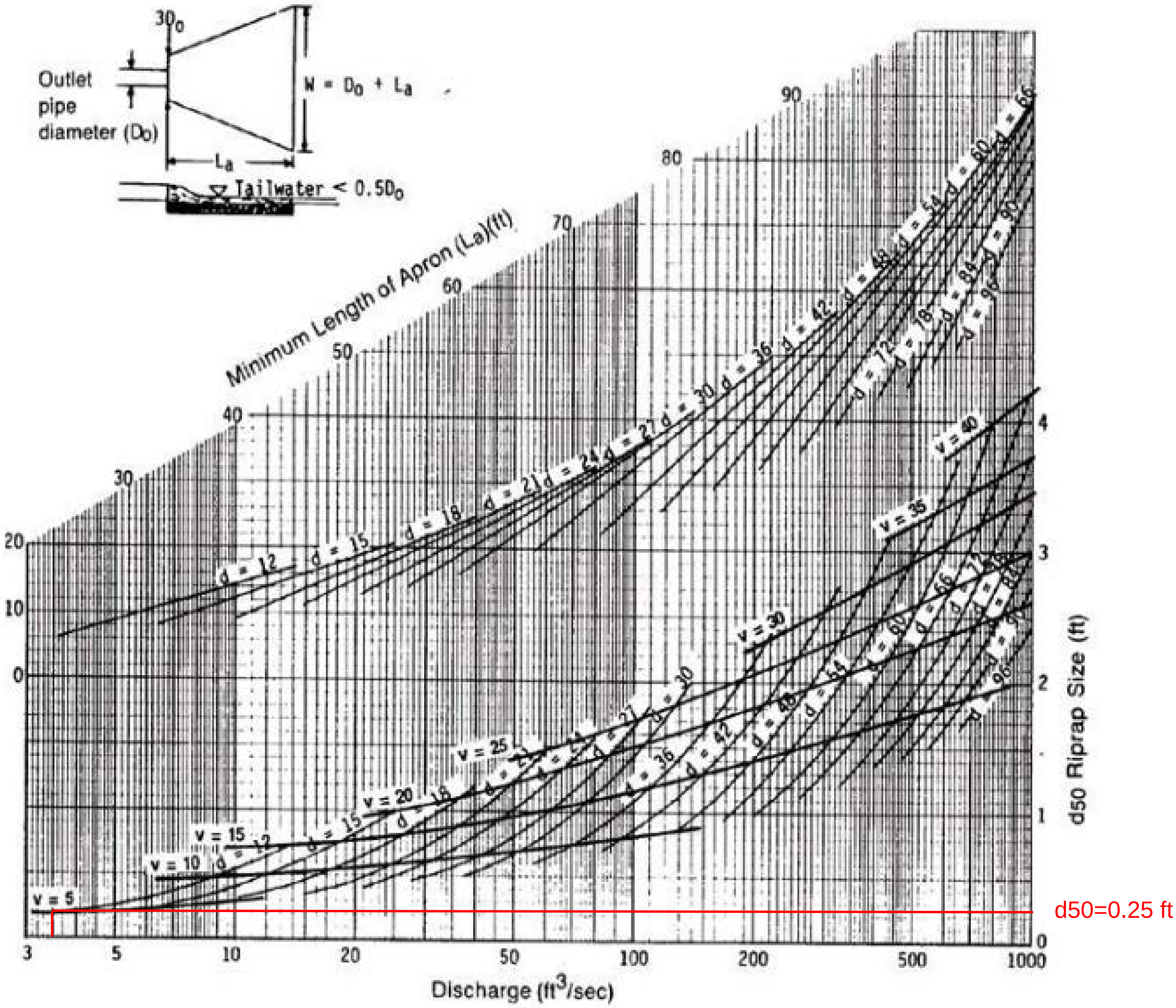
  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** L_A = 20.0'

  $W = D_0 + L_A$ = 23.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

<u>Figure 1</u>: Design of Riprap Apron under Minimum Tailwater Conditions:



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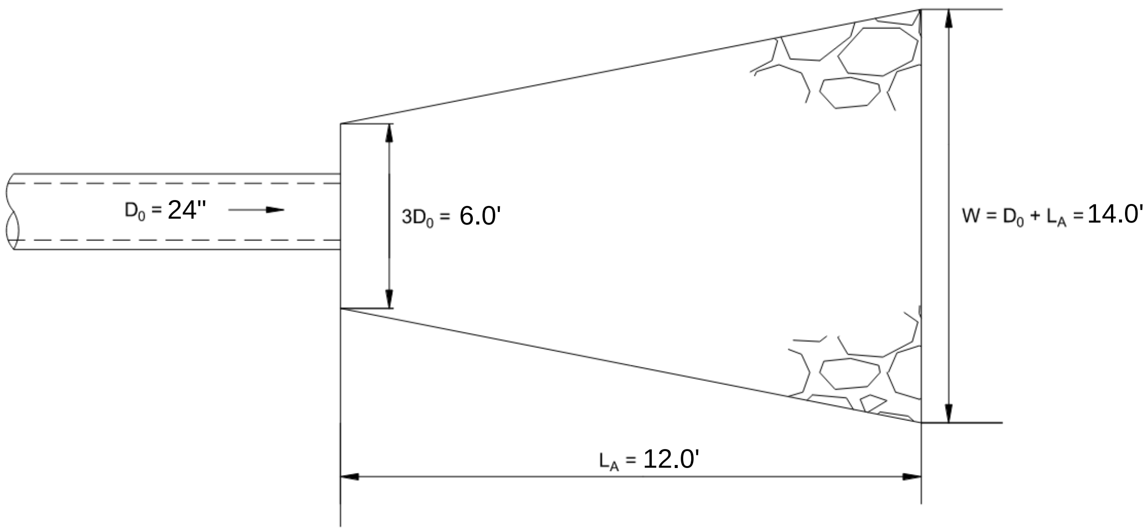
RIP-RAP APRON SIZING CALCULATIONS

Outlet: WO-2

- **Outlet Pipe Diameter:** D_0 = 24" in (2.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 0.6 cfs
- **25-Year Design Storm Velocity:** V_{25} = 4.57 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (0.6)/(3(2.0)(4.57)

  T_w = 0.02 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

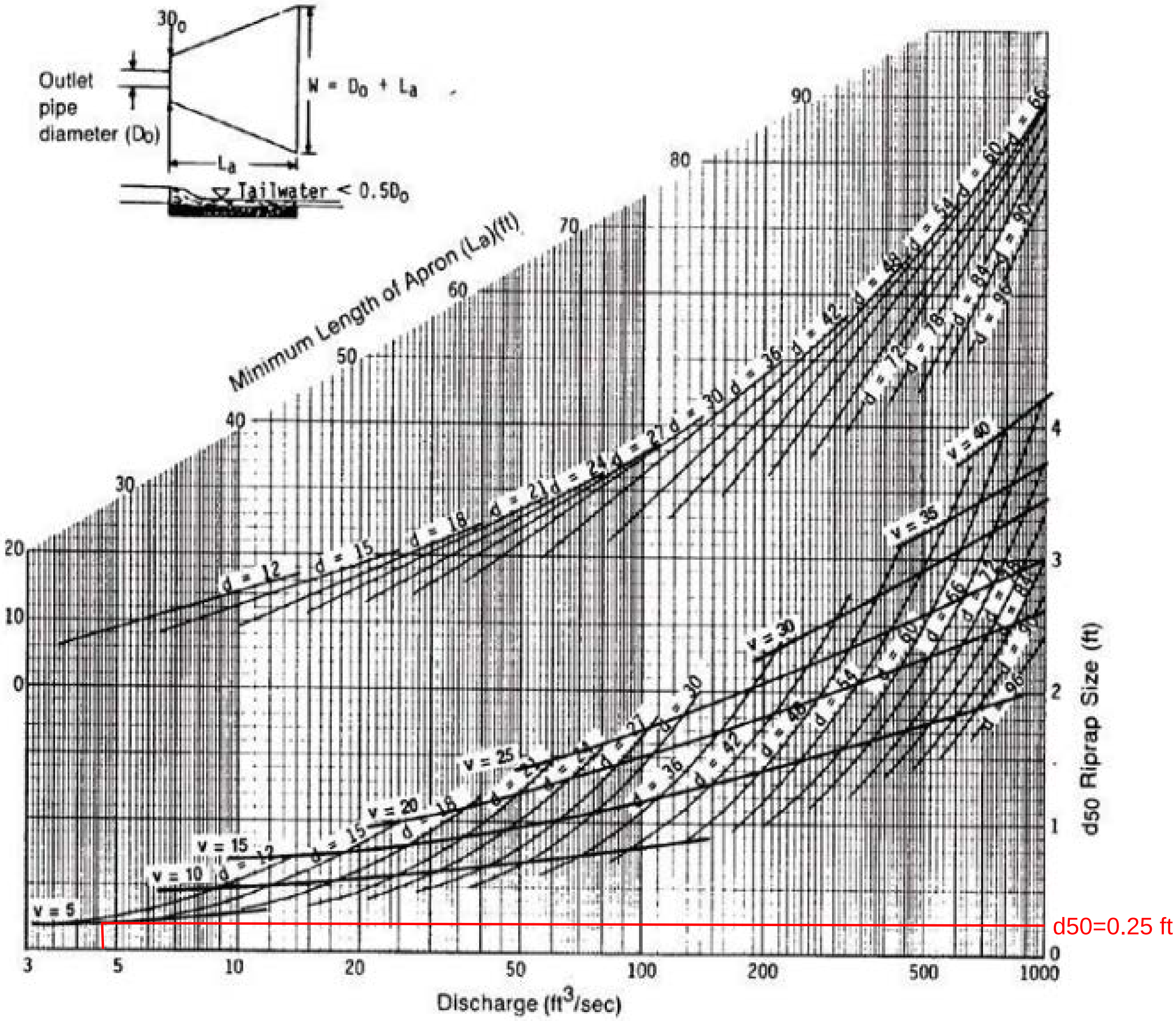
  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** L_A = 12.0'

  W = D_0 + L_A = 14.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

Figure 1: Design of Riprap Apron under Minimum Tailwater Conditions:



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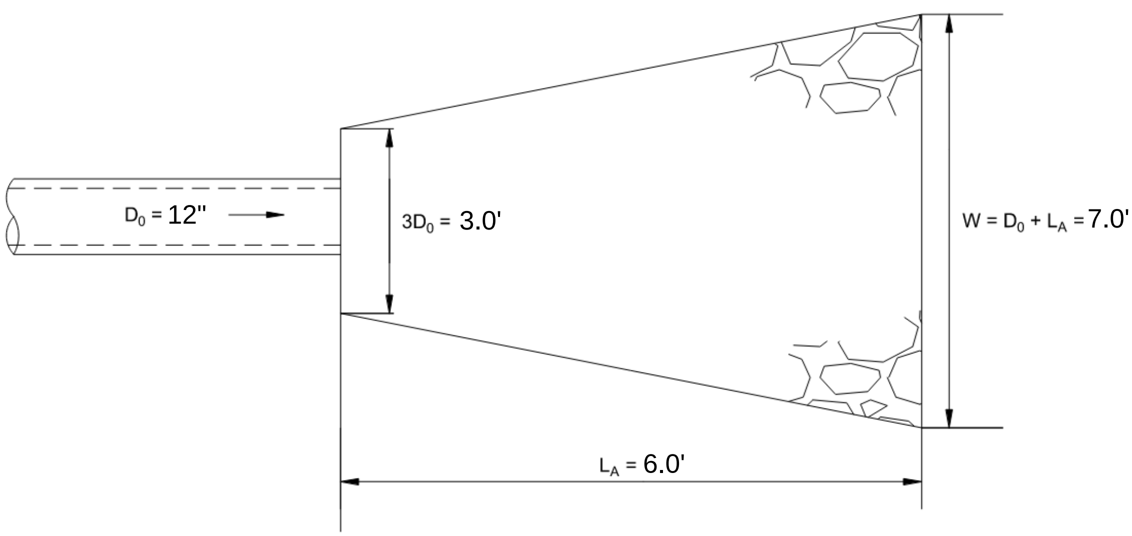
RIP-RAP APRON SIZING CALCULATIONS

Outlet: WO-3

- **Outlet Pipe Diameter:** D_0 = 12" in (1.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 0.1 cfs
- **25-Year Design Storm Velocity:** V_{25} = 1.64 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (0.1)/(3(1.0)(1.64)

  T_w = 0.14 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

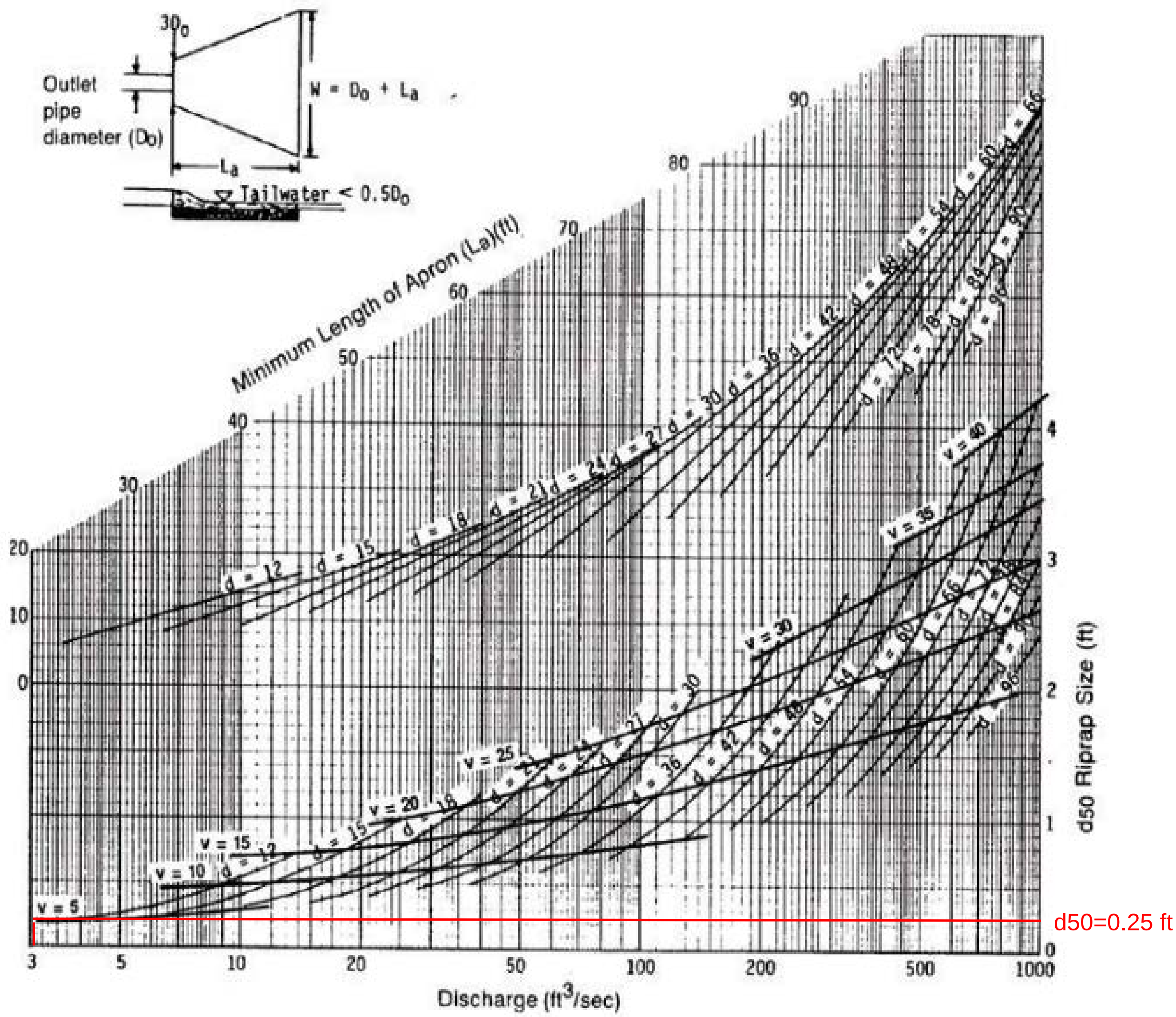
  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached): L_A =** 6.0'

  $W = D_0 + L_A$ = 7.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

Figure 1: Design of Riprap Apron under Minimum Tailwater Conditions:



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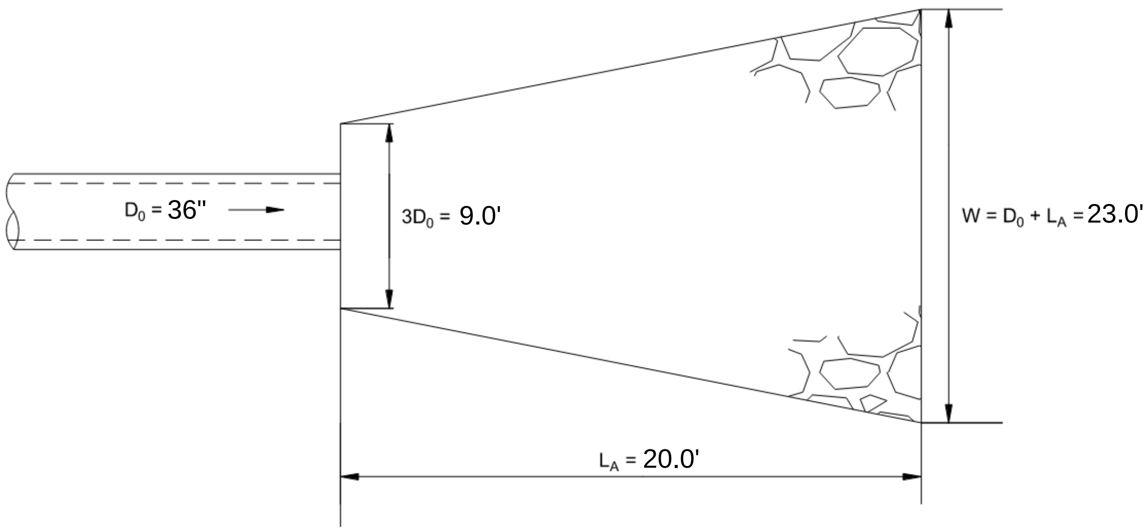
RIP-RAP APRON SIZING CALCULATIONS

Outlet: FES-4

- **Outlet Pipe Diameter:** $D_0 =$ 36" in (2.0 ft)
- **25-Year Design Storm Discharge Flow:** $Q_{25} =$ 1.7 cfs
- **25-Year Design Storm Velocity:** $V_{25} =$ 3.83 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  $T_w =$ (1.7)/(3(3.0)(3.83)

  $T_w =$ 0.05 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

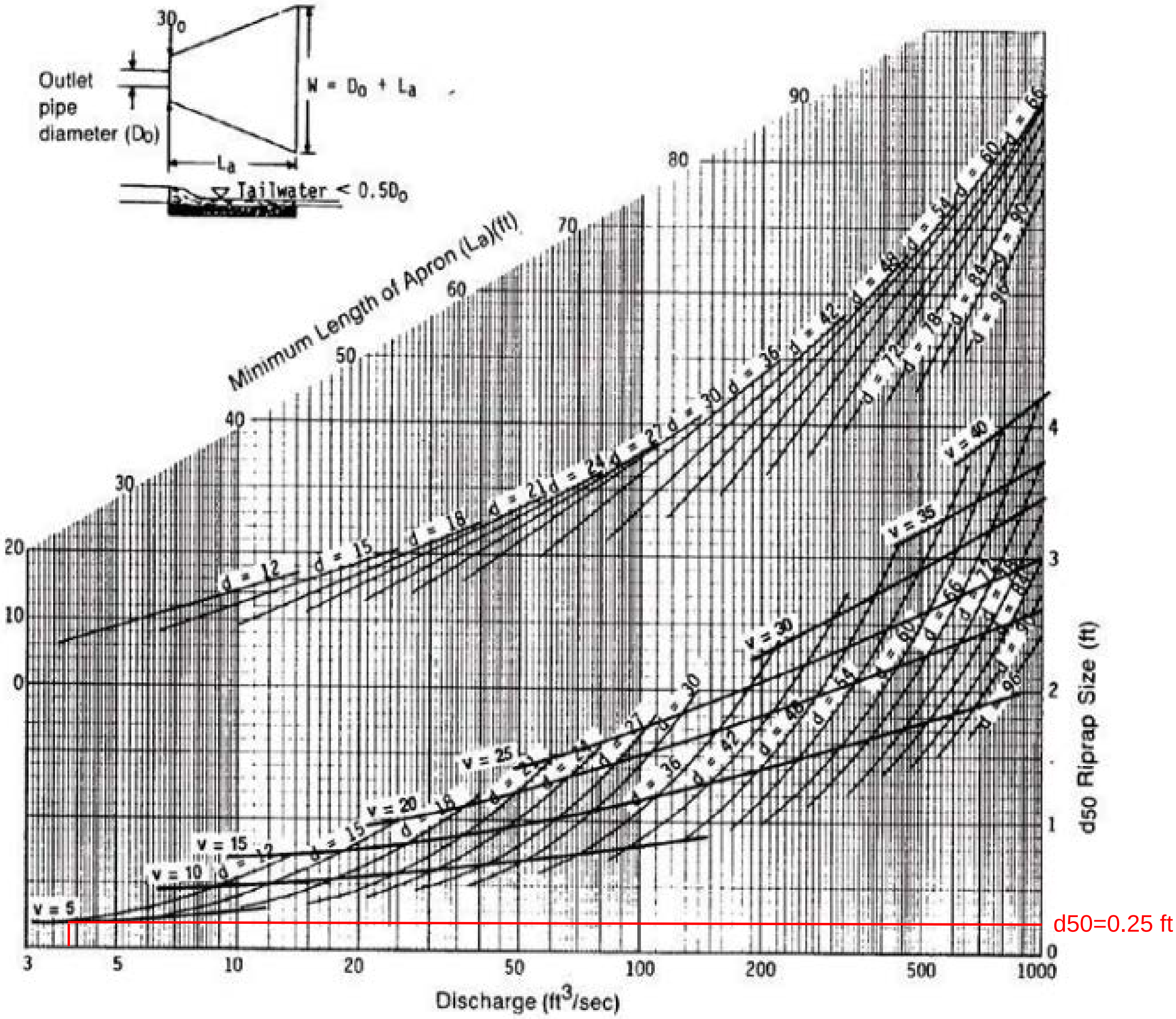
  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** $\mathbf{L_A} =$ 20.0'

  $\mathbf{W = D_0 + L_A} =$ 23.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

<u>Figure 1</u>: Design of Riprap Apron under Minimum Tailwater Conditions:



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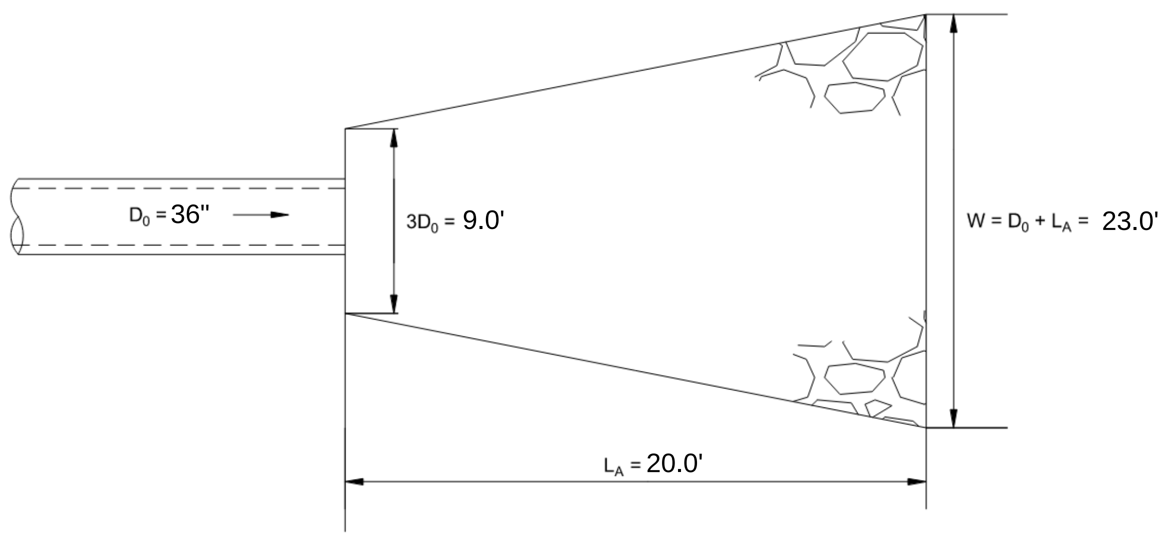
RIP-RAP APRON SIZING CALCULATIONS

Outlet: WO-5

- **Outlet Pipe Diameter:** D_0 = 36" in (3.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 0.0 cfs
- **25-Year Design Storm Velocity:** V_{25} = 0.0 fps

NO DISCHARGE IN THE 25-YEAR STORM



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (0.0)/(3(3.0)(0.0)

  T_w = 0.01 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

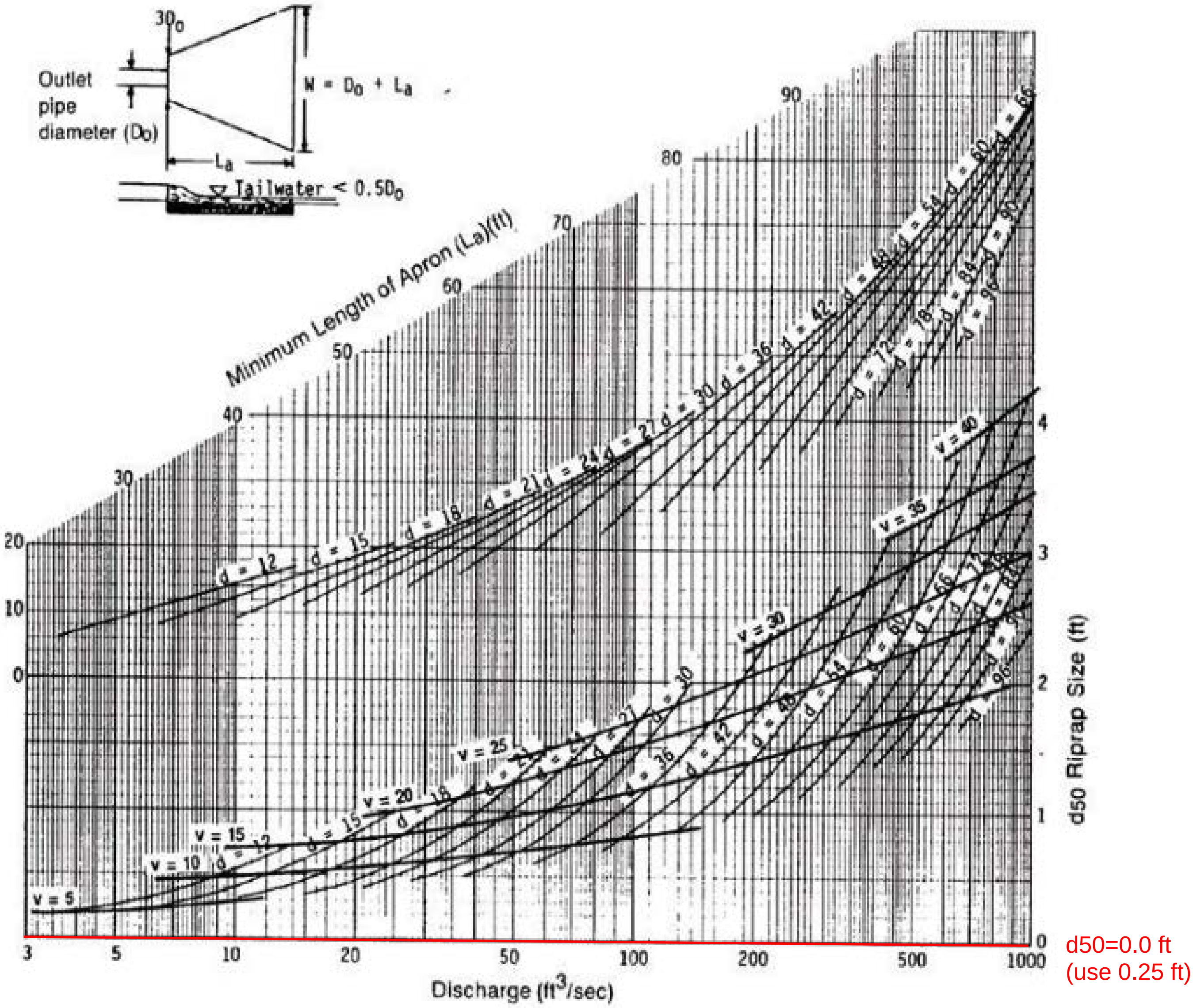
  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** $\mathbf{L_A}$ = 20.0'

  $\mathbf{W = D_0 + L_A}$ = 23.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

<u>Figure 1</u>: Design of Riprap Apron under Minimum Tailwater Conditions:



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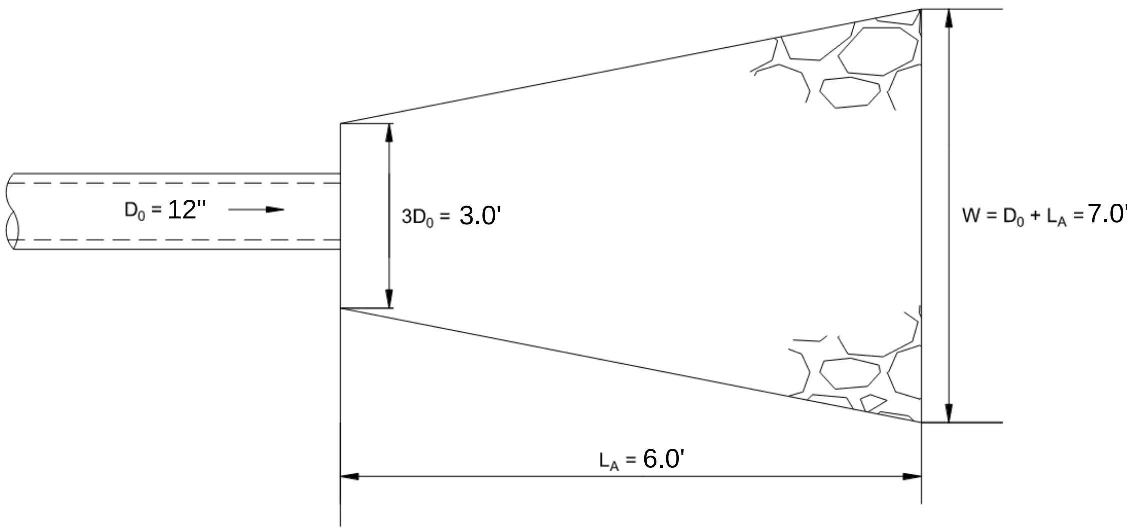
RIP-RAP APRON SIZING CALCULATIONS

Outlet: WO-6

- **Outlet Pipe Diameter:** D_0 = 12" in (1.0 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 3.4 cfs
- **25-Year Design Storm Velocity:** V_{25} = 10.42 fps



- **Tailwater Depth,** $T_w = Q/(3D_0)V$

  T_w = (3.4)/(3(1.0)(10.42)

  T_w = 0.11 ft

  (if $T_w < 0.5D_0$ then minimum tailwater conditions)

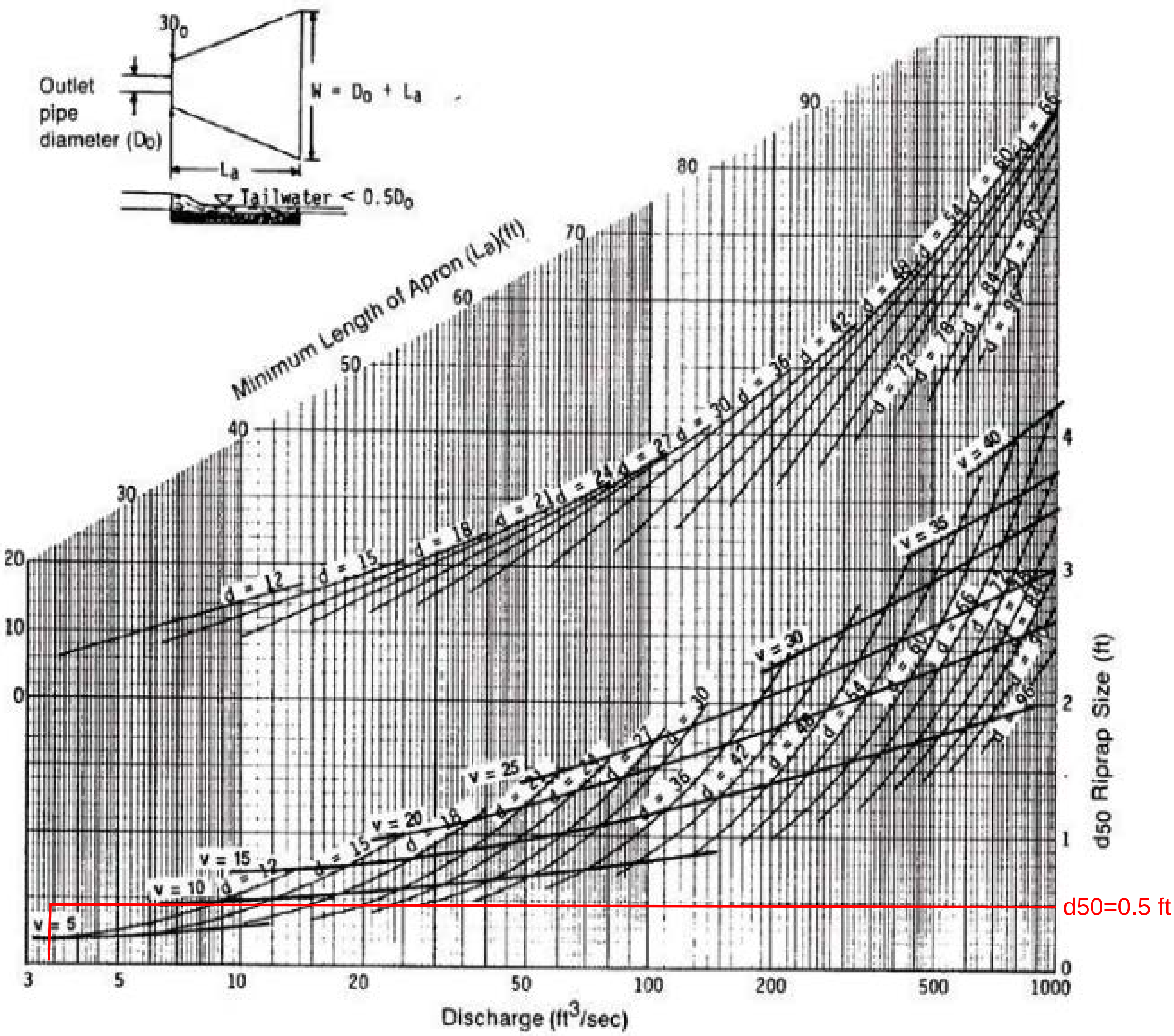
  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** $\mathbf{L_A}$ = 6.0'

  $\mathbf{W = D_0 + L_A}$ = 7.0'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

<u>Figure 1</u>: Design of Riprap Apron under Minimum Tailwater Conditions:



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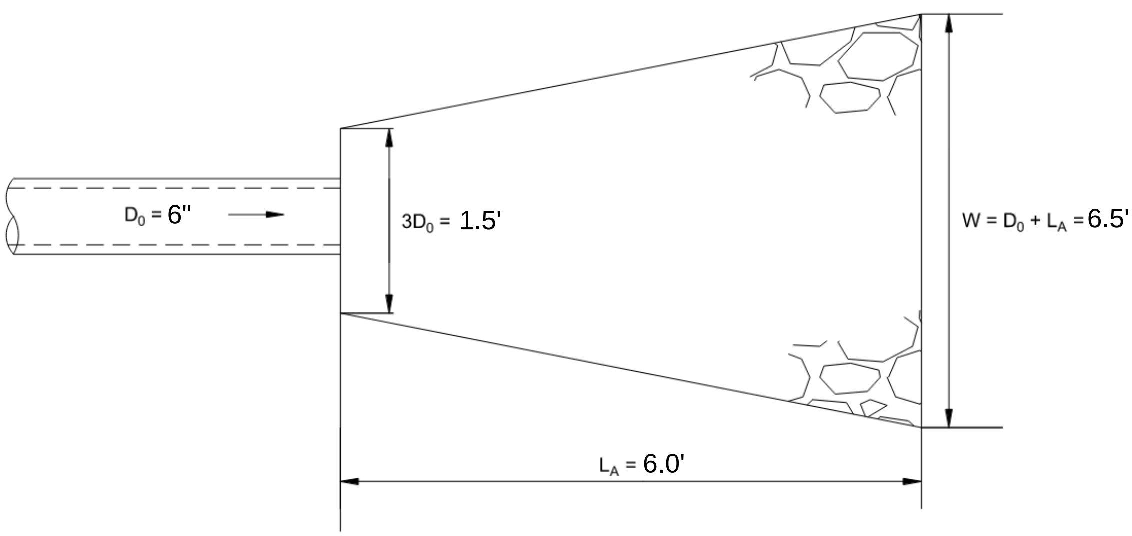
RIP-RAP APRON SIZING CALCULATIONS

Outlet: WO-7

- **Outlet Pipe Diameter:** D_0 = 6" in (0.5 ft)
- **25-Year Design Storm Discharge Flow:** Q_{25} = 0.1 cfs
- **25-Year Design Storm Velocity:** V_{25} = 2.5 fps

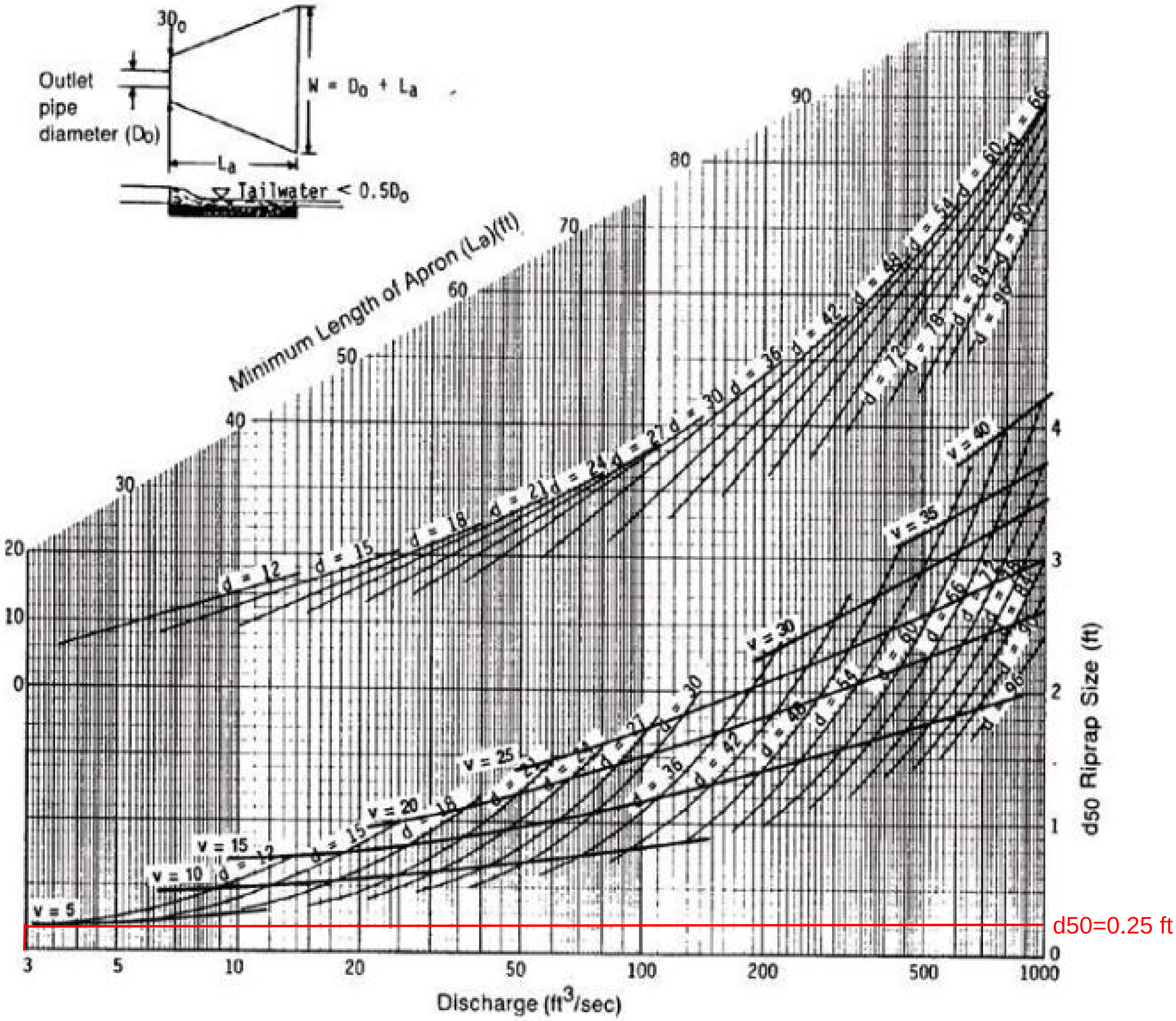


- **Tailwater Depth,** $T_w = Q/(3D_0)V$
  T_w = (0.1)/(3(0.5)(2.5)
  T_w = 0.03 ft
  (if $T_w < 0.5D_0$ then minimum tailwater conditions)
  (if $T_w > 0.5D_0$ then maximum tailwater conditions)

- **From Figures 1 or 2 (attached):** $\mathbf{L_A}$ = 6.0'
  $\mathbf{W = D_0 + L_A}$ = 6.5'

➢ **Use MADOT M2.023 stone for pipe ends (50-125 lbs)**

Figure 1: Design of Riprap Apron under Minimum Tailwater Conditions:



Stage-Storage Tables

Stage-Area-Storage for Pond PSIS-1: PSIS-1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
293.67	**3,427**	0
293.72	3,427	69
293.77	3,427	137
293.82	3,427	206
293.87	3,427	274
293.92	3,427	343
293.97	3,427	411
294.02	3,427	480
294.07	3,427	548
294.12	3,427	617
294.17	3,427	685
294.22	3,427	820
294.27	3,427	953
294.32	3,427	1,087
294.37	3,427	1,219
294.42	3,427	1,350
294.47	3,427	1,480
294.52	3,427	1,608
294.57	3,427	1,736
294.62	3,427	1,861
294.67	3,427	1,985
294.72	3,427	2,107
294.77	3,427	2,228
294.82	3,427	2,347
294.87	3,427	2,464
294.92	3,427	2,578
294.97	3,427	2,690
295.02	3,427	2,800
295.07	3,427	2,906
295.12	3,427	3,009
295.17	3,427	3,108
295.22	3,427	3,203
295.27	3,427	3,291
295.32	3,427	3,374
295.37	3,427	3,452
295.42	3,427	3,527
295.47	3,427	3,599
295.52	3,427	3,668
295.57	3,427	3,736
295.62	3,427	3,805
295.67	3,427	3,874
295.72	3,427	3,942
295.77	3,427	4,011
295.82	3,427	4,079
295.87	3,427	4,148
295.92	3,427	4,216
295.97	3,427	**4,285**
296.02	3,427	**4,330**
296.07	3,427	4,330
296.12	3,427	4,330
296.17	3,427	4,330
296.22	3,427	4,330
296.27	3,427	4,330
296.32	3,427	4,330
296.37	3,427	4,330
296.42	3,427	4,330
296.47	3,427	4,330
296.52	3,427	4,330
296.57	3,427	4,330
296.62	3,427	4,330
296.67	3,427	4,330
296.72	3,427	4,330
296.77	3,427	4,330
296.82	3,427	4,330
296.87	3,427	4,330
296.92	3,427	4,330
296.97	3,427	4,330
297.02	3,427	4,330
297.07	3,427	4,330
297.12	3,427	4,330
297.17	3,427	4,330
297.22	3,427	4,330
297.27	3,427	4,330
297.32	3,427	4,330
297.37	3,427	4,330
297.42	3,427	4,330
297.47	3,427	4,330
297.52	3,427	4,330
297.57	3,427	4,330
297.62	3,427	4,330
297.67	3,427	4,330
297.72	3,427	4,330
297.77	3,427	4,330
297.82	3,427	4,330
297.87	3,427	4,330
297.92	3,427	4,330
297.97	3,427	4,330
298.02	3,427	4,330
298.07	3,427	4,330
298.12	3,427	4,330
298.17	3,427	4,330

Stage-Area-Storage for Pond PSIS-2: PSIS-2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
305.50	**3,058**	0	308.05	3,058	3,827
305.55	3,058	61	308.10	3,058	3,827
305.60	3,058	122	308.15	3,058	3,827
305.65	3,058	183	308.20	3,058	3,827
305.70	3,058	245	308.25	3,058	3,827
305.75	3,058	306	308.30	3,058	3,827
305.80	3,058	367	308.35	3,058	3,827
305.85	3,058	428	308.40	3,058	3,827
305.90	3,058	489	308.45	3,058	3,827
305.95	3,058	550	308.50	3,058	3,827
306.00	3,058	612	308.55	3,058	3,827
306.05	3,058	729	308.60	3,058	3,827
306.10	3,058	847	308.65	3,058	3,827
306.15	3,058	963	308.70	3,058	3,827
306.20	3,058	1,079	308.75	3,058	3,827
306.25	3,058	1,194	308.80	3,058	3,827
306.30	3,058	1,308	308.85	3,058	3,827
306.35	3,058	1,421	308.90	3,058	3,827
306.40	3,058	1,532	308.95	3,058	3,827
306.45	3,058	1,642	309.00	3,058	3,827
306.50	3,058	1,751	309.05	3,058	3,827
306.55	3,058	1,859	309.10	3,058	3,827
306.60	3,058	1,965	309.15	3,058	3,827
306.65	3,058	2,069	309.20	3,058	3,827
306.70	3,058	2,172	309.25	3,058	3,827
306.75	3,058	2,272	309.30	3,058	3,827
306.80	3,058	2,371	309.35	3,058	3,827
306.85	3,058	2,467	309.40	3,058	3,827
306.90	3,058	2,561	309.45	3,058	3,827
306.95	3,058	2,652	309.50	3,058	3,827
307.00	3,058	2,739	309.55	3,058	3,827
307.05	3,058	2,822	309.60	3,058	3,827
307.10	3,058	2,901	309.65	3,058	3,827
307.15	3,058	2,974	309.70	3,058	3,827
307.20	3,058	3,043	309.75	3,058	3,827
307.25	3,058	3,110	309.80	3,058	3,827
307.30	3,058	3,174	309.85	3,058	3,827
307.35	3,058	3,236	309.90	3,058	3,827
307.40	3,058	3,297	309.95	3,058	3,827
307.45	3,058	3,358			
307.50	3,058	3,419			
307.55	3,058	3,481			
307.60	3,058	3,542			
307.65	3,058	3,603			
307.70	3,058	3,664			
307.75	3,058	3,725			
307.80	3,058	**3,786**			
307.85	3,058	**3,827**			
307.90	3,058	3,827			
307.95	3,058	3,827			
308.00	3,058	3,827			

Stage-Area-Storage for Pond PSIS-3: PSIS-3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
277.70	**6,068**	0
277.80	6,068	243
277.90	6,068	485
278.00	6,068	728
278.10	6,068	1,016
278.20	6,068	1,342
278.30	6,068	1,690
278.40	6,068	2,057
278.50	6,068	2,438
278.60	6,068	2,833
278.70	6,068	3,239
278.80	6,068	3,655
278.90	6,068	4,081
279.00	6,068	4,514
279.10	6,068	4,955
279.20	6,068	5,402
279.30	6,068	5,855
279.40	6,068	6,313
279.50	6,068	6,777
279.60	6,068	7,244
279.70	6,068	7,715
279.80	6,068	8,190
279.90	6,068	8,667
280.00	6,068	9,147
280.10	6,068	9,629
280.20	6,068	10,112
280.30	6,068	10,597
280.40	6,068	11,082
280.50	6,068	11,567
280.60	6,068	12,053
280.70	6,068	12,538
280.80	6,068	13,023
280.90	6,068	13,506
281.00	6,068	13,988
281.10	6,068	14,468
281.20	6,068	14,945
281.30	6,068	15,420
281.40	6,068	15,891
281.50	6,068	16,358
281.60	6,068	16,821
281.70	6,068	17,280
281.80	6,068	17,733
281.90	6,068	18,180
282.00	6,068	18,621
282.10	6,068	19,054
282.20	6,068	19,479
282.30	6,068	19,896
282.40	6,068	20,302
282.50	6,068	20,697
282.60	6,068	21,078
282.70	6,068	21,445
282.80	6,068	21,793
282.90	6,068	22,118
283.00	6,068	22,407
283.10	6,068	22,649
283.20	6,068	22,892
283.30	6,068	23,135
283.40	6,068	23,378
283.50	6,068	23,620
283.60	6,068	23,863
283.70	6,068	**24,106**
283.80	6,068	24,106
283.90	6,068	24,106
284.00	6,068	24,106
284.10	6,068	24,106
284.20	6,068	24,106

Stage-Area-Storage for Pond PSIS-4: PSIS-4

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
277.00	**4,560**	0
277.20	4,560	365
277.40	4,560	730
277.60	4,560	1,123
277.80	4,560	1,605
278.00	4,560	2,136
278.20	4,560	2,702
278.40	4,560	3,297
278.60	4,560	3,917
278.80	4,560	4,558
279.00	4,560	5,217
279.20	4,560	5,893
279.40	4,560	6,584
279.60	4,560	7,289
279.80	4,560	8,006
280.00	4,560	8,733
280.20	4,560	9,471
280.40	4,560	10,217
280.60	4,560	10,971
280.80	4,560	11,732
281.00	4,560	12,499
281.20	4,560	13,272
281.40	4,560	14,049
281.60	4,560	14,830
281.80	4,560	15,614
282.00	4,560	16,401
282.20	4,560	17,189
282.40	4,560	17,978
282.60	4,560	18,768
282.80	4,560	19,557
283.00	4,560	20,345
283.20	4,560	21,132
283.40	4,560	21,916
283.60	4,560	22,697
283.80	4,560	23,474
284.00	4,560	24,246
284.20	4,560	25,014
284.40	4,560	25,775
284.60	4,560	26,529
284.80	4,560	27,275
285.00	4,560	28,013
285.20	4,560	28,740
285.40	4,560	29,457
285.60	4,560	30,161
285.80	4,560	30,853
286.00	4,560	31,529
286.20	4,560	32,188
286.40	4,560	32,829
286.60	4,560	33,449
286.80	4,560	34,044
287.00	4,560	34,610
287.20	4,560	35,141
287.40	4,560	35,623
287.60	4,560	36,016
287.80	4,560	36,381
288.00	4,560	36,746
288.20	4,560	37,111
288.40	4,560	37,475
288.60	4,560	37,840
288.80	4,560	38,205
289.00	4,560	**38,570**

Stage-Area-Storage for Pond PSIS-5: PSIS-5

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
285.00	**2,982**	0	290.10	2,982	10,846
285.10	2,982	119	290.20	2,982	11,029
285.20	2,982	239	290.30	2,982	11,203
285.30	2,982	358	290.40	2,982	11,366
285.40	2,982	477	290.50	2,982	11,508
285.50	2,982	596	290.60	2,982	11,628
285.60	2,982	739	290.70	2,982	11,747
285.70	2,982	901	290.80	2,982	11,866
285.80	2,982	1,075	290.90	2,982	11,986
285.90	2,982	1,259	291.00	2,982	**12,105**
286.00	2,982	1,450	291.10	2,982	12,105
286.10	2,982	1,648	291.20	2,982	12,105
286.20	2,982	1,852	291.30	2,982	12,105
286.30	2,982	2,062	291.40	2,982	12,105
286.40	2,982	2,276	291.50	2,982	12,105
286.50	2,982	2,494			
286.60	2,982	2,716			
286.70	2,982	2,941			
286.80	2,982	3,169			
286.90	2,982	3,400			
287.00	2,982	3,634			
287.10	2,982	3,870			
287.20	2,982	4,108			
287.30	2,982	4,347			
287.40	2,982	4,588			
287.50	2,982	4,830			
287.60	2,982	5,073			
287.70	2,982	5,317			
287.80	2,982	5,562			
287.90	2,982	5,807			
288.00	2,982	6,052			
288.10	2,982	6,298			
288.20	2,982	6,543			
288.30	2,982	6,787			
288.40	2,982	7,031			
288.50	2,982	7,275			
288.60	2,982	7,517			
288.70	2,982	7,758			
288.80	2,982	7,997			
288.90	2,982	8,235			
289.00	2,982	8,471			
289.10	2,982	8,704			
289.20	2,982	8,936			
289.30	2,982	9,164			
289.40	2,982	9,389			
289.50	2,982	9,611			
289.60	2,982	9,829			
289.70	2,982	10,043			
289.80	2,982	10,252			
289.90	2,982	10,456			
290.00	2,982	10,654			

Stage-Area-Storage for Pond PSIS-6: PSIS-6

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
277.50	**2,911**	0
277.60	2,911	116
277.70	2,911	233
277.80	2,911	349
277.90	2,911	466
278.00	2,911	582
278.10	2,911	699
278.20	2,911	815
278.30	2,911	993
278.40	2,911	1,232
278.50	2,911	1,470
278.60	2,911	1,708
278.70	2,911	1,945
278.80	2,911	2,181
278.90	2,911	2,417
279.00	2,911	2,652
279.10	2,911	2,887
279.20	2,911	3,120
279.30	2,911	3,353
279.40	2,911	3,585
279.50	2,911	3,816
279.60	2,911	4,046
279.70	2,911	4,275
279.80	2,911	4,503
279.90	2,911	4,730
280.00	2,911	4,956
280.10	2,911	5,180
280.20	2,911	5,404
280.30	2,911	5,625
280.40	2,911	5,846
280.50	2,911	6,065
280.60	2,911	6,282
280.70	2,911	6,498
280.80	2,911	6,712
280.90	2,911	6,924
281.00	2,911	7,134
281.10	2,911	7,343
281.20	2,911	7,549
281.30	2,911	7,753
281.40	2,911	7,955
281.50	2,911	8,155
281.60	2,911	8,352
281.70	2,911	8,547
281.80	2,911	8,738
281.90	2,911	8,927
282.00	2,911	9,112
282.10	2,911	9,295
282.20	2,911	9,473
282.30	2,911	9,648
282.40	2,911	9,818
282.50	2,911	9,984
282.60	2,911	10,143
282.70	2,911	10,296
282.80	2,911	10,440
282.90	2,911	10,573
283.00	2,911	10,700
283.10	2,911	10,824
283.20	2,911	10,945
283.30	2,911	11,062
283.40	2,911	11,178
283.50	2,911	11,295
283.60	2,911	11,411
283.70	2,911	11,528
283.80	2,911	11,644
283.90	2,911	11,761
284.00	2,911	11,877
284.10	2,911	11,994
284.20	2,911	**12,110**
284.30	2,911	**12,168**
284.40	2,911	12,168
284.50	2,911	12,168
284.60	2,911	12,168
284.70	2,911	12,168
284.80	2,911	12,168
284.90	2,911	12,168
285.00	2,911	12,168

Stage-Area-Storage for Pond PSIS-7: PSIS-7

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
272.00	**1,108**	0	277.10	1,108	3,502
272.10	1,108	44	277.20	1,108	3,547
272.20	1,108	89	277.30	1,108	3,591
272.30	1,108	133	277.40	1,108	3,635
272.40	1,108	177	277.50	1,108	**3,680**
272.50	1,108	222			
272.60	1,108	266			
272.70	1,108	310			
272.80	1,108	378			
272.90	1,108	470			
273.00	1,108	561			
273.10	1,108	652			
273.20	1,108	743			
273.30	1,108	833			
273.40	1,108	922			
273.50	1,108	1,012			
273.60	1,108	1,101			
273.70	1,108	1,189			
273.80	1,108	1,277			
273.90	1,108	1,364			
274.00	1,108	1,451			
274.10	1,108	1,537			
274.20	1,108	1,623			
274.30	1,108	1,708			
274.40	1,108	1,792			
274.50	1,108	1,875			
274.60	1,108	1,958			
274.70	1,108	2,039			
274.80	1,108	2,120			
274.90	1,108	2,200			
275.00	1,108	2,279			
275.10	1,108	2,356			
275.20	1,108	2,432			
275.30	1,108	2,507			
275.40	1,108	2,581			
275.50	1,108	2,653			
275.60	1,108	2,724			
275.70	1,108	2,792			
275.80	1,108	2,859			
275.90	1,108	2,923			
276.00	1,108	2,984			
276.10	1,108	3,042			
276.20	1,108	3,094			
276.30	1,108	3,144			
276.40	1,108	3,191			
276.50	1,108	3,236			
276.60	1,108	3,281			
276.70	1,108	3,325			
276.80	1,108	3,369			
276.90	1,108	3,414			
277.00	1,108	3,458			

Stage-Area-Storage for Pond SWB-1: SWB-1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
287.50	2,613	0
287.55	2,657	132
287.60	2,701	266
287.65	2,745	402
287.70	2,790	540
287.75	2,835	681
287.80	2,880	824
287.85	2,926	969
287.90	2,973	1,116
287.95	3,019	1,266
288.00	3,066	1,418
288.05	3,091	1,572
288.10	3,116	1,727
288.15	3,141	1,884
288.20	3,167	2,041
288.25	3,192	2,200
288.30	3,218	2,361
288.35	3,243	2,522
288.40	3,269	2,685
288.45	3,295	2,849
288.50	3,321	3,015
288.55	3,347	3,181
288.60	3,373	3,349
288.65	3,399	3,518
288.70	3,425	3,689
288.75	3,452	3,861
288.80	3,478	4,034
288.85	3,505	4,209
288.90	3,532	4,385
288.95	3,559	4,562
289.00	3,586	4,741
289.05	3,613	4,921
289.10	3,640	5,102
289.15	3,667	5,285
289.20	3,694	5,469
289.25	3,722	5,654
289.30	3,749	5,841
289.35	3,777	6,029
289.40	3,805	6,219
289.45	3,833	6,410
289.50	3,861	6,602
289.55	3,889	6,796
289.60	3,917	6,991
289.65	3,945	7,187
289.70	3,974	7,385
289.75	4,002	7,585
289.80	4,031	7,785
289.85	4,059	7,988
289.90	4,088	8,191
289.95	4,117	8,397
290.00	**4,146**	**8,603**

APPENDIX C
Soil Evaluation by RJ O'Connell & Associates, Inc.

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.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Observed	Depth	Elevation	Notes
Excavator	Bill	Redox	28"	283.7	Weeping @ 38", Standing @ 59"
Logged by	Drew Gallant (SE# 14482)				
Reviewed by		Observed	Depth	Elevation	Notes
Surface Elevation	286				
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.	

		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	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

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.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A	273.1	Weeping @ 101", Standing @ 113"
Reviewed by		.			
Surface Elevation	281.5	Observed	Depth	Elevation	Notes
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.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Observed	Depth	Elevation	Notes
Excavator	Bill	Redox	95"	273.1	
Logged by	Drew Gallant (SE# 14482)				
Reviewed by		Observed	Depth	Elevation	Notes
Surface Elevation	281				
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.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	40"	275.5	Weeping @ 44", Standing @ 52"
Reviewed by					
Surface Elevation	278.8	Observed	Depth	Elevation	Notes
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.	

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.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
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.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
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.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
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.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.	Observed	Depth	Elevation	Notes
Excavator	Bill	Redox	33"	29.5	Weeping @ 46", Standing @ 71"
Logged by	Drew Gallant (SE# 14482)				
Reviewed by		Observed	Depth	Elevation	Notes
Surface Elevation	296.2				
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.	Observed	Depth	Elevation	Notes
Excavator	Bill	Redox	N/A		
Logged by	Drew Gallant (SE# 14482)				
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.				
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.	Groundwater Observations			
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.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
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.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
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

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	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.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
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.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
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.	

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	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.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A	291.6	Weeping @ 64", Standing @ 67"
Reviewed by					
Surface Elevation	296.9	Observed	Depth	Elevation	Notes
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.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
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

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.	

Contractor	Canesi Brothers Construction, Inc.	Groundwater Observations			
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.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	N/A	267.2	Weeping @ 74", Standing @ 76"
Reviewed by					
Surface Elevation	273.4	Observed	Depth	Elevation	Notes
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.	

		Groundwater Observations			
Contractor	Canesi Brothers Construction, Inc.				
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.	Groundwater Observations			
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.	

		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	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.				
Excavator	Bill	Observed	Depth	Elevation	Notes
Logged by	Drew Gallant (SE# 14482)	Redox	38"	274	Weeping @ 60", Standing @ 73"
Reviewed by					
Surface Elevation	277.2	Observed	Depth	Elevation	Notes
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									

Soil Evaluation by Northeast Geotechnical, Inc.

NORTHEAST GEOTECHNICAL, INC.
Delivering Practical Engineering Solutions

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

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

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1 Subsurface Exploration Location Plan
2 Subsurface Exploration Location Plan

APPENDICES

A Limitations and Service Constraints
B Test Pit Logs
C Test Pit Photos
D Soils Laboratory Testing Results

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.

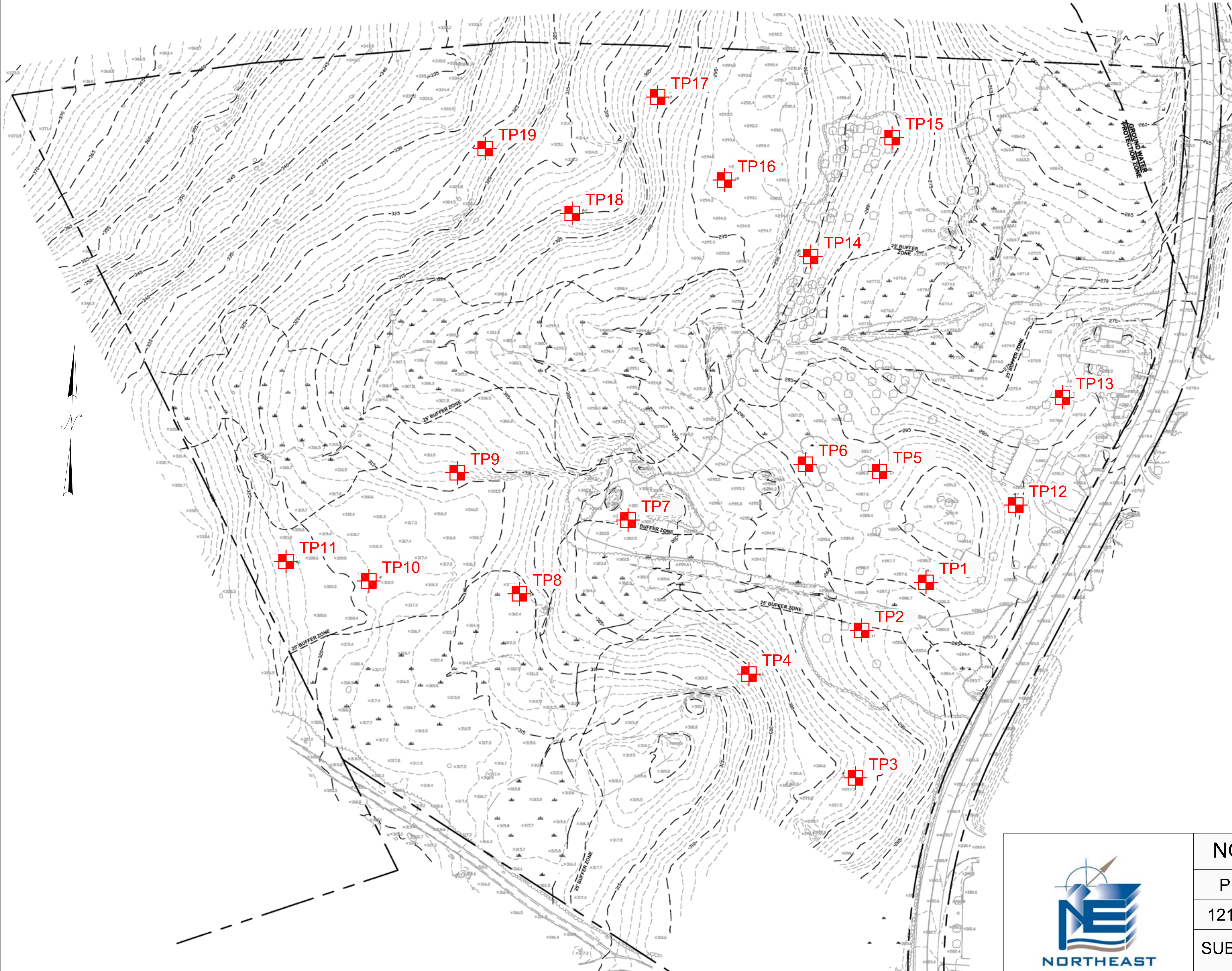
6.0 ADDITIONAL STUDIES AND SERVICES

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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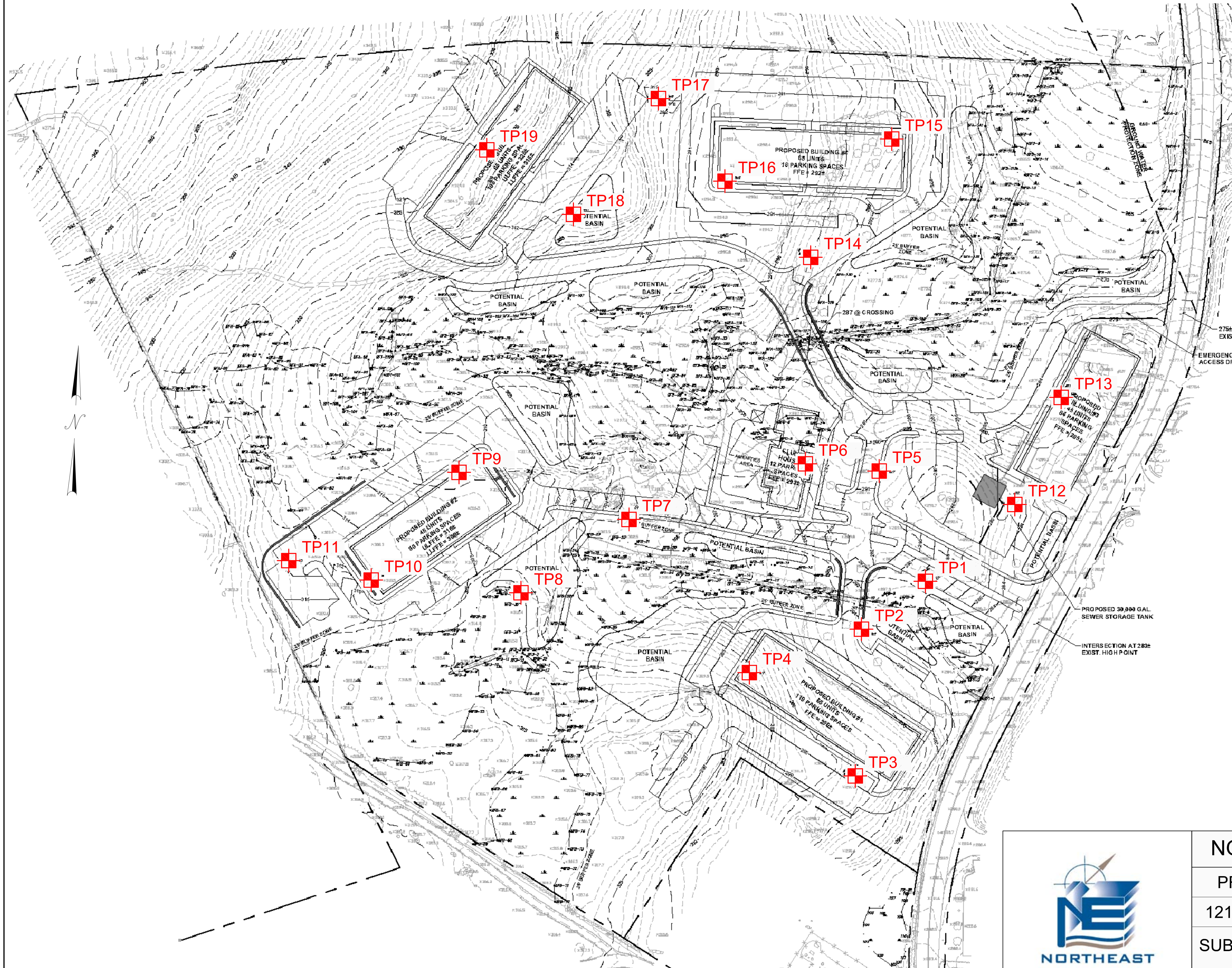

NOTES:

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.
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:	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	
2'–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' – 4'	Natural Gravelly Sand	Brown, F/C SAND, some F/C Gravel, trace Silt, moist	M	0	1 (at 4')
	4.6'±				2
5' – 8'	Natural Fine Sand and Silt	Tan-gray, F. SAND and SILT, trace (-) F/C Gravel wet	M	0	3 (at 6')
	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' 3' 4' 5' 6' 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' 9' 10' 11' 12' 13' 14' 15'	Apparent Bedrock	Bottom of test pit at 7.5± feet			

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
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-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'	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'					1
6'	Natural Glacial Till 6'±	Gray, SILT and F/M SAND, some F/C Gravel, occasional Cobbles, moist	D	2± to 3± (A)	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
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 = 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
	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 = 3.5± 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
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-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' 2' 3'	Subsoil 3'±	Light brown, SILT and F/M SAND, little Roots, trace F/C Gravel, occasional Cobbles, moist	M	1 (B)	
4' 5' 6' 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' 9' 10' 11' 12' 13' 14' 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
		Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
N/S =	12± 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-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
	18" - 36"	B	Some (So): 20-35%	C = Coarse	D = Difficult
E/W = 14± feet	>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.
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:	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'	Subsoil	Gray-brown, F/M SAND and SILT, little F/C Gravel, little Roots, occasional Cobbles, moist to wet	M	3± (A)	
3'	3'±				1 2
4'					
5'					
6'	Natural Glacial Till	Gray-brown, F/C SAND, some F/C Gravel, some Silt, frequent Cobbles, moist to wet	D	10± (A) 5± (B)	
7'					3
8'					
9'	9'±				4
10'		Bottom of test pit at 9± feet			
11'					
12'					
13'					
14'					
15'					

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.
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:	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.
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:	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' 3'	Existing Fill 2.5'±	Tan, F/C SAND, some F/C Gravel, trace Silt, trace Brick, occasional Cobbles, isolated pockets of buried Topsoil/Roots, moist	E	2± to 3± (A) 3± to 5± (B)	
4' 5' 6' 7' 8'	Natural Gravelly Sand 8'±	Tan, F/C SAND, some F/C Gravel, trace Silt, frequent Cobbles, moist to wet	M	5± to 10± (A)	1 2
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' 11' 12' 13' 14' 15'		Bottom of test pit at 9± feet			

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
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-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'–8'	Natural Glacial Till 8'±	Gray, F/C SAND, some (+) Silt, some F/C Gravel, frequent Cobbles, moist	M	5± to 10± (A)	1 (6'), 2 (8')
9'–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
	Diameter	Class	Trace (T): 0-10%	F = Fine	E = Easy
N/S = 13± 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-15
		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:	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	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 = 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-16
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:	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'	7.5'±				
8'	Possible Bedrock	Bottom of test pit at 7.5± feet			4
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'	Subsoil	Light brown, SILT, some F/M Sand, little Roots, trace F. Gravel, moist	E	0	
3'	3'±				
4'					1
5'					
6'	Natural Glacial Till	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)	
7'					
8'					
9'	8.5'±	Bottom of test pit at 8.5± feet (refusal on apparent boulders)			2,3
10'					
11'					
12'					
13'					
14'					
15'					

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.	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:	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'					
4'					
5'					
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
	Apparent Bedrock	Bottom of test pit at 6± feet			
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 6± feet below ground surface.

Test Pit Dimensions		Boulder Classification		Proportions Used	Abbreviations	Excavation Effort
		Diameter	Class			
N/S =	3.5± 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 =	12± feet	>36"	C	Some (So): 20-35%	C = Coarse	D = Difficult
				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

NORTHEAST GEOTECHNICAL, INC.

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

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

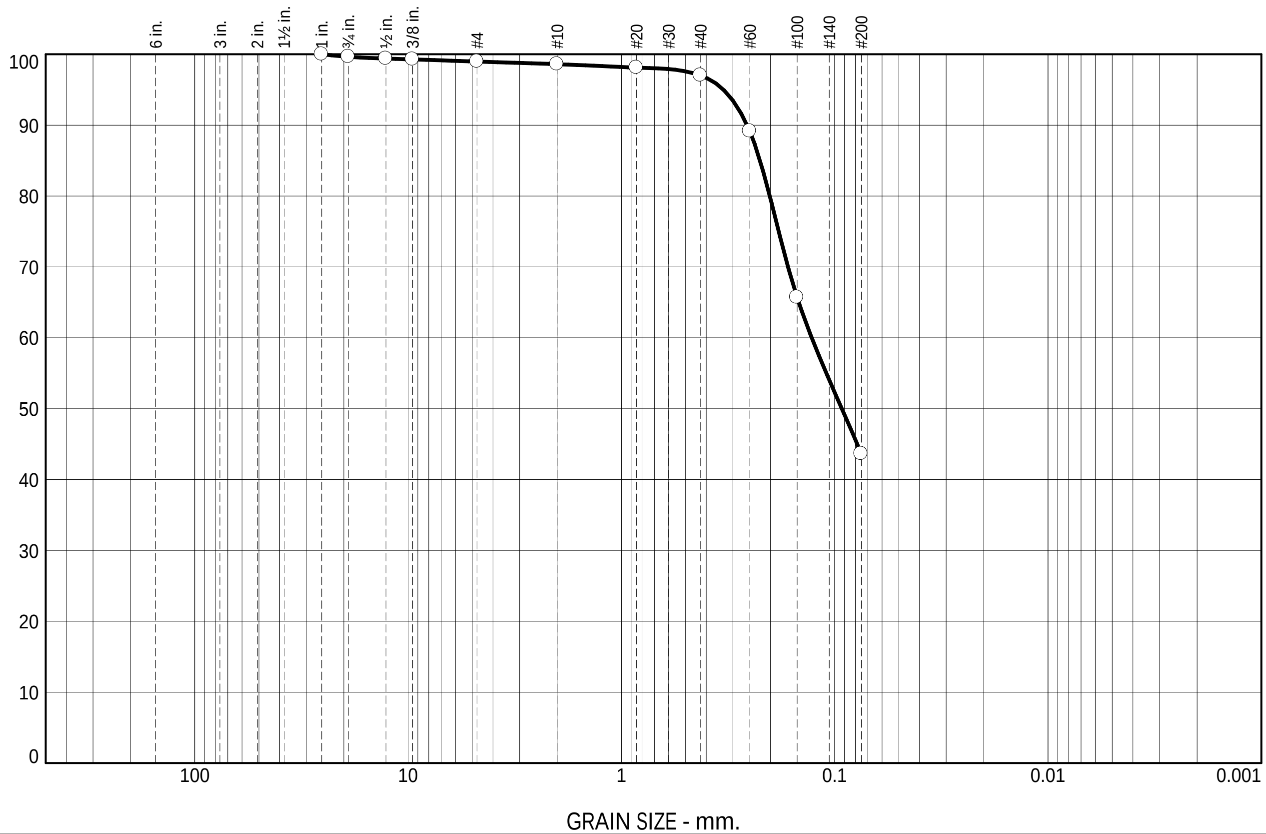
THIELSCH ENGINEERING	195 Frances Avenue Cranston RI, 02910 Phone: (401)-467-6454 Fax: (401)-467-2398 thielsch.com *Let's Build a Solid Foundation*	Client Information: Northeast Geotechnical, Inc. North Attleboro, MA PM: Glenn A. Olson, P. E. Assigned By: Glenn A. Olson, P. E. Collected By: Christian 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*

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

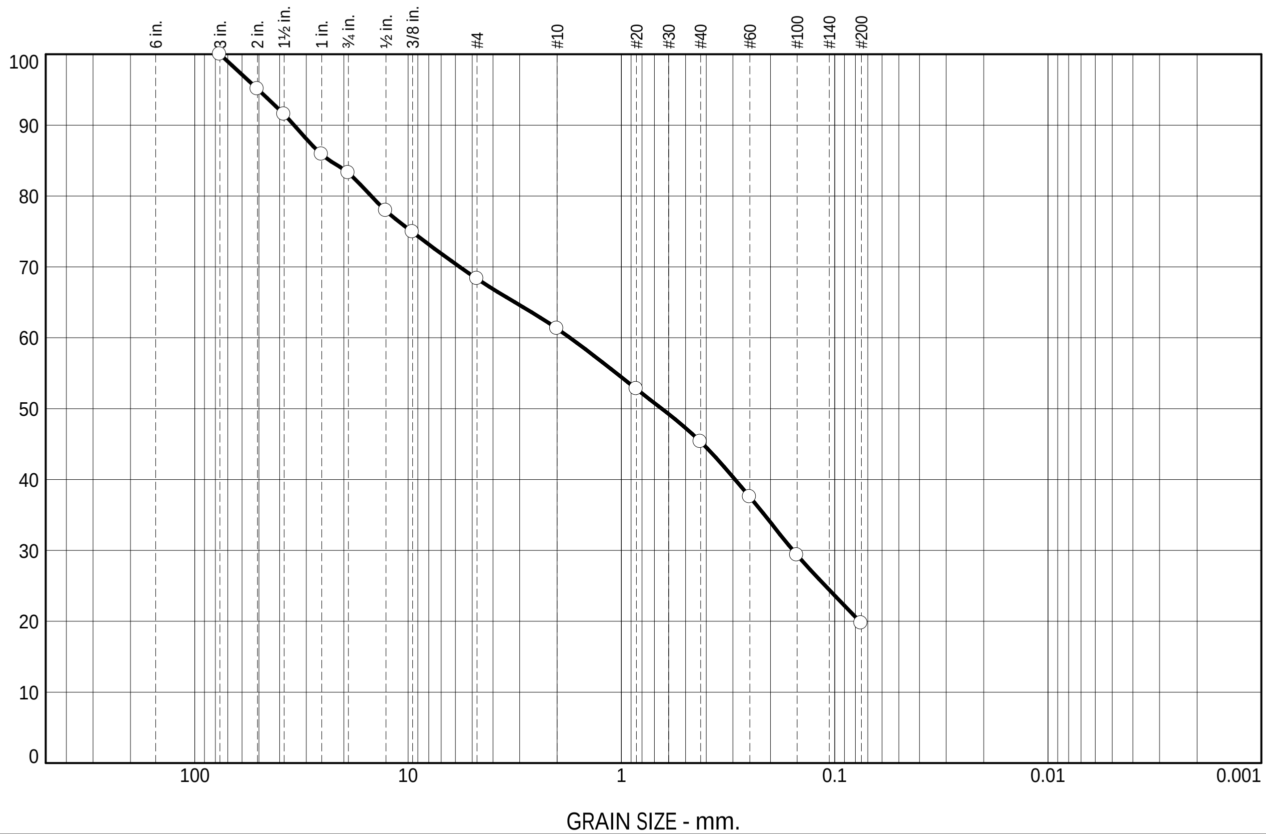
Thielsch Engineering Inc.

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

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.

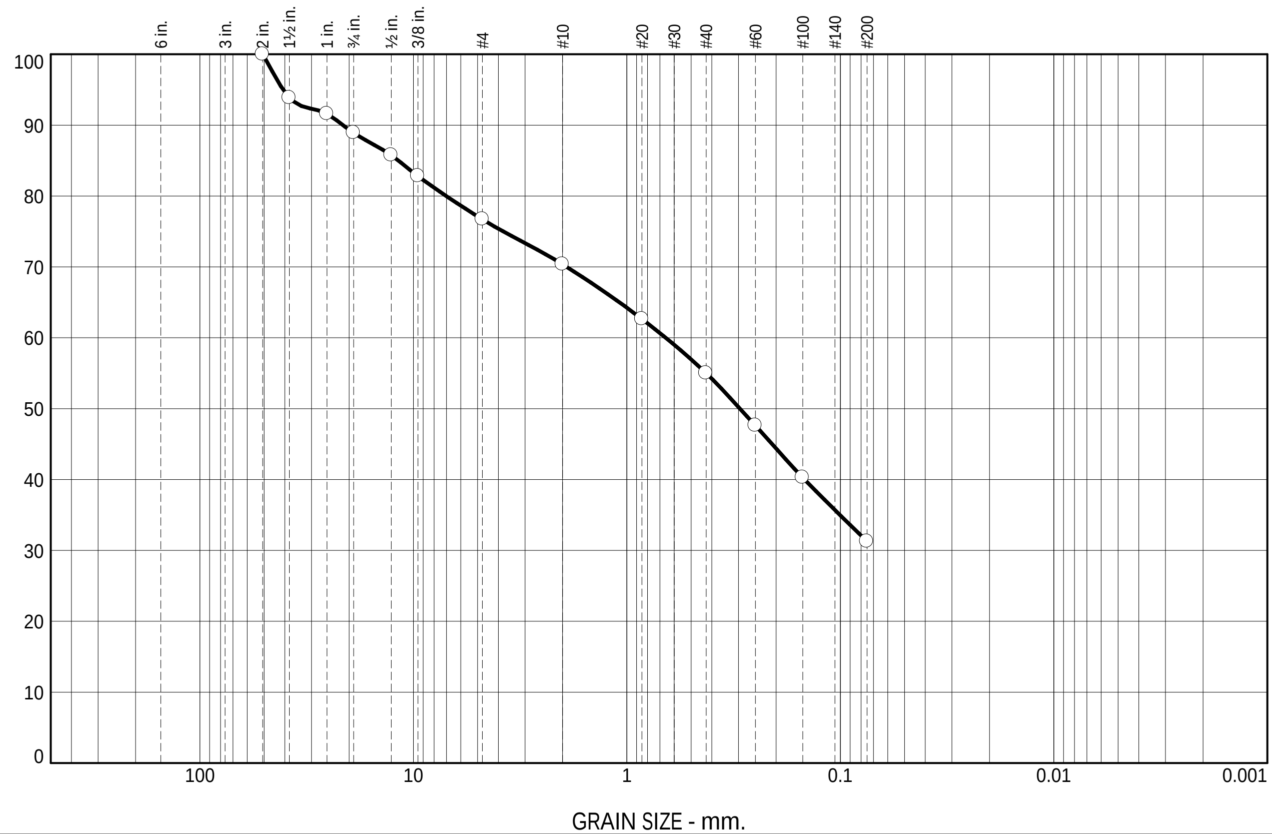
Cranston, RI

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

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	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.

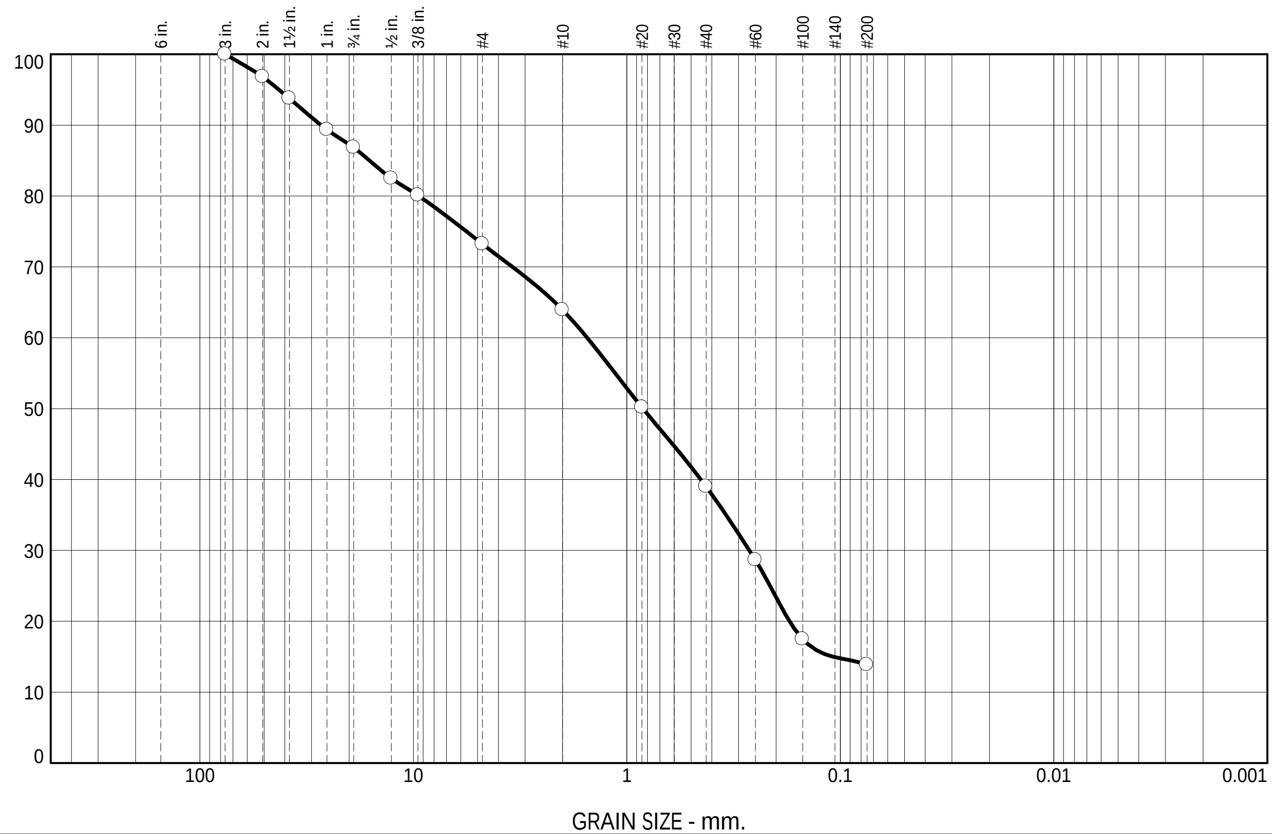
Cranston, RI

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

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	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

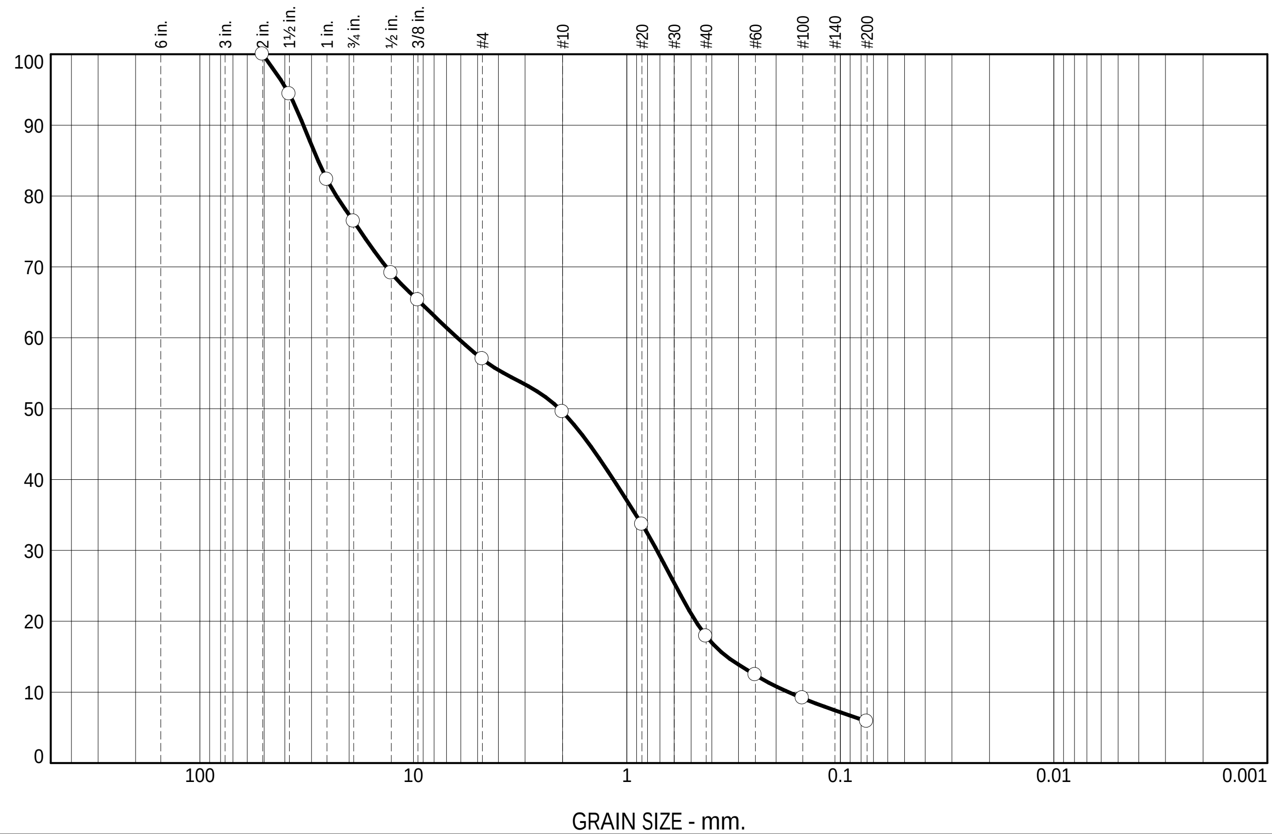
Thielsch Engineering Inc.

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

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

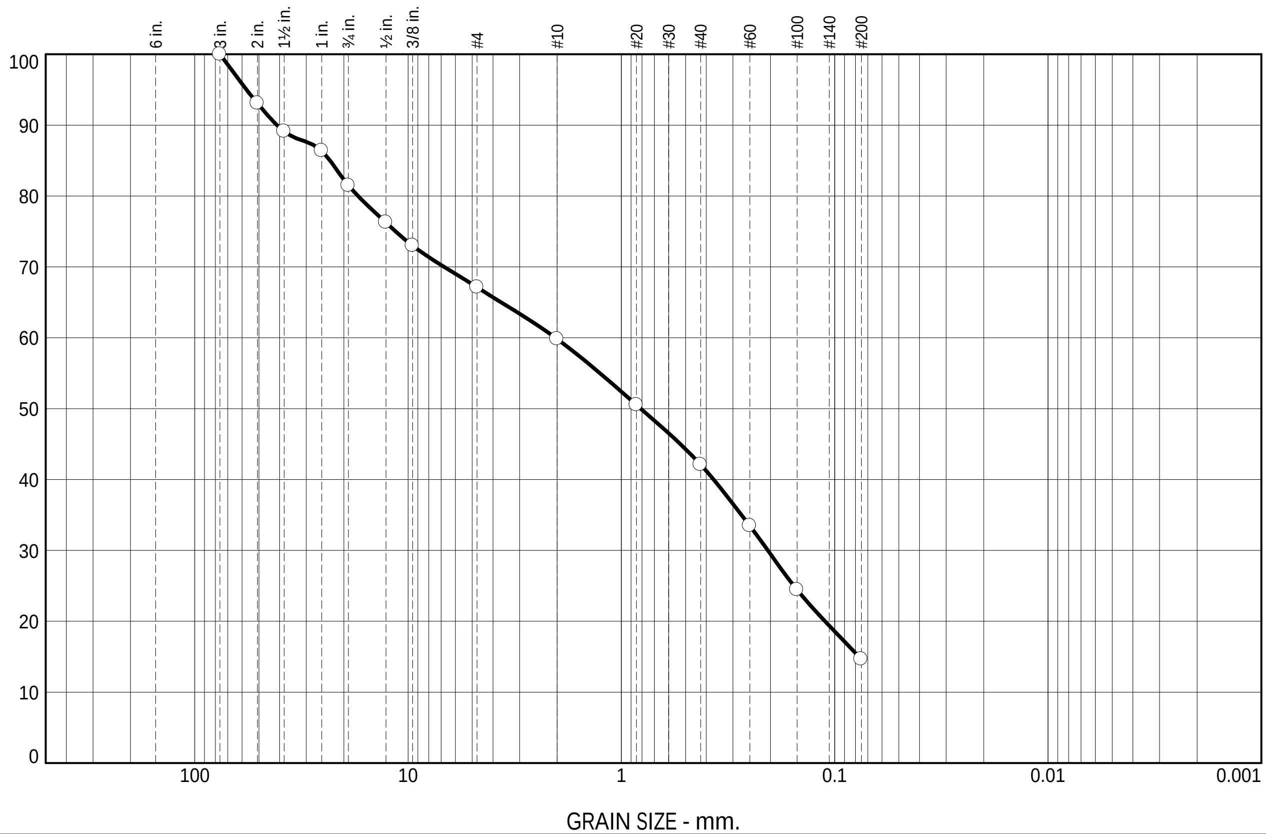
Client: Northeast Geotechnical, Inc.
Project: Proposed Residential Development
Franklin, MA
Project No: O473.00 Figure 22-S-1496

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.

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	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

APPENDIX D
Stormwater Pollution Prevention Plan (SWPPP)
(To be submitted prior to construction)

Stormwater Pollution Prevention Plan (SWPPP)

For Construction Activities At:

Grove Street Residences
121 Grove Street
Franklin MA 02038

SWPPP Prepared For:

Fairfield Grove Street, LLC
30 Braintree Hill Office Park, Suite 105
Braintree MA 02184

SWPPP Prepared By:

RJ O'Connell & Associates, Inc.
80 Montvale Avenue, Suite 201
Stoneham, MA 02180
Phone: (781) 279-0180
Fax: (781) 279-0173

SWPPP Preparation Date:

05/10/2024

Estimated Project Dates:
TBD

Project Start Date: TBD

Project Completion Date: TBD

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SWPPP Appendices

Appendix A Site Maps

FIG-1 USGS Site Locus Map
FIG-2 FEMA Flood Insurance Rate Map
FIG-3 NRCS Web Soil Survey Map
FIG-6 Resource Area Map

(The following plans are <u>not to scale</u> and are for informational purposes only, see Plan Set for detail)

EX-1 Existing Conditions Site Plan
C-1A Demolition and Erosion Control Phase I Plan
C-1B Demolition and Erosion Control Phase I Plan
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C-2A Grading and Drainage Plan
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Appendix B 2022 NPDES General Permit for Discharges from Construction Activities

Appendix C NOI and EPA Authorization Email
(To be filed prior to construction)

Appendix D SWPPP Inspection Form

Appendix E Corrective Action Log

Appendix F SWPPP Amendment Log

Appendix G Subcontractor Certifications / Agreements Form

Appendix H Grading and Stabilization Activities Log

Appendix I SWPPP Training Log

Appendix J Delegation of Authority Form

Appendix k Endangered Species Documentation

Appendix L Historic Preservation Documentation

Appendix M Rainfall Guage Reading

Appendix N Turbidity Monitoring Sampling Documentation

SECTION 1: CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 Operator(s) / Subcontractor(s)

Operator(s):

Fairfield Grove Street, LLC
Robb Hewitt
30 Braintree Hill Park, Suite 105
Braintree, MA 02184
781-881-2300
rhewitt@ffres.com

Subcontractor(s):

Insert Company or Organization Name
Insert Name
Insert Address
Insert City, State, Zip Code
Insert Telephone Number
Insert Fax/Email
Insert area of control (if more than one operator at site)

[Repeat as necessary.]

Emergency 24-Hour Contact:

Fairfield Grove Street, LLC – Robb Hewitt – 781-881-2300

1.2 Stormwater Team

Stormwater Team

Name and/or Position, and Contact	Responsibilities	I Have Completed Training Required by CGP Part 6.2	I Have Read the CGP and Understand the Applicable Requirements
TBD	Install, maintain and/or repair erosion and sediment controls	☐ Yes ☐ No	☐ Yes Date: Click here to enter a date.
Chris McDonnell Staff Designer 781-279-0180 ext.124 chris.mcdonnell@ rjoconnell.com	Conduct site erosion and sediment controls and dewatering inspections and monitoring. *	☐ Yes ☐ No	☐ Yes Date: Click here to enter a date.
TBD	Perform and Record corrective actions	☐ Yes ☐ No	☐ Yes Date: Click here to enter a date.

* ***If Dewatering Discharges occurs on site, Turbidity Monitoring of discharges shall be conducted (See Section 7.0 of the 2022 CGP).***

- *"Dewatering" discharges include any discharge of "accumulated stormwater and/or ground water from building foundations, vaults, and trenches, or similar points of accumulation. Examples can include, but are not limited to:*
  - *Surface area dewatering – water pumped from disturbed surface areas or from sediment basins or similar impoundments for maintenance or decommissioning purposes.*
  - *Ground water dewatering – water discharged from well development, well pump tests, or pumping of ground water from a construction area.*

Stormwater Team Members Who Conduct Inspections Pursuant to CGP Part 4

Name and/or Position and Contact	Training(s) Received	Date Training(s) Completed	If Training is a Non-EPA Training, Confirm that it Satisfies the Minimum Elements of CGP Part 6.3.b
Chris McDonnell Staff Designer 781-279-0180 ext.124 chris.mcdonnell@ rjoconnell.com		Date:	☒ Principles and practices of erosion and sediment control and pollution prevention practices at construction sites ☒ Proper installation and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites ☒ Performance of inspections, including the proper completion of required reports and documentation, consistent with the requirements of Part 4
		Date	☐ Principles and practices of erosion and sediment control and pollution prevention practices at construction sites ☐ Proper installation and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites ☐ Performance of inspections, including the proper completion of required reports and documentation, consistent with the requirements of Part 4

SECTION 2: SITE EVALUATION, ASSESSMENT, AND PLANNING

2.1 Project/Site Information

Project Name and Address

Project/Site Name: Grove Street Residences
Street/Location: 121 Grove Street
City: Franklin
State: MA
ZIP Code: 02038
County or Similar Government Division: Norfolk County

Project Latitude/Longitude

Latitude: 42 º 04' 36" N
(decimal degrees)

Longitude: - 71 º 25' 21" W
(decimal degrees)

Latitude/longitude data source: ☐ Map ☐ GPS ☒ Other : Google Earth

Horizontal Reference Datum: ☐ NAD 27 ☒ NAD 83 ☐ WGS 84

Additional Site Information

Is your site located on Indian country lands, or on a property of religious or cultural significance to an Indian Tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian Tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian Tribe associated with the property:

2.2 Discharge Information

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☒ Yes ☐ No

Are there any waters of the U.S. within 50 feet of your project's earth disturbances? ☐ Yes ☒ No

For each point of discharge, provide a point of discharge ID (a unique 3-digit ID, e.g., 001, 002), the name of the first receiving water that receives stormwater directly from the point of discharge and/or from the MS4 that the point of discharge discharges to, and the following receiving water information, if applicable:

Point of Discharge ID	Name of receiving water that receives stormwater discharge:	Is the receiving water impaired (on the CWA 303(d) list)?	If yes, list the pollutants that are causing the impairment:	Has a TMDL been completed for this receiving waterbody?	If yes, list TMDL Name and ID:	Pollutant(s) for which there is a TMDL:	Is this receiving water designated as a Tier 2, Tier 2.5, or Tier 3 water?	If yes, specify which Tier (2, 2.5, or 3)?
(001) MA72006	Beaver Pond	☐ Yes ☒ No	N/A	☐ Yes ☒ No			☐ Yes ☒ No	
(002) MA72-14	Mine Brook	☒ Yes ☐ No	Escherichia Coli	☐ Yes ☒ No			☒ Yes ☐ No	Tier 2.5
(003) MA72-04	Charles River	☒ Yes ☐ No	Escherichia Coli, Total Phosphorus, Nutrient/eutrophication Biological Indicators	☒ Yes ☒ No	Charles River Watershed Pathogen	Escherichia Coli	☒ Yes ☐ No	Tier 3

2.3 Nature of the Construction Activities

General Site Description & Proposed Project

Provide a general description of the nature of your construction activities, including the age or dates of past renovations for structures that are undergoing demolition:

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. A 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.

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.

General Site Description & Proposed Project

Provide a general description of the nature of your construction activities, including the age or dates of past renovations for structures that are undergoing demolition:

Size of Construction Site

Size of Property	31.44 +/- Acres
Total Area Expected to be Disturbed by Construction Activities	16.5 +/- Acres
Maximum Area Expected to be Disturbed at Any One Time, Including On-site and Off-site Construction Support Areas	16.5 +/- Acres

Type of Construction Site *(check all that apply):*

☐ Single-Family Residential ☒ Multi-Family Residential ☐ Commercial ☐ Industrial

☐ Institutional ☐ Highway or Road ☐ Utility ☐ Other ____________________

Will you be discharging dewatering water from your site? ☐ Yes ☒ No

If yes, will you be discharging dewatering water from a current or former Federal or State remediation site? ☐ Yes ☐ No

Pollutant-Generating Activities

List and describe all pollutant-generating activities and indicate for each activity the associated pollutants or pollutant constituents that could be discharged in stormwater from your construction site. Take into account where potential spills and leaks could occur that contribute pollutants to stormwater discharges, and any known hazardous or toxic substances, such as PCBs and asbestos, that will be disturbed during construction.

Pollutant-Generating Activity (e.g., paving operations; concrete, paint, and stucco washout and waste disposal; solid waste storage and disposal; and dewatering operations)	**Pollutants or Pollutant Constituents** (e.g., sediment, fertilizers, pesticides, paints, caulks, sealants, fluorescent light ballasts, contaminated substrates, solvents, fuels)
Fueling and Maintenance of Equipment or Vehicles	Gasoline, etc.
Washing of Equipment and Vehicles	Wheel wash water, etc.
Storage Handling, and Disposal of Building Products, Materials, and Wastes	Asphalt Sealants, Copper Flashing, Roofing Materials, Adhesives, etc.
Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals	Diesel Fuel, Oil, Hydraulic Fluids, Kerosene, etc.
Hazardous or Toxic Waste	Paints, Caulks, Sealants, etc.

Pollutant-Generating Activity (e.g., paving operations; concrete, paint, and stucco washout and waste disposal; solid waste storage and disposal; and dewatering operations)	**Pollutants or Pollutant Constituents** (e.g., sediment, fertilizers, pesticides, paints, caulks, sealants, fluorescent light ballasts, contaminated substrates, solvents, fuels)
Construction and Domestic Waste	Packaging Materials, Scrap Construction Materials, Masonry Products, etc.
Sanitary Waste	Portable Toilet Waste
Washing of Applicators and Containers used for Stucco, Paint, Concrete, Form Release Oils, Cutting Compounds, or Other Materials	Materials Directed into Leak-Proof Containers or Pits
Erosion	Soil, Sediment

Construction Support Activities *(only provide if applicable)*

Describe any construction support activities for the project (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas):

Designated construction support activities are depicted on Site Plans entitled “Demolition and Erosion Control Plan” and “Erosion and Control Plan”, prepared by R.J. O’Connell & Associates, dated 10/30/2023, last revised 12/8/2023.

2.4 Sequence and Estimated Dates of Construction Activities

The project is intended to be constructed in a single phase with an anticipated construction start date of May 1st. Upon occupying the site, the construction mobilization activities are to be performed with associated duration dates to complete the work as shown on the approved site plans is as outlined below:

Site Work Activity	Duration Dates
Site Mobilization	TBD
Install Erosion Control Measures	TBD
Install Temporary Construction Fencing	TBD
Site Demolition	TBD
Reclaim Parking Lot Areas	TBD
Install Stormwater BMPs	TBD
Install Site Sidewalks	TBD
Fine Grade and Compact Parking Lot Areas	TBD
Install Base Course Pavement	TBD
Install Curbing	TBD
Install Site Landscaping and stabilize grass channel to convert Sediment Basin to Wet Basin	TBD
Install Top Course Pavement	TBD
Traffic control Signage and Striping Installation	TBD
Site Clean-up and removal of erosion control Measures	TBD

Estimated Start Date of Construction Activities for this Phase	TBD
Estimated End Date of Construction Activities for this Phase	TBD
Estimated Date(s) of Application of Stabilization Measures for Areas of the Site Required to be Stabilized	TBD
Estimated Date(s) when Stormwater Controls will be Removed	TBD

2.5 Authorized Non-Stormwater Discharges

List of Authorized Non-Stormwater Discharges Present at the Site

Authorized Non-Stormwater Discharge	**Will or May Occur at Your Site?**
Discharges from emergency fire-fighting activities	☐ Yes ☒ No
Fire hydrant flushings	☒ Yes ☐ No
Landscape irrigation	☒ Yes ☐ No
Water used to wash vehicles and equipment	☐ Yes ☒ No
Water used to control dust	☒ Yes ☐ No
Potable water including uncontaminated water line flushings	☒ Yes ☐ No
External building washdown (soaps/solvents are not used and external surfaces do not contain hazardous substances)	☐ Yes ☒ No
Pavement wash waters	☒ Yes ☐ No
Uncontaminated air conditioning or compressor condensate	☒ Yes ☐ No
Uncontaminated, non-turbid discharges of ground water or spring water	☐ Yes ☒ No
Foundation or footing drains	☐ Yes ☒ No
Uncontaminated construction dewatering water	☐ Yes ☒ No

(Note: You are required to identify the likely locations of these authorized non-stormwater discharges on your site map. See Section 2.6, below, of this SWPPP Template.)

2.6 Site Maps

The following site maps are provided in Appendix A:

DRAWING DATE	LAST REVISION / ISSUE DATE	DRAWING NUMBER	DRAWING DESCRIPTION
12/08/2023		Figure 1	USGS Map
12/08/2023		Figure 2	FEMA Flood Map
12/08/2023		Figure 3	NRCS Soil Map
12/08/2023		Figure 6	Resource Area Map
05/25/2022	11/09/2023	1 OF 1	Existing Conditions Plans
10/30/2023	12/08/2023	C-1A	Demolition and Erosion Control Phase I Plan
10/30/2023	12/08/2023	C-1B	Demolition and Erosion Control Phase I Plan
10/30/2023	12/08/2023	C-1C	Erosion and Sediment Control Phase II Plan
10/30/2023	12/08/2023	C-1D	Erosion and Sediment Control Phase II Plan
10/30/2023	12/08/2023	C-2A	Grading and Drainage Plan
10/30/2023	12/08/2023	C-2B	Grading and Drainage Plan
10/30/2023	12/08/2023	C-2A	Parking and Traffic Control Plan
10/30/2023	12/08/2023	C-2B	Parking and Traffic Control Plan
10/30/2023	10/30/2023	C-5	Site Details I
10/30/2023	12/08/2023	C-6	Site Details II
10/30/2023	12/08/2023	C-7	Site Details III
10/30/2023	12/08/2023	C-8	Site Details IV
10/30/2023	12/08/2023	C-9	Site Details V
10/30/2023	12/08/2023	C-10	Site Details VI
10/30/2023	12/08/2023	C-11	Site Details VII
10/30/2023	12/08/2023	C-12	Site Details VIII
10/30/2023	12/08/2023	C-13	Site Details IX

SECTION 3: DOCUMENTATION OF COMPLIANCE WITH OTHER FEDERAL REQUIREMENTS

3.1 Endangered Species Protection

Eligibility Criterion

Following the process outlined in Appendix D, under which criterion are you eligible for coverage under this permit?

☒ **Criterion A**: No ESA-listed species and/or designated critical habitat present in action area. Using the process outlined in Appendix D of the CGP, you certify that ESA-listed species and designated critical habitat(s) under the jurisdiction of the USFWS or NMFS are not likely to occur in your site's "action area" as defined in Appendix A of the CGP. *Please Note: NMFS' jurisdiction includes ESA-listed marine and estuarine species that spawn in inland rivers.*

☒ Check to confirm you have provided documentation in your SWPPP as required by CGP Appendix D (Note: reliance on State resources is not acceptable; see CGP Appendix D).

Documentation: Publicly available species map. See Appendix K

☐ **Criterion B:** Eligibility requirements met by another operator under the 2022 CGP. The construction site's discharges and discharge-related activities were already addressed in another operator's valid certification of eligibility for your "action area" under eligibility Criterion A, C, D, E, or F of the 2022 CGP and you have confirmed that no additional ESA-listed species and/or designated critical habitat under the jurisdiction of USFWS and/or NMFS not considered in the that certification may be present or located in the "action area." To certify your eligibility under this criterion, there must be no lapse of NPDES permit coverage in the other CGP operator's certification. By certifying eligibility under this criterion, you agree to comply with any conditions upon which the other CGP operator's certification was based. You must include in your NOI the NPDES ID from the other 2022 CGP operator's notification of authorization under this permit and list any measures that you must comply with. If your certification is based on another 2022 CGP operator's certification under criterion C, you must provide EPA with the relevant supporting information required of existing dischargers in Criterion C.

☐ Check to confirm you have provided documentation in your SWPPP as required by CGP Appendix D.

Documentation:

Eligibility Criterion

Following the process outlined in Appendix D, under which criterion are you eligible for coverage under this permit?

☐ **Criterion C:** Discharges not likely to result in any short- or long-term adverse effects to ESA-listed species and/or designated critical habitat. ESA-listed species and/or designated critical habitat(s) under the jurisdiction of the USFWS and/or NMFS are likely to occur in or near your site's "action area," and you certify to EPA that your site's discharges and discharge-related activities are not likely to result in any short- or long-term adverse effects to ESA-listed threatened or endangered species and/or designated critical habitat. This certification may include consideration of any stormwater controls and/or management practices you will adopt to ensure that your discharges and discharge-related activities are not likely to result in any short- or long-term adverse effects to ESA-listed species and/or designated critical habitat. To certify your eligibility under this criterion, indicate 1) the ESA-listed species and/or designated habitat located in your "action area" using the process outlined in Appendix D of this permit; 2) the distance between the site and the listed species and/or designated critical habitat in the action area (in miles); and 3) a rationale describing specifically how short- or long-term adverse effects to ESA-listed species will be avoided from the discharges and discharge-related activities. (Note: You must include a copy of your site map from your SWPPP showing the upland and in-water extent of your "action area" with your NOI.)

☐ Check to confirm you have provided documentation in your SWPPP as required by CGP Appendix D.

Documentation:

☐ **Criterion D**: Coordination with USFWS and/or NMFS has successfully concluded. Coordination between you and the USFWS and/or NMFS has concluded. The coordination must have addressed the effects of your site's discharges and discharge-related activities on ESA-listed species and/or designated critical habitat under the jurisdiction of USFWS and/or NMFS, and resulted in a written confirmation from USFWS and/or NMFS that the effects of your site's discharges and discharge-related activities are not likely to result in any short- or long-term adverse effects. By certifying eligibility under this criterion, you agree to comply with any conditions you must meet for your site's discharges and discharge-related activities to not likely result in any short- or long-term adverse effects. You must include copies of the correspondence with the participating agencies in your SWPPP and this NOI.

☐ Check to confirm you have provided documentation in your SWPPP as required by CGP Appendix D.

Documentation:

Eligibility Criterion

Following the process outlined in Appendix D, under which criterion are you eligible for coverage under this permit?

☐ **Criterion E:** ESA Section 7 consultation has successfully concluded. Consultation between a Federal agency and the USFWS and/or NMFS under section 7 of the ESA has concluded. Consultations can be either formal or informal, and would have occurred only as a result of a separate Federal action (e.g., during application for an individual wastewater discharge permit or the issuance of a wetlands dredge and fill permit), and the consultation must have addressed the effects of your construction activity's discharges and discharge-related activities on all ESA-listed threatened or endangered species and all designated critical habitat under the jurisdiction of each Service, as appropriate, in your action area. The result of this consultation must be either:

i. A biological opinion currently in effect that determined that the action in question (taking into account the effects of your facility's discharges and discharge-related activities) is likely to adversely affect, but is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The biological opinion must have included the effects of your facility's discharges and discharge-related activities on all the listed species and designated critical habitat in your action area under the jurisdiction of each Service, as appropriate. To be eligible under (i), any reasonable and prudent measures specified in the incidental take statement must be implemented;

ii. Written concurrence (e.g., letter of concurrence) from the applicable Service(s) with a determination that your facility's discharges and discharge-related activities are not likely to adversely affect ESA-listed species and/or designated critical habitat. The concurrence letter must have included the effects of your facility's discharges and discharge-related activities on all the ESA-listed species and/or designated critical habitat on your species list(s) acquired from USFWS and/or NMFS as part of this worksheet.

The consultation does not warrant reinitiation under 50 CFR §402.16; or, if reinitiation of consultation is required (e.g., due to a new species listing, critical habitat designation, or new information), the Federal action agency has reinitiated the consultation and the result of the consultation is consistent with the statements above. (Note: you must include any reinitiation documentation from the Services or consulting Federal agency with your NOI.) -

☐ Check to confirm you have provided documentation in your SWPPP as required by CGP Appendix D.

Documentation:

Eligibility Criterion
Following the process outlined in Appendix D, under which criterion are you eligible for coverage under this permit?

☐ **Criterion F:** Issuance of section 10 permit. Potential take is authorized through the issuance of a permit under section 10 of the ESA by the USFWS and/or NMFS, and this authorization addresses the effects of the site's discharges and discharge-related activities on ESA-listed species and designated critical habitat. You must include copies of the correspondence between yourself and the participating agencies in your SWPPP and your NOI.

☐ Check to confirm you have provided documentation in your SWPPP as required by CGP Appendix D.

Documentation:

3.2 Historic Property Screening Process

Appendix E, Step 1
Do you plan on installing any stormwater controls that require subsurface earth disturbance, including, but not limited to, any of the following stormwater controls at your site? Check all that apply below, and proceed to Appendix E, Step 2.

☐ Dike

☐ Berm

☒ Catch Basin

☒ Pond

☐ Constructed Site Drainage Feature (e.g., ditch, trench, perimeter drain, swale, etc.)

☒ Culvert

☐ Channel

☐ Other type of ground-disturbing stormwater control:

Appendix E, Step 2
If you answered yes in Step 1, have prior professional cultural resource surveys or other evaluations determined that historic properties do not exist, or have prior disturbances at the site have precluded the existence of historic properties? ☒ YES ☐ NO

- If yes, no further documentation is required for Section 3.2 of the Template and you may provide the prior documentation in your SWPPP. See Appendix E
- If no, proceed to Appendix E, Step 3.

Appendix E, Step 3

If you answered no in Step 2, have you determined that your installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties? ☐ YES ☐ NO

- If yes, provide documentation of the basis for your determination. Insert references to documents, studies, or other sources relied upon
- If no, proceed to Appendix E, Step 4.

Appendix E, Steps 4 and 5

If you answered no in Step 3, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other Tribal representative (whichever applies) respond to you within 15 calendar days to indicate their views as to the likelihood that historic properties are potentially present on your site and may be impacted by the installation of stormwater controls that require subsurface earth disturbance? ☐ YES ☐ NO

- If yes, describe the nature of their response:
  - ☐ Written indication that no historic properties will be affected by the installation of stormwater controls.
  - ☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions.
  - ☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls.
  - ☐ Other:
- If no, no further documentation is required for Section 3.2 of the Template.

3.3 Safe Drinking Water Act Underground Injection Control Requirements

Do you plan to install any of the following controls? Check all that apply below. **No**

- ☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)
- ☒ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow
- ☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, insert copies of letters, emails, or other communication between you and the State agency or EPA regional office.

SECTION 4: EROSION AND SEDIMENT CONTROLS AND DEWATERING PRACTICES

4.1 Natural Buffers or Equivalent Sediment Controls

Buffer Compliance Alternatives

Are there any receiving waters within 50 feet of your project's earth disturbances? ☒ YES ☐ NO

Check the compliance alternative that you have chosen:

☐ (i) I will provide and maintain a 50-foot undisturbed natural buffer.

☐ (ii) I will provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by additional erosion and sediment controls that achieve, in combination, the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

☒ (iii) It is infeasible to provide and maintain an undisturbed natural buffer of any size, therefore I will implement erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

☐ I qualify for one of the exceptions in Part 2.2.1.b. (If you have checked this box, provide information on the applicable buffer exception that applies, below.)

Buffer Exceptions

Which of the following exceptions to the buffer requirements applies to your site?

☐ There is no discharge of stormwater to waters of the U.S. through the area between the disturbed portions of the site and any waters of the U.S. located within 50 feet of your site.

☐ No natural buffer exists due to preexisting development disturbances (e.g., structures, impervious surfaces) that occurred prior to the initiation of planning for this project.

☐ For "linear construction sites" (defined in Appendix A), site constraints (e.g., limited right-of-way) make it infeasible to meet any of the CGP Part 2.2.1.a compliance alternatives, provided that, to the extent feasible, you limit disturbances within 50 feet of the receiving water.

☐ The project qualifies as "small residential lot" construction (defined in Appendix A as "a lot being developed for residential purposes that will disturb less than 1 acre of land, but is part of a larger residential project that will ultimately disturb greater than or equal to 1 acre") (see Appendix F, Part F.3.2).

- ☐ For Alternative 1:
- ☐ For Alternative 2:

☐ Buffer disturbances are authorized under a CWA Section 404 permit.

☐ Buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail).

4.2 Perimeter Controls

General

- Sediment controls shall be installed as shown along the perimeter of the site to prevent sediment from earth disturbing activities leaving the site

Specific Perimeter Controls

Silt Fence, Compost Filter Socks	
Description: Silt fencing and/or compost filter socks (wattles)	
Installation	Prior to any construction activity
Maintenance Requirements	Remove sediment before it has accumulated to one-half of the above-ground height of any perimeter control. After a storm event, if there is evidence of stormwater circumventing or undercutting the perimeter control, extend controls and/or repair undercut areas to correct the problem.
Design Specifications	Drawing C-5 – Site Details I Drawing C-6 – Site Details II

4.3 Sediment Track-Out

General

Minimize the track out of sediment onto off-site streets and paved areas by installing a vehicle tracking pad at construction exits from the site.

Specific Track-Out Controls

Construction Entrance	
Description Temporary crushed stone vehicle tracking pad.	
Installation	Prior to the start of construction.
Maintenance Requirements	Inspect weekly and after heavy rains or heavy use. Where sediment has been tracked-out from the site onto paved roads, sidewalks, or other paved areas outside of the site, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. Hosing or sweeping tracked-out sediment into any constructed or natural site drainage feature, storm drain inlet, or receiving water is prohibited. Mud and soil particles eventually clog the voids in the stone and renders the pad ineffective. When this occurs, new stone should be installed on the top of the pad. Complete replacement of the pad may be necessary when the pad becomes completely clogged.
Design Specifications	Drawing C-5 – Site Details I

4.4 Stockpiles or Land Clearing Debris Piles Comprised of Sediment or Soil

General

- Minimize the discharge of sediment or soil from stockpiles by installing temporary sediment barriers (wattles and/or silt fencing) around the perimeter of stockpiles.

Specific Stockpile Controls

Silt fencing, Wattles	
Description: Silt fencing and/or wattles	
Installation	Immediately after stockpile is completed.
Maintenance Requirements	Hosing down or sweeping soil or sediment accumulated on pavement or other impervious surfaces into any constructed or natural site drainage feature, storm drain inlet, or receiving water is prohibited.
Design Specifications	Drawing C-5 – Site Details I Drawing C-6 – Site Details II

4.5 Minimize Dust

General

- Minimize the generation of dust and pollutants from the site onto adjacent properties and into nearby surface waters through the appropriate application of water or other dust suppression techniques.

Specific Dust Controls

Water	
Description: Water sprayed on dust generating areas on site.	
Installation	
Maintenance Requirements	When the generation of dust emanating from the site becomes evident.
Design Specifications	

4.6 Minimize Steep Slope Disturbances

General

- Install erosion control blankets on steep slopes to minimize erosion of the slope.

Specific Steep Slope Controls

Erosion Control Blanket	
Description: Preformed protective blanket of plastic fibers, straw or other plant residue to retain water and facilitate establishment of vegetation.	
Installation	All 3H:1V slopes or steeper shall be stabilized with erosion control blanket prior to hydroseeding and protected from erosion.
Maintenance Requirements	Inspect every week and after rain events that cause stormwater runoff to occur on-site and until adequate vegetation is established. Repair erosion and/or undermining at top of slope and/or beneath blankets.
Design Specifications	Drawing C-6 – Site Details II

4.7 Topsoil

General

- All disturbed areas subject to erosion shall be stabilized with mulch or seed in accordance with the *Massachusetts Erosion and Sediment Control Guidelines* as soon as possible.

Specific Topsoil Controls

Seed	
Description: Seed in accordance with the *Massachusetts Erosion and Sediment Control Guidelines* and Landscaping specifications.	
Installation	
Maintenance Requirements	All disturbed areas subject to erosion shall be stabilized with mulch or seeded for temporary vegetative cover where construction activities have permanently ceased or have been suspended for more than 14 days. When final grades are achieved in any portion of the site, stabilization measures shall be implemented within 3 days. Areas that remain disturbed but inactive for at least 30 days shall receive temporary seeding. In all cases, stabilization measures shall be implemented as soon as possible.
Design Specifications	See Landscaping specifications

4.8 Soil Compaction

General

- In areas of the site where final vegetative stabilization will occur or where infiltration practices will be installed either: 1.) Restrict vehicle and equipment use in these locations to avoid soil compaction or 2.) Prior to seeding or planting areas of exposed soil that has been compacted use techniques that condition the soil to support vegetative growth if necessary.

Specific Soil Compaction Controls

NA	
Description:	
Installation	
Maintenance Requirements	
Design Specifications	

4.9 Storm Drain Inlets

General

- Storm drain inlet protection to be provided by installing sediment filter bags in all existing and new catch basins that receive stormwater runoff from the site.

Specific Storm Drain Inlet Controls

Sediment Filter Bag	
Description: A geosynthetic filter bag, temporarily inserted into catch basins, that acts as a separator, allowing water to pass through while preventing sediment, trash and debris from entering the basin and storm drainage system.	
Installation	
Maintenance Requirements	Clean, or remove and replace, the inlet protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, remove the deposited sediment by the end of the same business day in which it is found or by the end of the following business day if removal by the same business day is not feasible.
Design Specifications	Drawing C-5 – Site Details I

4.10 Constructed Site Drainage Feature

General

- Subsurface infiltration systems and a surface infiltration basin have been proposed to detain and infiltrate runoff from the site into the ground, significantly reducing both peak flowrates and total stormwater volume discharged from the site from storms up to the 100 – year event. Groundwater recharge will be increased and the phosphorous loading in runoff will be significantly reduced.

Specific Constructed Site Drainage Features

Subsurface Infiltration Systems	
Description: The subsurface infiltration system consists of Plastic Chambers or Corrugated Metal Pipes, encased in crushed stone. Discharge from the system is via infiltration to the underlying soil. The system is designed to detain and infiltrate storm runoff from up to the 100-year storm event.	
Installation	
Maintenance Requirements	Inspect inlet and outlet observation manholes and observation ports for any accumulation of sediment and remove prior to the end of construction activities.
Design Specifications	Drawing C-8 – Site Details IV Drawing C-9 – Site Details V

Surface Infiltration Basin	
Description: The primary function of the surface infiltration basin is to provide water quality treatment to incoming stormwater runoff via infiltration.	
Installation	
Maintenance Requirements	Accumulated trash and debris shall be removed on a weekly basis. Any eroded or areas with poor grass coverage shall be loomed and seeded.
Design Specifications	Drawing C-7 – Site Details III

4.11 Sediment Basins or Similar Impoundments

Specific Sediment Basin Controls

Description: Temporary Sediment Basin	
Installation	
Maintenance Requirements	**Monitor and remove sediment when needed.**
Design Specifications	Drawing C-1A & C-1B – Demolition and Erosion Control Phase I Plans

4.12 Chemical Treatment

Soil Types
List all the soil types including soil types expected to be exposed during construction in areas of the project that will drain to chemical treatment systems and those expected to be found in fill material: N/A

Treatment Chemicals
List all treatment chemicals that will be used at the site and explain why these chemicals are suited to the soil characteristics: N/A
Describe the dosage of all treatment chemicals you will use at the site or the methodology you will use to determine dosage: N/A

Provide information from any applicable Safety Data Sheets (SDS): N/A

Describe how each of the chemicals will be stored consistent with CGP Part 2.2.13c: N/A

Include references to applicable State or local requirements affecting the use of treatment chemicals, and copies of applicable manufacturer's specifications regarding the use of your specific treatment chemicals and/or chemical treatment systems: N/A

Special Controls for Cationic Treatment Chemicals (if applicable)
If the applicable EPA Regional Office authorized you to use cationic treatment chemicals, include the official EPA authorization letter or other communication, and identify the specific controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to a discharge that does not meet water quality standards: N/A

Schematic Drawings of Stormwater Controls/Chemical Treatment Systems
Provide schematic drawings of any chemically-enhanced stormwater controls or chemical treatment systems to be used for application of treatment chemicals: N/A

Training
Describe the training that personnel who handle and apply chemicals have received prior to permit coverage, or will receive prior to the use of treatment chemicals: N/A

4.13 Dewatering Practices

General

- N/A

Specific Dewatering Practices

N/A	
Description:	
Installation	Click or tap to enter a date.
Maintenance Requirements	
Design Specifications	

4.14 Other Stormwater Controls

General

- N/A

Specific Stormwater Control Practices

N/A	
Description:	
Installation	Click or tap to enter a date.
Maintenance Requirements	
Design Specifications	

4.15 Site Stabilization

Total Amount of Land Disturbance Occurring at Any One Time

☐ *Five Acres or less*

☒ *More than Five Acres*

Use this template box if you are <u>not</u> located in an arid, semi-arid, or drought-stricken area and are not discharging to a sediment- or nutrient-impaired water or Tier 2, Tier 2.5, or Tier 3 water.

N/A	
☐ *Vegetative* ☐ *Non-Vegetative* ☐ *Temporary* ☐ *Permanent*	
Description:	
Installation	Click or tap to enter a date.
Completion	Click or tap to enter a date.
Maintenance Requirements	

N/A	
Design Specifications	

Use this template box if you are located in an arid, semi-arid, or drought-stricken area.

N/A	
☐ *Vegetative* ☐ *Non-Vegetative* ☐ *Temporary* ☐ *Permanent*	
Description:	
Dry Period	▪ Beginning month of seasonally dry period: ▪ Ending month of seasonally dry period: ▪ Site conditions during this period:
Installation and completion schedule	▪ Approximate installation date: ▪ Approximate completion date:
Maintenance Requirements	
Design Specifications	

Use this template box if you are discharging to a sediment- or nutrient-impaired water or to a water that is identified by your State, Tribe, or EPA as Tier 2, Tier 2.5, or Tier 3 for antidegradation purposes.

Seeding	
☒ *Vegetative* ☐ *Non-Vegetative* ☐ *Temporary* ☒ *Permanent*	
Description: ▪ Seed mix and application shall be in accordance with the *Massachusetts Erosion and Sedimentation Guidelines* and the Landscaping specifications.	
Installation	
Completion	When final grades are achieved in any portion of the site, seeding to stabilize the site shall be implemented and *m*ust *be* completed as soon as practicable, but no later than 7 calendar days after stabilization has been initiated.
Maintenance Requirements	See Landscaping specifications
Design Specifications	See Landscaping specifications

Use this template box if unforeseen circumstances have delayed the initiation and/or completion of vegetative stabilization. Note: You will not be able to include this information in your initial SWPPP. If you are affected by circumstances such as those described in CGP Part 2.2.14.b.ii, you will need to modify your SWPPP to include this information.

<table>
<tr><th colspan="2">N/A</th></tr>
<tr><td colspan="2">☐ Vegetative ☐ Non-Vegetative
☐ Temporary ☐ Permanent</td></tr>
<tr><td colspan="2">Description:
▪ Insert description of stabilization practice to be installed
▪ Note how design will meet requirements of Part 2.2.14.b.ii</td></tr>
<tr><td>Justification</td><td>Insert description of circumstances that prevent you from meeting the deadlines required in CGP CGP Parts 2.2.14.a</td></tr>
<tr><td rowspan="2">Installation and completion schedule</td><td>Vegetative Measures:
Describe the schedule you will follow for initiating and completing vegetative stabilization
▪ Approximate installation date:
▪ Approximate completion date:</td></tr>
<tr><td>Non-Vegetative Measures:
(Must be completed within 14 days of the cessation of construction if disturbing 5 acres or less; within 7 days if disturbing more than 5 acres)
▪ Approximate installation date: Insert the approximate date
▪ Approximate completion date: Insert the approximate date</td></tr>
<tr><td>Maintenance Requirements</td><td></td></tr>
<tr><td>Design Specifications</td><td></td></tr>
</table>

SECTION 5: POLLUTION PREVENTION CONTROLS

5.1 Potential Sources of Pollution

Pollutant-Generating Activity	**Pollutants or Pollutant Constituents** (That could be discharged if exposed to stormwater)	**Location on Site** (Or reference SWPPP site map where this is shown)
Fueling and Maintenance of Equipment or Vehicles	Gasoline, etc.	Site Specific. (Managed by Contractors)
Washing of Equipment and Vehicles	Wheel wash water, etc.	Site Specific. (Managed by Contractors)
Storage Handling, and Disposal of Building Products, Materials, and Wastes	Asphalt Sealants, Copper Flashing, Roofing Materials, Adhesives, etc.	Site Specific. (Managed by Contractors)
Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials	N/A	N/A
Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals	Diesel Fuel, Oil, Hydraulic Fluids, Kerosene, etc.	Site Specific. (Managed by Contractors)
Hazardous or Toxic Waste	Paints, Caulks, Sealants, etc.	Site Specific. (Managed by Contractors)
Construction and Domestic Waste	Packaging Materials, Scrap Construction Materials, Masonry Products, etc.	Site Specific. (Managed by Contractors)
Sanitary Waste	Portable Toilet Waste	Site Specific. (Managed by Contractors)
Washing of Applicators and Containers used for Stucco, Paint, Concrete, Form Release Oils, Cutting Compounds, or Other Materials	Materials Directed into Leak-Proof Containers or Pits	Site Specific. (Managed by Contractors)
Application of Fertilizers	N/A	N/A
Erosion	Soil, Sediment	See site plans

5.2 Spill Prevention and Response

A spill contingency plan shall be implemented during construction and include the following provisions:

Equipment necessary to quickly attend to spills will be stored on site in a secure and accessible location. Equipment will include:

1. Safety goggles.
2. Chemically resistant gloves and boots.
3. Water and chemical fire extinguishers.
4. Sand and shovels.
5. Suitable absorbent materials.
6. Storage containers
7. First aid equipment.

Spills and leaks will be treated properly in accordance with material type, volume of spillage and location of the spill. Mitigation will include:

1. Preventing further spillage.
2. Containing the spilled material in the smallest practicable area.
3. Removing spilled material immediately in a safe and environmentally sound manner.
4. Mitigating any damage to the environment.

For spills of less than 5 gallons of material, initiate source control and containment and 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 response contractor.

Spills of toxic or hazardous materials shall be reported to the appropriate federal, state and local government agencies regardless of the size of the spill. Spills that exceed reportable quantities of certain substances in federal regulation 40 CFR 110, 40 CFR 117 and 40 CFR 302 must be immediately reported the EPA National Response Center, telephone 1-800-424-8802.

5.3 Fueling and Maintenance of Equipment or Vehicles

General

- Provide an effective means of eliminating the discharge of spilled or leaked fuels and oils. If applicable, comply with requirements of 40 CFR part 112 and Section 311 of the Clean Waters Act. Clean up spills or contaminated surfaces immediately using dry clean up measures. Do not hose the area down. Quickly eliminate the source of the spill.

Specific Pollution Prevention Practices

Secondary Containment	
Description: Spill Berm/Dike	
Implementation	
Maintenance Requirements	Provide secondary containment (spill berms, dikes) and provide a spill kit on site and personnel available to respond in the event of a leak or spill.
Design Specifications	NA

5.4 Washing of Equipment and Vehicles

General

- Provide an effective means of minimizing the discharge of pollutants from equipment and vehicle washing, wheel wash water and other types of wash waters. Locate wash areas away from storm drains and constructed and/or natural site drainage features so that wash water and stormwater that comes into contact with washing activities does not reach waters of the U.S. Provide storage of soaps, detergents and other solvents from coming into contact with rainwater.

Specific Pollution Prevention Practices

Secondary Containment	
Description: Spill Berm/Dike	
Implementation	
Maintenance Requirements	Provide secondary containment (spill berms, dikes) and provide a spill kit on site and personnel available to respond in the event of a leak or spill.
Design Specifications	NA

5.5 Storage, Handling, and Disposal of Building Products, Materials, and Wastes

5.5.1 Building Materials and Building Products

(Note: Examples include asphalt sealants, copper flashing, roofing materials, adhesives, concrete admixtures, and gravel and mulch stockpiles.)

General

- For building materials and building products, such as asphalt sealants, roofing materials, adhesives, concrete admixtures and earth and mulch stockpiles, provide either cover (plastic sheeting or temporary roofs to minimize exposure of these products to precipitation and/or stormwater.

Specific Pollution Prevention Practices

Plastic Sheeting	
Description: Plastic Sheeting	
Implementation	
Maintenance Requirements	Inspect and ensure that building materials and products are fully covered and secured and protected from the environment at all times.
Design Specifications	NA

5.5.2 Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials

General

- No pesticides, herbicides, insecticides or fertilizers shall be used on the site.

Specific Pollution Prevention Practices

NA	
Description:	
Implementation	
Maintenance Requirements	
Design Specifications	

5.5.3 Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals

General

- Store petroleum products and other chemicals in water-tight containers and provide either cover or other effective means to prevent these containers from coming into contact with rainwater and to prevent the discharge of pollutants from these areas.
- Note: The requirements in CGP Part 2.3.3.c differ based on whether the chemical containers on your site are less than 55 gallons, or 55 gallons or more. See CGP Parts 2.3.3.c.i and ii.

Specific Pollution Prevention Practices

Plastic Sheeting	
Description: Plastic Sheeting	
Implementation	
Maintenance Requirements	Inspect and ensure that containers are fully and securely covered.
Design Specifications	NA

5.5.4 Hazardous or Toxic Waste

(Note: Examples include paints, caulks, sealants, fluorescent light ballasts, solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids.)

General

- Separate hazardous waste from construction and domestic waste. Store waste in sealed containers made of suitable material that prevents leakage and corrosion. Containers are to be labeled in accordance with applicable Resource Conservation and Recovery Act (RCRA) requirements.

Specific Pollution Prevention Practices

Secondary Containment	
Description: Curbing, Spill Berm or Spill Containment Pallet	
Implementation	
Maintenance Requirements	All containers to be placed outside to be stored in appropriately sized secondary containment. Hazardous waste containers to be disposed of in accordance with the manufacturer's recommended method of disposal and in compliance with federal, state and local requirements.
Design Specifications	NA

5.5.5 Construction and Domestic Waste

(Note: Examples include packaging materials, scrap construction materials, masonry products, timber, pipe and electrical cuttings, plastics, styrofoam, concrete, demolition debris, and other trash or discarded materials.)

General

- Provide waste containers of sufficient size and number to contain construction and domestic waste. Dispose of waste in designated waste containers and immediately clean up any overflow.

Specific Pollution Prevention Practices

Dumpster	
Description: Dumpster	
Implementation	
Maintenance Requirements	Remove or empty dumpster(s) when full.
Design Specifications	NA

5.5.6 Sanitary Waste

General

- Position portable toilets so they are secure and will not be tipped or knocked over. Locate away from storm drain inlets and constructed or natural site drainage features.

Specific Pollution Prevention Practices

Portable Toilets	
Description: Portable Toilets	
Implementation	
Maintenance Requirements	Clean or replace as required.
Design Specifications	NA

5.6 Washing of Applicators and Containers used for Stucco, Paint, Concrete, Form Release Oils, Cutting Compounds, or Other Materials

General

- All wash-water shall be directed into leak-proof containers or pits designed so that no overflow will occur due inadequate size or precipitation. Dispose of liquid waste in accordance with applicable requirements; do not dump in storm drains. Concrete waste shall be removed and disposed of consistent with the handling of other construction wastes.

Specific Pollution Prevention Practices

NA	
Description:	
Implementation	Click or tap to enter a date.
Maintenance Requirements	
Design Specifications	

5.7 Application of Fertilizers

General

- Use of fertilizers is prohibited on the site.

Specific Pollution Prevention Practices

NA	
Description:	
Implementation	
Maintenance Requirements	
Design Specifications	

5.8 Other Pollution Prevention Practices

General

Specific Pollution Prevention Practices

NA	
Description:	
Implementation	I
Maintenance Requirements	
Design Specifications	

SECTION 6: INSPECTION, MAINTENANCE, AND CORRECTIVE ACTION

6.1 Inspection Personnel and Procedures

Site Inspection Schedule

Standard Frequency:

☐ Every 7 calendar days

☐ Every 14 calendar days and within 24 hours of either:

- A storm event that produces 0.25 inches or more of rain within a 24-hour period (including when there are multiple, smaller storms that alone produce less than 0.25 inches but together produce 0.25 inches or more in 24 hours), or
- A storm event that produces 0.25 inches or more of rain within a 24-hour period on the first day of a storm and continues to produce 0.25 inches or more of rain on subsequent days (you conduct an inspection within 24 hours of the first day of the storm and within 24 hours after the last day of the storm that produces 0.25 inches or more of rain (i.e., only two inspections would be required for such a storm event)), or
- A discharge caused by snowmelt from a storm event that produces 3.25 inches or more of snow within a 24-hour period.

Increased Frequency (if applicable):

For areas of sites discharging to sediment or nutrient-impaired waters or to waters designated as Tier 2, Tier 2.5, or Tier 3

☒ Every 7 days and within 24 hours of either:

- A storm event that produces 0.25 inches or more of rain within a 24-hour period, or
- A discharge caused by snowmelt from a storm event that produces 3.25 inches or more of snow within a 24-hour period.

Reduced Frequency (if applicable)

For stabilized areas

☐ Twice during first month, no more than 14 calendar days apart; then once per month after first month until permit coverage is terminated consistent with Part 9 in any area of your site where the stabilization steps in 2.2.14.a have been completed.

- Specify locations where stabilization steps have been completed
- Insert date that they were completed

(Note: It is likely that you will not be able to include this in your initial SWPPP. If you qualify for this reduction (see CGP Part 4.4.1), you will need to modify your SWPPP to include this information. If construction activity resumes in this portion of the site at a later date, the inspection frequency immediately increases to that required in Parts 4.2 and 4.3, as applicable.)

For stabilized areas on "linear construction sites" (as defined in Appendix A)

☐ Twice during first month, no more than 14 calendar days apart; then once more within 24 hours of a storm event that produces 0.25 inches or more of rain within a 24-hour period, or within 24 hours of a snowmelt discharge from a storm event that produces 3.25 inches or more of snow within a 24-hour period

- Specify locations where stabilization steps have been completed
- Insert date that they were completed

(Note: It is likely that you will not be able to include this in your initial SWPPP. If you qualify for this reduction (see CGP Part 4.4.1), you will need to modify your SWPPP to include this information.)

For arid, semi-arid, or drought-stricken areas during seasonally dry periods or during drought

☐ Once per month and within 24 hours of either:

- A storm event that produces 0.25 inches or more of rain within a 24-hour period, or
- A snowmelt discharge from a storm event that produces 3.25 inches or more of snow within a 24-hour period.

Insert beginning and ending month identified as the seasonally dry period for your area or the valid period of drought:

- Beginning month of the seasonally dry period: Insert approximate date
- Ending month of the seasonally dry period: Insert approximate date

For frozen conditions where construction activities are being conducted

☒ Once per month

Insert beginning and ending dates of frozen conditions on your site:

- Beginning date of frozen conditions: Insert approximate date
- Ending date of frozen conditions: Insert approximate date

For frozen conditions where construction activities are suspended

☐ Inspections are temporarily suspended

Insert beginning and ending dates of frozen conditions on your site:

- Beginning date of frozen conditions: Insert approximate date
- Ending date of frozen conditions: Insert approximate date

Dewatering Inspection Schedule

Select the inspection frequency that applies based on CGP Part 4.3.2

Dewatering Inspection
☒ Once per day on which the discharge of dewatering water occurs.

Rain Gauge Location (if applicable)
At construction trailer.

Inspection Report Forms
See Appendix D of this SWPPP for Inspection Form.

(Note: EPA has developed a sample inspection form that CGP operators can use. The form is available at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources)

6.2 Corrective Action

All corrective measures to any BMPs outlined in this SWPPP, including repairs, replacement measures or maintenance undertaken as a result of inspections and general maintenance procedures shall be logged and attached to this document. This list shall include inspection date, name of inspector, description of BMP deficiency, corrective action needed, date action was taken and responsible individual for that action. See Appendix E for a blank Corrective Action form.

Personnel Responsible for Corrective Actions
TBD

Corrective Action Logs
See Appendix E of this SWPPP for Corrective Action Log form.

(Note: EPA has developed a sample corrective action log that CGP operators can use. The form is available at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources)

6.3 Delegation of Authority

Duly Authorized Representative(s) or Position(s):
RJ O'Connell & Associates
Chris McDonnell
Staff Designer
80 Montvale Ave
Stoneham, Ma 02180
781-279-0180 ext.124
chris.mcdonnell@ rjoconnell.com

SECTION 7: TURBIDITY BENCHMARK MONITORING FOR DEWATERING DISCHARGES

Procedures:

Collecting and evaluating samples	One turbidity sample from dewatering discharges each day a discharge occurs.
Reporting results and keeping monitoring information records	Reports of weekly average turbidity data to be reported electronically to EPA no later than 30 days following the end of each monitoring quarter (see Section 3.3.4 b, Table 3 of the CGP).
Taking corrective action when necessary	All reasonable steps to minimize or prevent the discharge of pollutants will be immediately implemented including shutting off the dewatering discharge as soon as possible depending on the severity of the condition taking safety considerations into account.

Turbidity Meter:

Type of turbidity meter	NA - No dewatering discharges proposed

Turbidity meter manuals and manufacturer instructions

See Appendix N of this SWPPP.

Coordinating Arrangements for Turbidity Monitoring (if applicable):

Permitted operator name	NA
Permitted operator NPDES ID	NA
Coordinating Arrangement	NA

[Repeat as necessary.]

Alternate turbidity benchmark (if applicable):

Alternate turbidity benchmark (NTU)	NA
Data and documentation used to request the alternate benchmark	NA

SECTION 8: CERTIFICATION AND NOTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: ______________________________ Title: ______________________________

Signature: ______________________________________ Date: __________________

SWPPP APPENDICES

Appendix A – Site Maps

FIG-1 USGS Site Locus Map
FIG-2 FEMA Flood Insurance Rate Map
FIG-3 NRCS Web Soil Survey Map
FIG-6 MassGIS Resource Area Map
EX-1 Existing Conditions Site Plan
C-1A Demolition and Erosion Control Phase I Plan
C-1B Demolition and Erosion Control Phase I Plan
C-1C Erosion and Sediment Control Phase II Plan
C-1D Erosion and Sediment Control Phase II Plan
C-2A Grading and Drainage Plan
C-2B Grading and Drainage Plan
C-4A Parking and Traffic Control Plan
C-4B Parking and Traffic Control Plan
C-5 Site Details – I
C-6 Site Details - II
C-7 Site Details - III
C-8 Site Details - IV
C-9 Site Details - V
C-10 Site Details - VI
C-11 Site Details - VII
C-12 Site Details - VIII
C-13 Site Details - IX

Appendix B – Copy of 2022 CGP

Appendix C – NOI and EPA Authorization Email

Appendix D – Site Inspection Form and Dewatering Inspection Form (if applicable)

Appendix E – Corrective Action Log

Appendix F – SWPPP Amendment Log

Appendix G – Subcontractor Certifications/Agreements

Appendix H – Grading and Stabilization Activities Log

Appendix I – Training Documentation

Appendix J – Delegation of Authority

Appendix K – Endangered Species Documentation

Appendix L – Historic Preservation Documentation

Appendix M – Rainfall Gauge Recording

Appendix N – Turbidity Meter Manual and Manufacturer's Instructions

Appendix A – Site Maps

Appendix B – Copy of 2022 CGP

(Note: The 2022 CGP is available at https://www.epa.gov/npdes/2022-construction-general-permit-cgp)

Appendix C – Copy of NOI and EPA Authorization Email

Appendix D – Copy of Site and Dewatering Inspection Forms

(Note: EPA has developed a sample site inspection and dewatering inspection form templates that CGP operators can use. The template is available at https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates)

Appendix E – Copy of Corrective Action Log

(Note: EPA has developed a sample corrective action log that CGP operators can use. The form is available at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources)

Appendix F – SWPPP Amendment Log

No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

Appendix G – Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: ______________________________

Project Title: ______________________________

Operator(s): ______________________________

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: ____

Address: ____

Telephone Number: ____________________________

Type of construction service to be provided: ____

____

____

Signature: _________________________________

Title: _________________________________

Date: _________________________________

Appendix H – Grading and Stabilization Activities Log

Date Grading Activity Initiated	**Description of Grading Activity**	**Description of Stabilization Measure and Location**	**Date Grading Activity Ceased** (Indicate Temporary or Permanent)	**Date When Stabilization Measures Initiated**
			☐ Temporary ☐ Permanent	
			☐ Temporary ☐ Permanent	
			☐ Temporary ☐ Permanent	
			☐ Temporary ☐ Permanent	
			☐ Temporary ☐ Permanent	
			☐ Temporary ☐ Permanent	
			☐ Temporary ☐ Permanent	
			☐ Temporary ☐ Permanent	

Appendix I –Training Documentation

Appendix J – Delegation of Authority Form

Delegation of Authority

I, _____________________ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the EPA's Construction General Permit (CGP), at the _________________________________ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____________________________________ (name of person or position)
_____________________________________ (company)
_____________________________________ (address)
_____________________________________ (city, State, zip)
_____________________________________ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix G of EPA's CGP, and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix G.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: ____

Company: ____

Title: ____

Signature: ____

Date: ____

Appendix K – Endangered Species Documentation

Appendix L – Historic Preservation Documentation

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Norfolk County, Massachusetts

Local office

New England Ecological Services Field Office

(603) 223-2541
(603) 223-0104

70 Commercial Street, Suite 300

Concord, NH 03301-5094

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below.

Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Oct 15 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

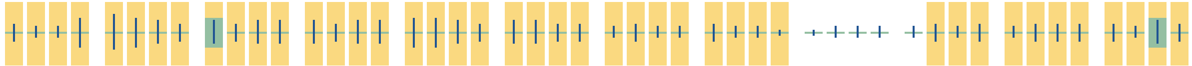
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Bald Eagle
Non-BCC
Vulnerable



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Oct 15 to Aug 31
Blue-winged Warbler Vermivora pinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30

Bobolink Dolichonyx oryzivorus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Chimney Swift Chaetura pelagica This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Pectoral Sandpiper Calidris melanotos This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Prairie Warbler Dendroica discolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season ( )

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

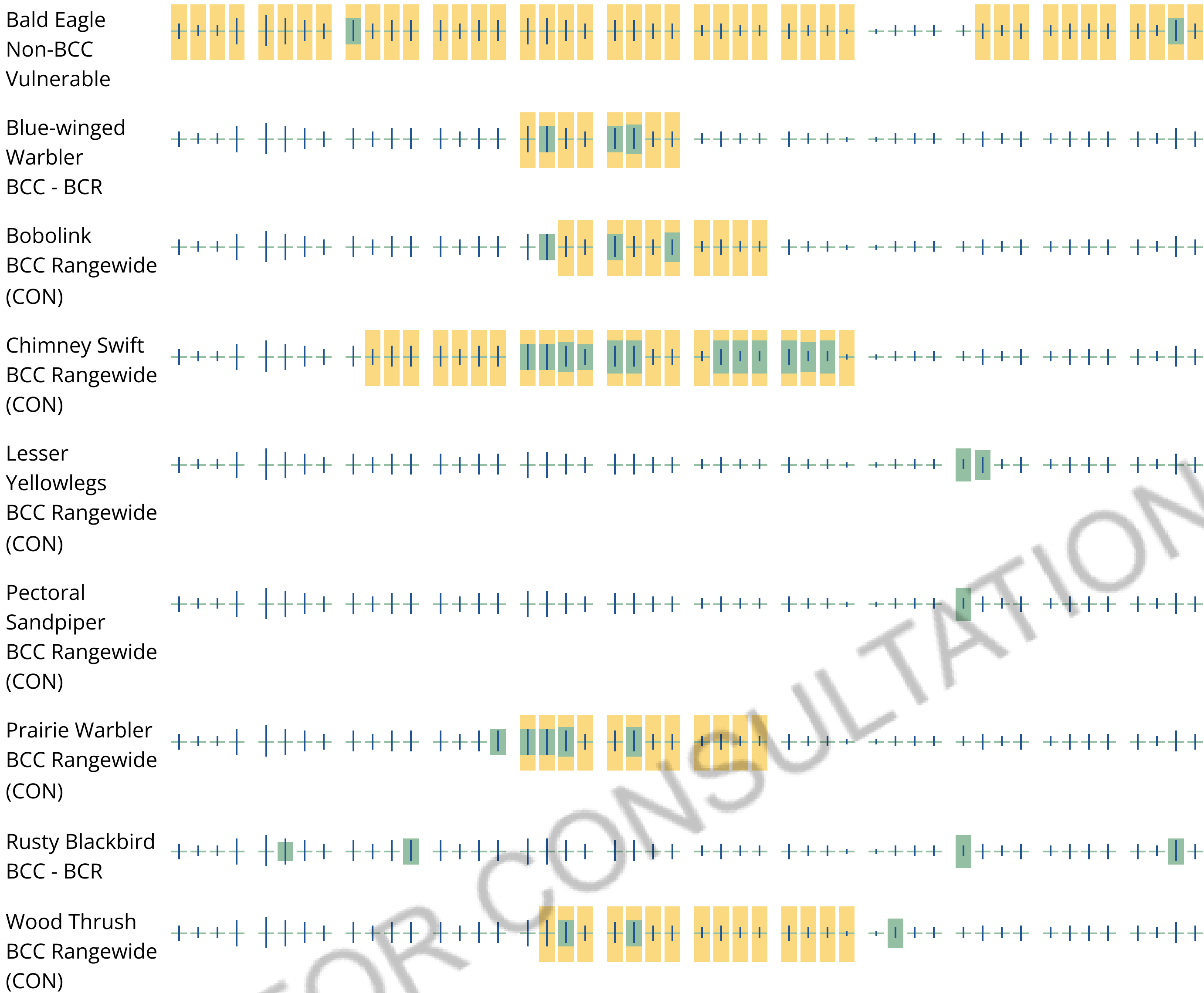
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

probability of presence breeding season | survey effort – no data

SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND
- PFO1E

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix M – Rainfall Gauge Recording

Use the table below to record the rainfall gauge readings at the beginning and end of each work day. An example table follows.

Month/Year			Month/Year			Month/Year		
Day	Start time	End time	Day	Start time	End time	Day	Start time	End time
1			1			1		
2			2			2		
3			3			3		
4			4			4		
5			5			5		
6			6			6		
7			7			7		
8			8			8		
9			9			9		
10			10			10		
11			11			11		
12			12			12		
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21			21			21		
22			22			22		
23			23			23		
24			24			24		
25			25			25		
26			26			26		
27			27			27		
28			28			28		
29			29			29		
30			30			30		
31			31			31		

Example Rainfall Gauge Recording

April 2022			May 2022			June 2022		
Day	7:00 am	4:400 pm	Day	7:00 am	4:00 pm	Day	7:00 am	4:00 pm
1	--	--	1	0.2	0	1	0	0.4
2	--	--	2	0	0	2	0	0
3	0	0	3	0.1	0.3	3	--	--
4	0	0.3	4	0	0	4	--	--
5	0	0	5	0	0	5	0	0

In this example (for only partial months), 0.25-inch rainfall inspections would have been conducted on April 4 and June 1.

Appendix N – Turbidity Monitoring Sampling Documentation

No Dewatering Planned – Not Applicable

APPENDIX E
Operation and Maintenance Plan (O & M)
with Long Term Pollution Prevention Plan (LTPPP)

RJOC

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: 2/2/24, 2/12/24, 3/28/24, 5/10/24

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Monthly Inspection Checklist
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Appendix B – 310 CMR 40.00 Subpart C: Notification of Releases and Threats of Release of Oil and Hazardous Materials

Appendix C – C-2A – Grading and Drainage Plan;
C-2B – Grading and Drainage Plan.

Appendix D – CDS Stormwater Treatment Unit Operation and Maintenance Guidelines

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 $15,000 and $20,000 annually.

Operation and Maintenance Plan
Grove Street Residences, Franklin Ma

Applicant: **Fairfield Grove Street, LLC** **Signature:** Robert D. Hewitt

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.

See Appendix C for additional maintenance requirements per 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. The inlet chamber row shall be constructed as an Isolator Row.

> 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.

Refer to maintenance guide for Isolator Row from manufacturer for additional detail.

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.

Robert D. Hewitt

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/Detention 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 2nd 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 w/ Isolator Row	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.		

121 Grove Street Franklin, MA

Long Term Pollution Prevention Plan

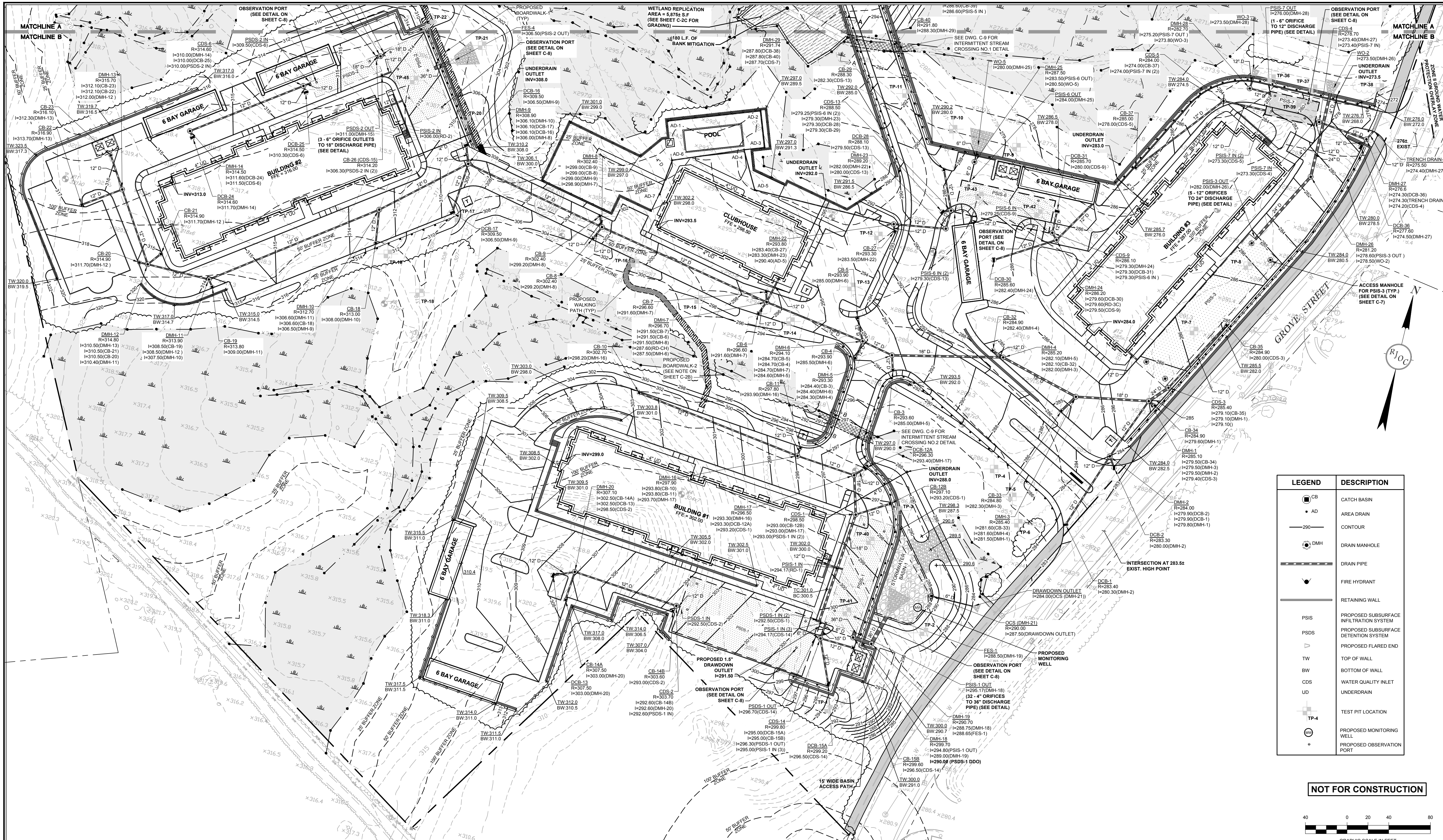
Spill and Leak History

(____ 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*			

Appendix B

C-2A – C-2B: Grading and Drainage Plans (for BMP Locations)



LEGEND	DESCRIPTION
CB	CATCH BASIN
AD	AREA DRAIN
290	CONTOUR
DMH	DRAIN MANHOLE
	DRAIN PIPE
	FIRE HYDRANT
	RETAINING WALL
PSIS	PROPOSED SUBSURFACE INFILTRATION SYSTEM
PSDS	PROPOSED SUBSURFACE DETENTION SYSTEM
	PROPOSED FLARED END
TW	TOP OF WALL
BW	BOTTOM OF WALL
CDS	WATER QUALITY INLET
UD	UNDERDRAIN
TP-4	TEST PIT LOCATION
MW	PROPOSED MONITORING WELL
	PROPOSED OBSERVATION PORT

NOT FOR CONSTRUCTION

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Main\22016_C-2 Grading and Drainage Plan.dwg
May 09, 2024 - 14:32pm

RJOC

NO.	REVISION	DATE
5.	REVISED PER CONCOM PEER REVIEW COMMENTS	05/10/2024
4.	REVISED PER CONCOM PEER REVIEW COMMENTS	03/28/2024
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

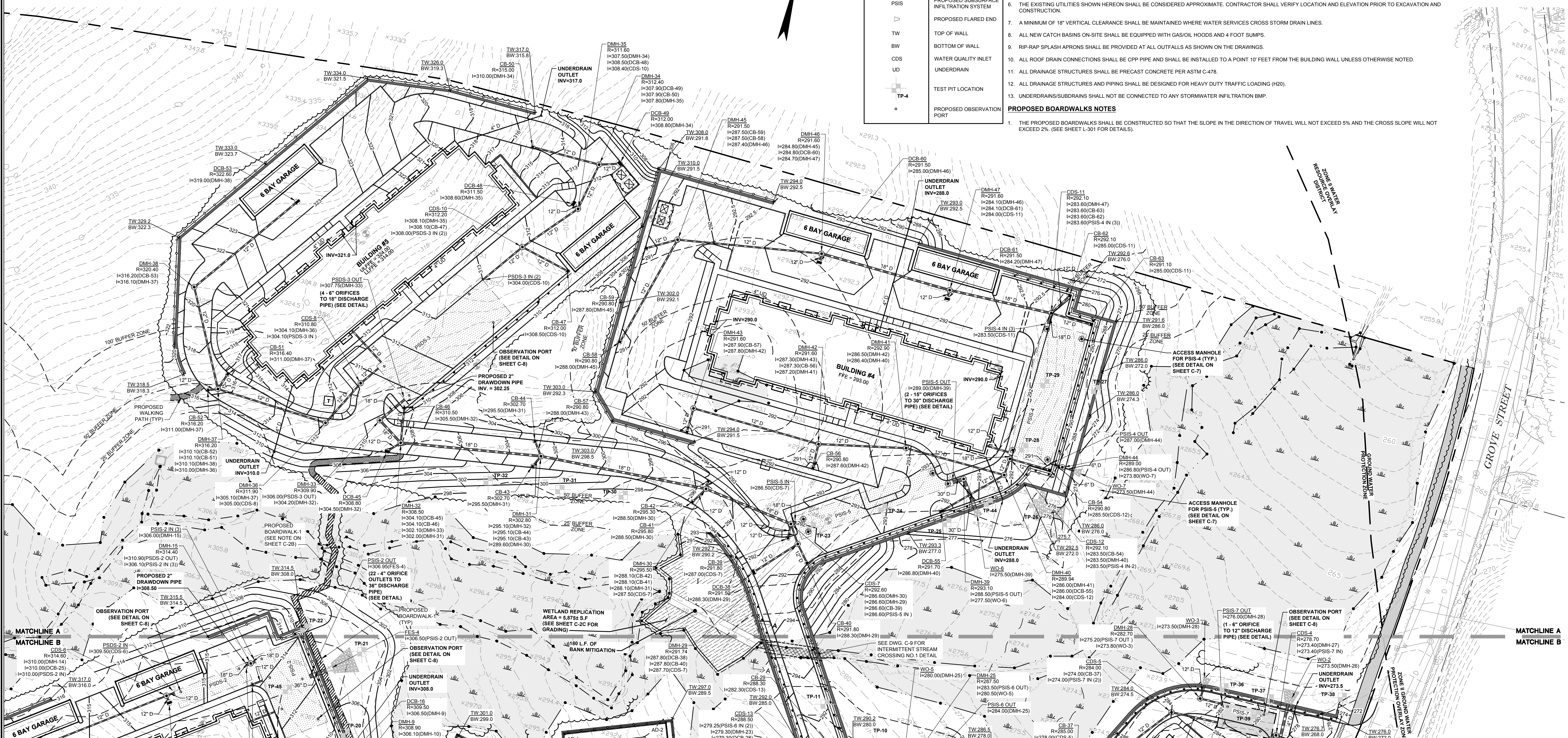
LEGEND	DESCRIPTION
CB	CATCH BASIN
290	CONTOUR
DMH	DRAIN MANHOLE
	DRAIN PIPE
	FIRE HYDRANT
	RETAINING WALL
PSIS	PROPOSED SUBSURFACE INFILTRATION SYSTEM
	PROPOSED FLARED END
TW	TOP OF WALL
BW	BOTTOM OF WALL
CDS	WATER QUALITY INLET
UD	UNDERDRAIN
TP-4	TEST PIT LOCATION
	PROPOSED OBSERVATION PORT

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).
13. UNDERDRAINS/SUBDRAINS SHALL NOT BE CONNECTED TO ANY STORMWATER INFILTRATION BMP.

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

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Main\22016_C-2 Grading and Drainage Plan.dwg
May 09, 2024 - 14:32pm

RJOC

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DESIGNED BY:	MAC
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PHONE: 781.279.0180 RJOCONNELL.COM

PROJECT NAME:

GROVE STREET RESIDENCES
FRANKLIN, MA

DRAWING NAME:

GRADING AND DRAINAGE PLAN

DRAWING NUMBER:

C-2B

DATE: 10/30/2023 PROJECT NO.: 22016

Appendix C

CDS Stormwater Treatment Unit Operation and Maintenance Guidelines and Isolator Row O&M Manual

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.

<u>CLEANOUT AND DISPOSAL</u>

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, inspect 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).**

CONTECH®
ENGINEERED SOLUTIONS

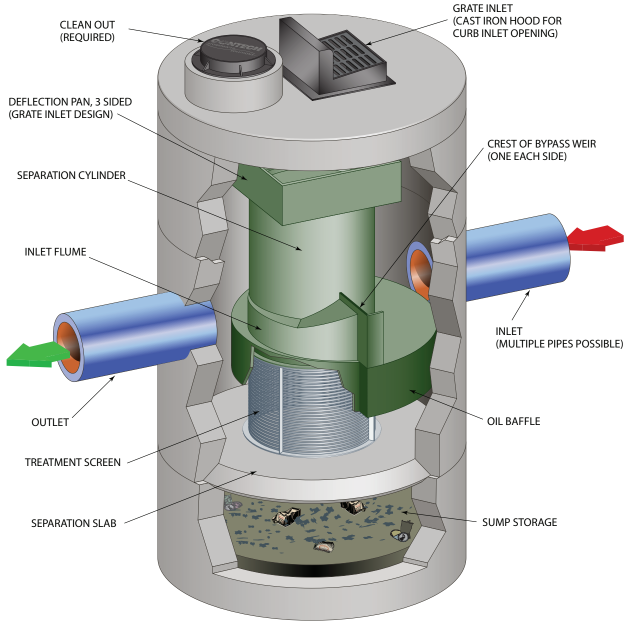
Hydrodynamic Separation Products Overview

Massachusetts

CDS™ Vortechs® VortSentry® HS

CDS®

Patented continuous deflection separation (CDS) technology

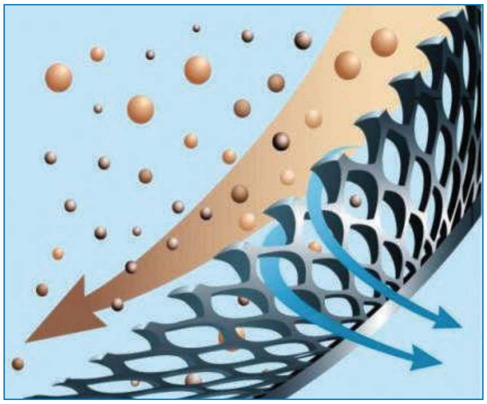


Using patented continuous deflective separation technology, the CDS system screens, separates and traps sediment, debris, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Available in precast or cast-in-place. Offline units can treat flows from 30 to 8500 L/s (1 to 300 cfs). Inline units can treat up to 170 L/s (7.5 cfs), and internally bypass larger flows in excess of 1420 L/s (50 cfs). The pollutant removal capability of the CDS system has been proven in the lab and field.

How does it work?

Stormwater enters the CDS unit's diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed. All flows up to the system's treatment design capacity enter the separation chamber.

Swirl concentration and screen deflection forces floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the 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.

During flow events exceeding the design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants will not wash out.

CDS

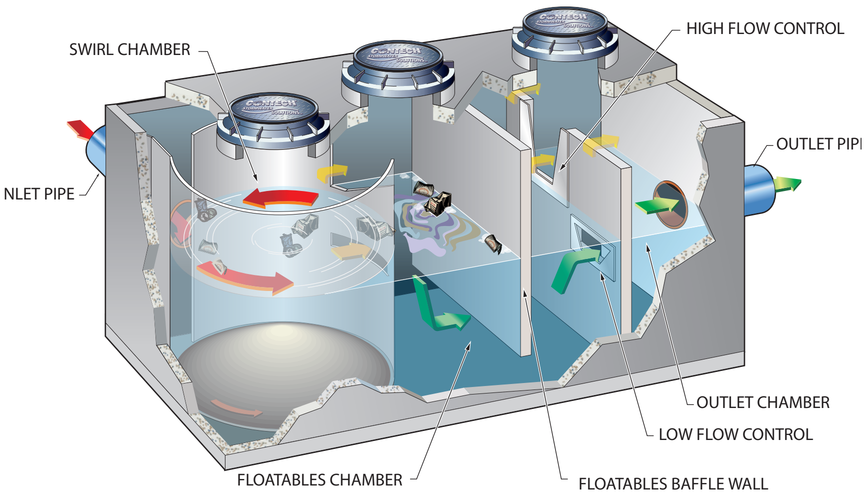
- Removes sediment, trash and free oil and grease
- Patented screening technology captures and retains 100% of floatables, including neutrally buoyant and all other material larger than the screen aperture
- Operation independent of flow
- Performance verified through lab and field testing
- Unobstructed maintenance access
- Customizable/flexible design and multiple configurations available
- Separates and confines pollutants from outlet flow
- Inline, offline, grate inlet and drop inlet configurations available
- Multiple screen aperture sizes available
- Allows for multiple inlet pipes

Vortechs®

High performance hydrodynamic separation

The Vortechs system is a high-performance hydrodynamic separator that effectively removes finer sediment, oil and grease, and floating and sinking debris. Its swirl concentrator and flow controls work together to minimize turbulence and provide stable storage of captured pollutants. The design also allows for easy inspection and unobstructed maintenance access. With comprehensive lab and field testing, the system delivers proven results and site-specific solutions.

Precast models can treat peak design flows up to 25 cfs; cast-in-place models handle even greater flows. A typical system is sized to provide an 80% load reduction based on laboratory-verified removal efficiencies for varying particle size distributions such as 50-micron sediment particles.



How does it work?

Water enters the swirl chamber at a tangent, inducing a gentle swirling flow pattern and enhancing gravitational separation. Sinking pollutants stay in the swirl chamber while floating pollutants are stopped at the baffle wall. Typically Vortechs systems are sized such that 80% or more of runoff through the system will be controlled exclusively by the low flow control. This orifice effectively reduces inflow velocity and turbulence by inducing a slight backwater appropriate to the site.

During larger storms, the water level rises above the low flow control and begins to flow through the high flow control. The layer of floating pollutants is elevated above the influent pipe, preventing re-entrainment. Swirling action increases in relation to the storm intensity, which helps prevent re-suspension. When the storm drain is flowing at peak capacity, the water surface in the system approaches the top of the high flow control. The Vortechs system will be sized large enough so that previously captured pollutants are retained in the system even during these infrequent events.

As a storm subsides, treated runoff decants out of the Vortechs system at a controlled rate, restoring the water level to a dry-weather level equal to the invert of the inlet and outlet pipes. The low water level facilitates easier inspection and cleaning, and significantly reduces maintenance costs by reducing pump-out volume.

Vortechs

- Proven performance speeds approval process
- Treats peak flows without bypassing
- Flow controls reduce inflow velocity and increase residence time
- Unobstructed access simplifies maintenance
- Shallow system profile makes installation easier and less expensive
- Very low headloss
- Flexible design fits multiple site constraints

Vortechs®

Available Models

CDS Model	Typical Internal MH Diameter or Equivalent ID[1] (ft)	Typical Depth[2] Below Pipe Invert (ft)	Treatment Capacity[3] (cfs)	Screen Diameter/ Height (ft)	Maximum Sediment Storage Capacity (CF)
2015_4	4	4.5	1.4	2.0/1.5	50
w/ 1' added sump	4	5.5	1.4	2.0/1.5	63
w/ 2' added sump	4	6.5	1.4	2.0/1.5	75
w/ 3' added sump	4	7.5	1.4	2.0/1.5	88
2015	5	4.7	1.4	2.0/1.5	79
w/ 1' added sump	5	5.7	1.4	2.0/1.5	98
w/ 2' added sump	5	6.7	1.4	2.0/1.5	118
2020	5	5.3	2.2	2.0/2.0	90
w/ 1' added sump	5	6.3	2.2	2.0/2.0	110
w/ 2' added sump	5	7.3	2.2	2.0/2.0	129
2025	5	5.6	3.2	2.0/2.5	97
w/ 1' added sump	5	6.6	3.2	2.0/2.5	117
w/ 2' added sump	5	7.6	3.2	2.0/2.5	136
3020	6	5.4	3.9	3.0/2.0	134
w/ 1' added sump	6	6.4	3.9	3.0/2.0	163
w/ 2' added sump	6	7.4	3.9	3.0/2.0	191
3030	6	6.2	6.1	3.0/3.0	157
w/ 1' added sump	6	7.2	6.1	3.0/3.0	185
w/ 2' added sump	6	8.2	6.1	3.0/3.0	213
4030	8	7.2	7.9	4.0/3.0	329
w/ 1' added sump	8	8.2	7.9	4.0/3.0	379
w/ 2' added sump	8	9.2	7.9	4.0/3.0	429
4040	8	8.3	12.4	4.0/4.0	381
w/ 1' added sump	8	9.3	12.4	4.0/4.0	431
w/ 2' added sump	8	10.3	12.4	4.0/4.0	482

1. Structure diameter represents the typical inside dimension of the concrete structure. Offline systems will require additional concrete diversion components
2. Depth below pipe can vary to accommodate site specific design. Depth below pipe invert represents the depth from the pipe invert to the inside bottom of concrete structure.
3. Treatment Capacity is based on laboratory testing using OK-110 (average d50 particle size of approximately 100 microns) and a 2400 micron screen.

Sediment Depths Indicating Required Servicing*

CDS Model	Sediment Depth (in.)
2015_4	18"
2015	18"
2020	18"
2025	18"
3020	18"
3030	18"
4030	27"
4040	27"
Every 1' of added sump depth	Add 9"

* Based on 75% capacity of isolated sump.

Available Models

Vortechs Model	Swirl Chamber Diameter		Internal Length		Peak Treatment Flow[1]		Sediment Storage[2]	
	ft	m	ft	m	cfs	L/s	yd3	m3
1000	3	0.9	9	2.7	1.6	45.3	0.7	0.5
2000	4	1.2	10	3	2.8	79.3	1.2	0.9
3000	5	1.5	11	3.4	4.5	127.4	1.8	1.4
4000	6	1.8	12	3.7	6	169.9	2.4	1.8
5000	7	2.1	13	4	8.5	240.7	3.2	2.4
7000	8	2.4	14	4.3	11	311.5	4	3.1
9000	9	2.7	15	4.6	14	396.4	4.8	3.7
11000	10	3	16	4.9	17.5	495.5	5.6	4.3
16000	12	3.7	18	5.5	25	707.9	7.1	5.4

1. Peak Treatment Flow is maximum flow treated for each unit listed. This flow represents an infrequent storm event such as a 10 or 25 yr storm.
   Standard Vortechs System depth below invert is 3' for all precast models.
   Cast-in-place system are available to treat higher flows. Check with your local representatives for specifications.
2. Maintenance recommended when sediment depth has accumulated to within 12-18 inches of the dry weather water surface elevation.

VortSentry HS Model	Swirl Chamber Diameter (ft)	Typical Depth Below Invert (ft)	Treatment Capacity (cfs)[1]	Max. Inlet/Outlet Pipe Diameter (in)	Maximum Sediment Storage Capacity (CF)
VortSentry HS36*	3	5.6	0.55	18	39
w/ 1' added sump	3	6.6	0.55	18	47
w/ 2' added sump	3	7.6	0.55	18	54
w/ 3' added sump	3	8.6	0.55	18	61
w/ 4' added sump	3	9.6	0.55	18	68
w/ 5' added sump	3	10.6	0.55	18	75
VortSentry HS48**	4	6.8	1.2	24	85
w/ 1' added sump	4	7.8	1.2	24	97
w/ 2' added sump	4	8.8	1.2	24	110
w/ 3' added sump	4	9.8	1.2	24	123
w/ 4' added sump	4	10.8	1.2	24	135
VortSentry HS60***	5	8.0	2.2	30	156
w/ 1' added sump	5	9.0	2.2	30	176
w/ 2' added sump	5	10.0	2.2	30	196
w/ 3' added sump	5	11.0	2.2	30	215

*maintenance recommended when sediment reaches a height of 3'-7" below water surface elevation in sump.
**maintenance recommended when sediment reaches a height of 4'-9" below water surface elevation in sump.
***maintenance recommended when sediment reaches a height of 6.0' below water surface elevation in sump.
1. Design Flow Rate is based on 80% removal of particle size distribution with an average particle size of 240 micron. This flow also represents the maximum flow prior to which bypass occurs.

Notes: Systems can be sized based on a water quality flow (e.g. 1 inch storm) or on a net annual basis depending on the local regulatory requirement.

When sizing based on a water quality storm, the required flow to be treated should be equal or less than the listed water quality flow for the selected system. Systems sized based on a water quality storm are generally more conservatively sized.

Additional particle size distributions are available for sizing purposes upon request.

Depth below invert is measured to the inside bottom of the system. This depth can be adjusted to meet specific storage or maintenance requirements.

Contact our support staff for the most cost effective sizing for your area.

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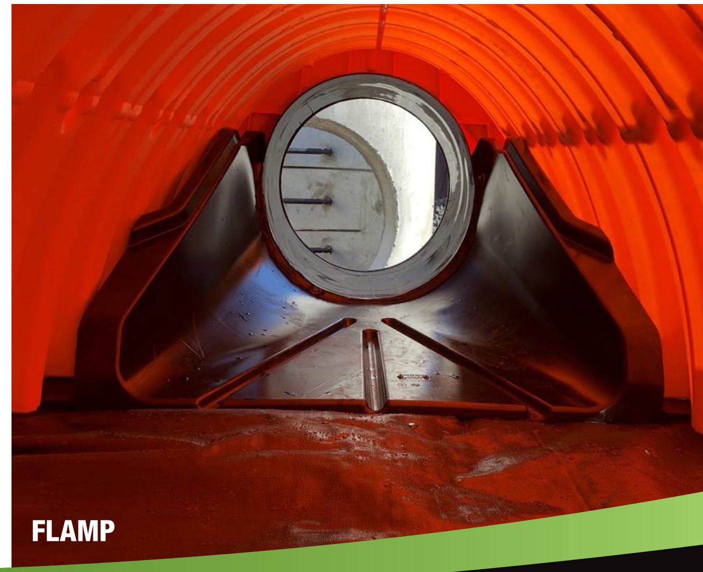
An ADS company

Isolator® Row PLUS O&M Manual



THE MOST *ADVANCED* NAME IN WATER MANAGEMENT SOLUTIONS®

THE ISOLATOR® ROW PLUS

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row PLUS is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

THE ISOLATOR ROW PLUS

The Isolator Row PLUS is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row PLUS and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row PLUS protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

ADS geotextile fabric is placed between the stone and the Isolator Row PLUS chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

The Isolator Row PLUS is designed to capture the “first flush” runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole not only provides access to the Isolator Row PLUS but includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row PLUS bypass through a manifold to the other chambers. This is achieved with either an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row PLUS row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row PLUS. After Stormwater flows through the Isolator Row PLUS and into the rest of the StormTech chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

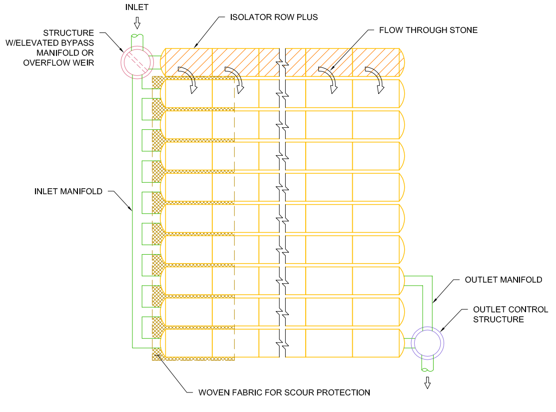
The Isolator Row FLAMP™ (patent pending) is a flared end ramp apparatus that is attached to the inlet pipe on the inside of the chamber end cap. The FLAMP provides a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance over time by enhancing outflow of solid debris that would otherwise collect at an end of the chamber. It also serves to improve the fluid and solid flow into the access pipe during maintenance and cleaning and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The Isolator Row PLUS may be part of a treatment train system. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row PLUS is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row PLUS.

Looking down the Isolator Row PLUS from the manhole opening, ADS PLUS Fabric is shown between the chamber and stone base.

StormTech Isolator Row PLUS with Overflow Spillway (not to scale)



ISOLATOR ROW PLUS INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row PLUS should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row PLUS incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row PLUS, clean-out should be performed.

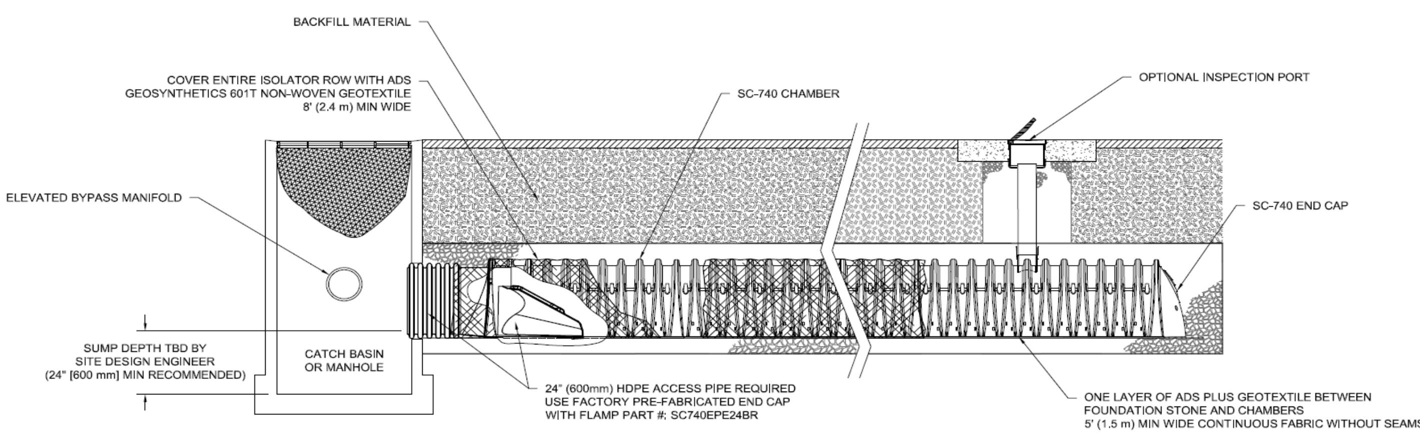
MAINTENANCE

The Isolator Row PLUS was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row PLUS while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row PLUS up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Row PLUS that have ADS PLUS Fabric (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row PLUS (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row PLUS.



ISOLATOR ROW PLUS STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row PLUS for sediment.

A) Inspection ports (if present)
   - i. Remove lid from floor box frame
   - ii. Remove cap from inspection riser
   - iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
   - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.

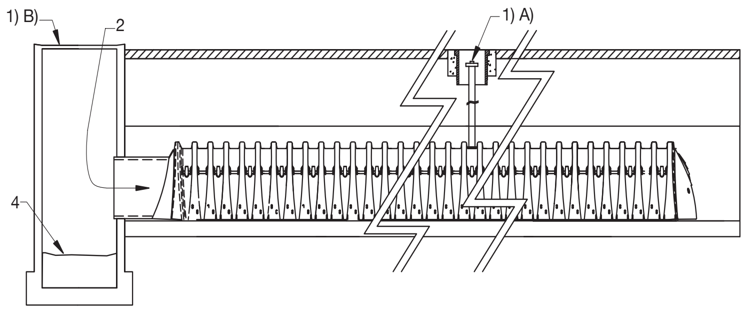
B) All Isolator Row PLUS
   - i. Remove cover from manhole at upstream end of Isolator Row PLUS
   - ii. Using a flashlight, inspect down Isolator Row PLUS through outlet pipe
     1. Mirrors on poles or cameras may be used to avoid a confined space entry
     2. Follow OSHA regulations for confined space entry if entering manhole
   - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row PLUS using the JetVac process.

A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
B) Apply multiple passes of JetVac until backflush water is clean
C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row PLUS, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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1-800-821-6710 www.ads-pipe.com

StormTech Maintenance Log

Project Name:
Location:

StormTech
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	Stadia Rod Readings				
Date	**Fixed point to chamber bottom (1)**	**Fixed point to top of sediment (2)**	**Sediment Depth (1) - (2)**	**Observations / Actions**	**Inspector**