NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Application for:

COASTAL AREA FACILITIES REVIEW ACT, COASTAL WETLANDS, AND FRESHWATER WETLANDS INDIVIDUAL PERMITS

NEW JERSEY WIND PORT PHASE 1B DEVELOPMENT
New Jersey Economic Development Authority

Lower Alloways Creek Township, NJ

February 8, 2023

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New Jersey Wind Port Parcel G, Substation, and Heavy Haul Road Permit Package, Prepared by Moffott and Nichol, Dated November 4, 2022.

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Chapter 1: Introduction

New Jersey Economic Development Authority (NJEDA) is submitting this application for a Coastal Area Facilities Review Act (CAFRA) Individual Permit, Coastal Wetland Individual Permit (IP), and Freshwater Wetlands IP for additional development at the New Jersey Wind Port (NJWP) adjacent to the Public Service Enterprises Group (PSEG) Salem and Hope Creek Generating Station (referred to as "Station", "Generating Station", "Facility") on Artificial Island, Lower Alloways Creek Township (LACT), Salem County, New Jersey (NJ) (herein referred to as "Project").

The NJWP is part of a larger sustainable energy initiative put forth by the State of New Jersey and is designed to support offshore wind energy development in New Jersey and along the entire eastern United States. The existing NJWP consists of the development of Area A for a marine port facility and marshalling area and is currently under construction. The proposed Project aims to increase the capabilities of the NJWP to better serve the growing offshore wind industry and consists of three main components: 1) the development of Parcel C1 to expand the laydown and storage area at the existing NJWP; 2) the construction of a new electrical substation and light manufacturing facility within Parcel G for the assembly, testing, and storage of nacelles for offshore wind turbines; and 3) the construction of a heavy haul road (herein referred to as HH Road) to provide access for the transport of materials and connect Parcel G to the port facility at Area A.

Site Location

The proposed Project area is located entirely within the existing PSEG Nuclear Salem and Hope Creek Generating Station property located on Artificial Island. Artificial Island is located in the southern region of the Delaware River Valley on the east bank of the Delaware River in Lower Alloways Creek Township, Salem County, New Jersey (Figures 1 and 2). The site is located 18 miles south of Wilmington, Delaware, 20 miles south of Philadelphia, Pennsylvania, and 7.5 miles south of Salem, New Jersey. Nuclear and fossil-fueled electric generating facilities, ancillary support equipment, switchyards, and related structures are located on the approximately 734 acres of the southern portion of Artificial Island (known as Block 26, 4, 4.01, 5, 5.01 of the Lower Alloways Creek Township tax maps) (see Figure 3).

Parcel C1 is located within Block 26, Lot 4.02 and is bounded by the port facility development within Area A to the west, coastal wetlands to the north, and an existing Confined Disposal Facility (CDF) owned and operated by PSEG to the east. Parcel G is located within Block 26, Lot 5.02 and is bounded by facilities for the Salem and Hope Creek Generating Station to the south and west, coastal wetlands to the north, and previously disturbed undeveloped land to the east. The proposed HH Road is located

along the southern boundary of Site C1 and will connect Area A to Parcel G within Block 26, Lot 4.02, and Block 26, Lot 5.02. These areas are further described below in the section entitled "Description of Proposed Work Areas."

Site Background

Artificial Island, which includes lands owned by PSEG, the State of New Jersey, and the U.S. Government (United States Army Corps of Engineers), was created, beginning early in the twentieth century, by disposing of hydraulic dredge spoils within a progressively enlarged diked area established around a natural bar that projected into the river. The United States Army Corps of Engineers (USACE) used the area as a dredge spoil disposal site for navigation channel maintenance until about 1955.

Construction of the Salem Generating Station site improvements began in the 1970s. Salem Unit No.1 commenced commercial operation in 1976, followed by Salem Unit No.2 in 1981. PSEG secured CAFRA Permit No. 74-014 in 1974 for the construction of the Hope Creek Generating Station which began commercial operations in 1986.

CAFRA Node Designation

The proposed project is located within the Salem and Hope Creek Generating Station property, which is designated by NJDEP as an Energy Facility Node. On July 24, 2002, the New Jersey State Planning Commission adopted Resolution 2002-11 approving amendment of the State Plan Policy Map to delineate a "Heavy Industry-Transportation-Utility Node" within the Environmentally Sensitive Planning Area 5. Further, the State Planning Commission adopted NJDEP recommendations that the boundary of the Node include 483 acres of the approximately 734 acre site (Figure 4). On December 2, 2002, NJDEP amended the CAFRA Planning Map to include the Energy Facility Node. The "Node is consistent with the CAFRA decision making process established at N.J.A.C. 7:7E-1.5(b)1viii, specifically to maintain and upgrade existing energy facilities in a manner consistent with the Coastal Management Rules." Following a land exchange between USACE and PSEG in 2022, a request was made to the New Jersey State Planning Commission to revise the CAFRA Energy Facility Node boundary to include additional lands within the Salem and Hope Creek Generating Station property. On September 1, 2021, the State Planning Commission Resolution 2021-14 passed which added areas within the PSEG Facility and additional lands to the north of the Facility to the State Plan Industrial/Utility Node map. A review by NJEP of CAFRA consistency was completed and an amendment to the CAFRA planning area was published in the New Jersey Register on June 6, 2022.

Existing Site Description

Wetlands

The creation of what is today known as Artificial Island, a man-made island in the tidal Delaware River that includes lands owned by PSEG, the State of New Jersey, and the federal government, originally began around 1900 with the USACE's disposal of dredge spoil materials within an artificially diked area that was established around a naturally occurring sandbar in the Delaware River. In the intervening years, the diked area has been progressively enlarged to accommodate additional spoils materials produced as a

result of maintenance dredging of the Delaware River navigation channel and other nearby navigable water bodies. Developed areas of the site are nominally 10 to 12 feet NAVD 88, which primarily comprises the PSEG-owned electric generation facilities on the southern end of the island. These parcels were part of the USACE's original dredge material disposal area on Artificial Island, but were transferred from the USACE on January 19, 1968 for the purposes of filling and the subsequent siting PSEG's electric generation facilities.

The Salem and Hope Creek Generating Station property contains both freshwater wetlands and NJDEP Coastal Wetlands (Figure 5). Coastal wetlands are limited to the shoreline of the tidally influenced Delaware River, as well as tributaries to the Delaware River along the northern site boundary, as mapped by the NJDEP Upper Wetland Boundary Mapping. While coastal wetlands along the property boundary are generally degraded and consist of vegetation dominated by the invasive Common Reed (*Phragmites australis)*, these wetlands extend away from the facility and CDF to the north where they transition into an extensive tidal community predominantly vegetated with smooth cordgrass (*Spartina alterniflora*) and other beneficial species. A delineation of the jurisdictional boundary of wetlands and waters was conducted for the entire Salem and Hope Creek Generating Station property in April 2020. A full copy of the Wetland Delineation Report is included as Attachment A.

As demonstrated in the Wetland Delineation Report and Figure 6, the majority of the proposed improvements are located outside of the boundary of coastal and freshwater wetlands and transition areas. Within Parcel C1, coastal wetlands located along the northern perimeter of the site within the NJDEP Upper Wetlands Boundary consist of degraded tidal wetlands dominated by dense stands of invasive common reed due to the construction of berms, dikes, and access paths for the CDF facilities. Seasonal pockets of standing water and a monoculture of common reed were also identified during the delineation within the CDF facility which includes Parcel C1, however, these features are no longer present as a result of routine operations and maintenance activities within the permitted CDF. Within Parcel G, four freshwater wetlands were identified within the Project area and are described in further detail below (see Figure 6).

Wetland B1

Wetland B1 is a freshwater wetland predominantly vegetated with common reed. Other species observed in Wetland B1 included broomsedge *(Andropogon virginicus),* and marsh elder *(Iva frutescens).* A linear drainage feature extends in a southeasterly direction into the main portion of Wetland B1.

Wetlands H1 and G1

Wetlands G1 and H1 are freshwater wetlands predominantly vegetated with common reed and olive. Wetland G1 and H1 include stormwater ditches that were constructed or formed along the northern edge of a dirt access road that runs behind the chiller buildings at the Salem and Hope Creek Generating Station. Over time, portions of the stormwater ditch overflowed and caused the wetland area to expand in the northeastern direction. The result is large wetland areas that narrows to more defined stormwater ditches as the flows converge into culverts that runs under a paved access road.

Wetland I1

Wetland I1 is a large expansive wetland community predominantly vegetated with common reed. Areas on the western portion of the wetland within Parcel G are characterized as a freshwater wetland community predominantly dominated by common reed. Portions on the easternmost extent of the wetland outside of the Project area contain tidally influenced ditches and support relic tidal marsh communities.

Surface Water and Floodplain

The site is bordered to the west by a tidal stretch of the Delaware River, in the region known as the Lower Delaware. The site is located within Watershed Management Area No. 5, Maurice, Salem, and Cohansey. The site is located in the Alloway Creek / Hope Creek Watershed (HUC11) and the Hope Creek / Artificial Island Sub-Watershed (HUC14). Regionally, tributaries to the Delaware River (including the Salem River and Hope Creek) and various smaller tidal tributaries intertwined within adjacent tidal marshes are also noted.

The Salem and Hope Creek Station is located along the shoreline of the tidal Delaware River. Significant areas of tidal marsh lands adjacent to the facility are located within the mapped 100 year floodplain. Historic development of the power plant has resulted in the majority of the facility being located at an elevation at or above the floodplain elevation.

The Delaware River near Artificial Island has been identified as a tidal null point of the Delaware Estuary (the point where ebb and flood tidal phase bottom currents are balanced). As a consequence, this portion of the Estuary is the longitudinal turbidity maximum of the system. The null point is also a location where fine sediments are likely to accumulate. Cook (2004) notes that USACE dredging in recent years (averaging 1 to 2 million metric tons per year) has been limited to the upper Delaware Estuary in the reach from RM 59 to RM 81 – this portion of the Estuary is a natural sediment sink in the absence of maintenance dredging.

Soils

Surface soils on Artificial Island are predominantly hydraulic fill (composed of clay, silt, sand and gravel with some organic material) deposited by the USACE during the first half of the 20th century (Figure 7). This dredged material, which is 25 to 30 feet thick, covers a 5 to 10 foot base of coarse sand and gravel (historic river bottom). Soils along the perimeter of Artificial Island are a mixture of hydraulic fill and tidal marsh soils. During early construction of the generating stations, dredged material would routinely be excavated as necessary and replaced with clean fill in order to facilitate construction activities. Consequently, the soil profile of Artificial Island varies depending on these past construction activities. According to the Salem County Soil Survey, soils on Artificial Island are classified as "Made Land, dredged river materials" (MF). Soils of this type are too variable to be rated or given a generalized engineering classification. This dredged fill material generally has a low permeability, which can lead to ponding of water and/or ephemeral surface saturated conditions.

Description of Proposed Work Areas

Parcel C1

Parcel C1 consists of open land that historically operated as a CDF for USACE and is currently permitted as a CDF for the Salem and Hope Creek Station. The site is located east of Parcel A and directly adjacent to the NJWP which is being developed as a marshalling port in support of offshore wind development. The site is comprised of open land with pockets of invasive common reed and is surrounded on all four sides by berms associated with the development of the NJWP and the PSEG operated CDF.

A delineation of the jurisdictional boundary of wetlands and waters was conducted for the entire Salem and Hope Creek Generating Station property in April 2020. Coastal wetlands defined by the NJDEP Upper Wetlands Boundary are present on the northern border of Parcel C1. Coastal wetlands within the proposed development area consist of remnant tidal wetlands of low habitat quality due to the construction of berms, dikes, outfall structure, and access paths for the operating CDF facility. Wetland vegetation in this area consists of a monoculture of the invasive common reed. No freshwater wetlands were identified within Parcel C1, however, seasonal pockets of standing water were observed at the time of the delineation which are no longer present as a result of routine operations and maintenance activities within the permitted CDF and recent construction activities for the NJWP.

Parcel G

Parcel G is situated to the east of the Salem and Hope Creek Generating Station cooling tower and to the north and east of the PSEG Learning and Development Center. The western portion of the of the site is comprised of hard packed gravel, and is currently utilized by PSEG for laydown and storage of materials and provides access through the site along paved access roads. The eastern portion of the site consists of undeveloped open land with emergent and scrub-shrub vegetation dominated by common reed and eastern red cedar (*Juniperus virginiana*). A gravel access road utilized by the facility bisects the eastern portion of the undeveloped site, and overhead high-voltage electrical transmission lines are present to the east outside of the development area.

Coastal wetlands defined by the NJDEP Upper Wetlands Boundary are present on the northern border of Parcel G. Coastal wetlands within the proposed development area consist of a monoculture of the invasive common reed growing along the slopes of the PSEG facility. A delineation of the jurisdictional boundary of wetlands conducted for the station in April 2020 identified four freshwater wetlands within Parcel G. Wetlands B1, H1, and G1 are associated with drainage features that convey stormwater from the surrounding gravel and parking areas. These wetlands are predominantly vegetated with the invasive common reed and provided limited value as wetlands or waterbodies.

Near the northeastern boundary of Parcel G, wetland I1 is a large expansive wetland community predominantly vegetated with common reed. The portion of the wetland located within Parcel G is characterized as a freshwater wetland with vegetation dominated by common reed, however, areas of the wetland outside of the Project area on its easternmost extent contain tidally influenced ditches and support relic tidal marsh communities. While mapped as bald eagle foraging and nesting habitat, and great blue heron foraging habitat by the iMAP Landscape Project, the overall quality of this area

has been degraded as a result of the previous fill activities during the creating of artificial island and the predominant and invasive nature of common reed which dominates the landscape. In addition, the habitats beyond the property boundaries become much improved, as the wetlands transition from common reed dominated areas to tidal wetlands predominantly vegetated with smooth cordgrass (*Spartina alterniflora*) and other beneficial species. Based on the disturbed nature of this wetland and the limited functions and values provided, combined with the existence of over 93,000 acres of bald eagle and great blue heron foraging and nesting habitat in the region, a resource value of exceptional value wetland is not appropriate, making these areas of intermediate value. The NJDEP also has identified species such as osprey (*Pandion haliaetus*) and northern harrier (*Circus cyaneus*) as occurring within the general vicinity of the Salem and Hope Creek Generating Stations. However, the disturbed nature of the site does not offer special habitats for rare species or unique habitats that support listed species.

HH Road

The proposed HH Road will be located along the southern perimeter of Parcel C1, and will provide a connection for the transportation of materials between Parcel G and the NJWP. An existing access road utilized by PSEG called the Material Center Access Road currently provides access from Parcel G to Area A, however, it does not have sufficient loading capacity for the transport of heavy offshore wind components via self-propelled modular transporters (SPMT) and would require crossing existing high-voltage power lines. Therefore, a new road is required to transport large components from the manufacturing facility to the port.

Originated in the northwest corner of Parcel G, the proposed HH Road will begin in an area east of the Salem and Hope Creek Generating Station cooling tower that is comprised of hard-packed gravel currently used for the storage and laydown of materials and parking of equipment. The HH Road will extend west following portions of the existing Material Center Access Road before reaching the high-voltage overhead power lines, where it will be routed to the north within the existing PSEG CDF facility to avoid crossing under them. The new HH Road alignment will then extend west through the existing CDF along the southern boundary of Parcel C1 to the NJWP at Area A. The area within the CDF where the HH Road is proposed is comprised of existing gravel access roads and vegetated berms constructed for the CDF with vegetation dominated by common reed.

Coastal wetlands defined by the NJDEP Upper Wetlands Boundary are present on the northern border of the HH Road outside of the CDF. Coastal wetlands within the proposed development area consist of a monoculture of the invasive common reed growing along the slopes of the PSEG facility. A stormwater pond and drainage ditches associated with the Salem and Hope Creek Generating Stations stormwater management facilities are present to the south of the proposed HH Road. Freshwater wetlands comprised of narrow stormwater drainage ditches are located south of the existing Materials Center Access Road outside of the proposed workspace. These areas exist as ordinary wetlands and/or waters and are not subject to regulated transition areas.

Purpose and Need

The offshore wind (OSW) industry in the northeast of the United States (US) is a relatively new industry that is poised for significant growth and development. Multiple states have passed legislation mandating offshore wind power to be included in their energy portfolio. As a result, several power purchasing agreements (PPAs) have been awarded to various offshore wind developers. These new offshore wind farms will be commercial scale (over 300 MW). Additional northeastern states are in process to solicit and award additional PPAs. Due to the awarded power purchases and the pipeline of soon to be awarded work, significant infrastructure retrofits/enhancements will be required to prepare the region to support the offshore wind farm supply chain.

Offshore wind components are extremely large and require port facilities with significant laydown areas and high loading capacities. Due to the size and weight of the components, they are typically transported over water rather than overland. Due to the limited manufacturing facilities in the northeast US capable of producing the required components; many of the required components will be imported from overseas manufacturers.

The New Jersey Economic Development Authority (NJEDA) is in the process of developing a marine terminal on land owned by PSEG located directly to the north of the existing Hope Creek Nuclear Generating Station in Lower Alloways Creek, New Jersey. This development, the NJWP is being designed and constructed to serve as a wind turbine generation (WTG) port facility to service the offshore wind industry. WTG port facilities typically serve to import, stage, preassemble and loadout large components for the commercial-scale wind installation sites. These components consist of tower sections, nacelles, and blades. Other components such as transition pieces and monopiles may also be moved through these types of facilities. The marine facilities for this project are referred to as Site A, which is the subject of a separate report.

The NJWP will serve as an import, storage, pre-assembly and loadout facility for wind towers, nacelles, and blades to service the offshore wind market. The marshalling port to be located at Sites A and C1 will have the potential to import and loadout the new GE Haliade-X 12 MW turbines as well as the associated towers and blades.

The New Jersey Board of Public Utilities (NJBPU) awarded 1.1 GW to the Ørsted Ocean Wind Project (led by Ørsted A/S) in June 2019. The proposed marshalling port will be online in time to support this project in 2023. New Jersey's analysis has determined that the port's delivery by 2023 will provide a distinct early mover advantage as the State looks to secure additional commitments for co-located component manufacturing.

Additionally, In June 2021, NJBPU awarded a total of 2.658 GW of OSW capacity to two projects, Atlantic Shores Offshore Wind, to be developed by Atlantic Shores Offshore Wind 1, LLC, a joint venture between EDF-RE Offshore Development, LLC and Shell New Energies US LLC, and Ocean Wind II, to be developed by Ørsted's Ocean Wind II, LLC. In February of 2022, the Bureau of Ocean Energy Management held an auction for more than 480,000 acres off the coasts of New York and New Jersey for six new offshore wind energy leases to be developed within the next decade.

The development of these projects as well as future operation and maintenance requirements at existing OSW farms will require additional infrastructure to service the industries needs. Development of the proposed project will allow for expanded marshalling and lay down areas as well as additional capabilities for the assembly of nacelles at the NJWP allowing it to better service the needs of the growing offshore wind industry.

In summary, if New Jersey is to meet its intended goals of combatting climate change through the encouragement of sustainable energy sources, development of enabling infrastructure and supply chain resources dedicated to offshore wind development is a critical first step. The expansion of development at the New Jersey Wind Port provides New Jersey with critical infrastructure to achieve the climate change goals and to make New Jersey a leader in the offshore wind supply chain market.

Chapter 2: Project Description

NJEDA is proposing additional development for the NJWP to increase the capabilities of the facility to better serve the offshore wind industry through the expansion of the laydown and marshalling areas, the construction of a new light manufacturing facility for the assembly, testing, and storage of nacelles for offshore wind turbines, and the construction of a new HH Road to provide access for the transport of materials between the facilities. The details regarding each portion of the proposed improvements are provided below.

Parcel C1

As shown in the attached Engineering Design Drawings prepared by Moffatt & Nichol, dated November 4, 2022, the proposed 9.5 acre development of the Parcel C1 will serve as an extension of the original port development and be comprised of flat, gravel covered open space. The proposed Port is designed to be flexible to suit the specific needs of various offshore wind developers. As a result, the layout of the Port is purposely sparse. This allows for customization based on user preference or unique aspects/size of a particular project. The flexibility also provides a means to extend the useful life of the NJWP by allowing for modifications without major reconstruction.

Typical duration of an offshore wind development ranges from 6 to 12 months. As a result, it is anticipated that temporary facilities will be utilized by most developers. Trailers, fabric structures or other low cost short duration structures will be utilized at the Port. Electrical connections will be provided for the future temporary installation. Potable water and sanitary sewerage will not be provided. These additional utilities will be temporary in nature and will include storage/holding tanks as appropriate. Light towers will be constructed within Parcel C1 to provide illumination for 24-hour operations.

To obtain the required stabilization and bearing capacity of the subsurface soils, the project involves surcharging the 9.5 acre site to an elevation of approximately 38 feet. Fill materials utilized for the surcharge of Area A will be kept onsite and reused for the surcharge of Parcel C1. During surcharge activities, temporary impacts will occur to NJDEP Mapped Coastal Wetlands to the north of the site as materials will need to be sloped beyond the site boundary to obtain adequate compaction. Perched water contained in void spaces within the soils will be removed using a series of wick drains and well points. Once the wick drains have been installed and the surcharge material brought to design height, the area will be monitored to evaluate when the desired subsurface soil characteristics are achieved. Once the engineers are satisfied with the results of the surcharge, excess material will be removed and utilized and repurposed as needed. Some slopes will remain on the northern boundary of the site following the

removal of the surcharge resulting in permanent impacts to mapped coastal wetlands. Ultimately, the site will be raised to an elevation of 10 feet NAVD 88, which is one (1) foot above the 100-year flood elevation.

Stormwater management compliance will be achieved utilizing a subsurface collection and treatment system (see Attachment B). Because Site C1 will function as an extension of Site A, the proposed stormwater management system will connect to the two outfall pipes of Site A that discharge directly to the Delaware River. Within Site C1, stormwater runoff from four drainage areas will be intercepted by trench drains that are oriented in the north-south direction and parallel to the Port in the adjacent Parcel A, which will convey the flow into a storm drain network. A stormwater management plan, designed by Moffatt & Nichol, dated November 4, 2022, has been prepared and is included in Attachment B.

The total area of disturbance related to the proposed development of Parcel C1 is 9.5 Acres. The development will result in both temporary and permanent impacts to coastal wetlands which are discussed in further detail in the project summary below and in Chapter 3, N.J.A.C. 7:7-9.27 Wetlands.

Parcel G

As shown in the attached Engineering Design Drawings prepared by Moffatt & Nichol, dated November 4, 2022, the proposed 30.8-acre development of Parcel G will consist of the construction of a light manufacturing facility and laydown and testing area for offshore wind components, and the construction of an electrical substation. To obtain the required stabilization and bearing capacity of the subsurface soils, the project involves surcharging the 30.8-acre site to an elevation of approximately 40 feet. Fill materials utilized for the surcharge of Area A will be kept onsite and reused for the surcharge of Parcel G. Surcharge will occur in two stages beginning on the eastern portion of Parcel G at the location of the manufacturing facility and parking area, with the second surcharge occurring in the western portion of the site within areas designated for laydown and testing of offshore wind components. Ultimately, the site will be raised to an elevation of approximately 12 feet NAVD 88, which is three (3) feet above the 100-year flood elevation.

The proposed manufacturing facility is approximately 1057 feet long by 508 feet wide and 95 feet tall. A small, paved ADA accessible parking area constructed of permeable pavement is proposed on the south side of the building, with the rest of the building being surrounded by asphalt. The laydown and testing area to the west of the building will be constructed of hard packed gravel. Existing access roads within the PSEG facility will be utilized to access the manufacturing facility. Water and sewer service will be fed from existing service lines at the PSEG facility. An electrical substation will be constructed in the southeast corner of Parcel G and will encompass the necessary electrical infrastructure to receive high voltage transmission electricity and distribute it to the remaining NJWP sites. Fire hydrants and high mast light poles will be constructed around the perimeter of the manufacturing facility to provide illumination for 24-hour operations. Stormwater will be managed through a series of manufactured treatment devices and discharged through adjacent wetlands to the north and existing PSEG

drainage ditch west of the site. Details of the stormwater management plan and design are included in Attachment B.

The total area of disturbance related to the proposed development of Parcel G is 30.8 acres. The development will result in permanent impacts to approximately 1.4 acres of freshwater wetlands and 3.6 acres of wetland transition area, and temporary impacts to 0.1 acre of freshwater wetlands and 0.1 acre of transition area for which a Freshwater Wetland Individual Permit is being requested, in accordance with the Freshwater Wetland Protection Act Rules at N.J.A.C. 7:7A. Compliance with N.J.A.C. 7:7A is provided in Chapter 4 of this application.

Heavy Haul Access Road

As shown on the attached Engineering Design Drawings prepared by Moffatt & Nichol, dated November 4, 2022, the proposed HH Road will consist of a new roadway constructed of dense aggregate to provide access for the transport of materials between Parcel G to the NJWP within Area A. Fill will be utilized to raise the roadway to an elevation ranging from approximately 12 to 14 feet. High mast lighting will be installed along the roadway and will be fed from existing electrical service at the PSEG facility. Stormwater runoff from the HH Road will be collected and filtered prior to discharge to existing stormwater management facilities onsite. Details of the stormwater management plan and design are included in Attachment B.

The total area of disturbance related to the installation of the proposed HH Road is approximately 3.7 acres. The development will result in temporary impacts to coastal wetlands which are discussed in further detail in the project summary below and in Chapter 3, N.J.A.C. 7:7-9.27 Wetlands.

Project Impacts Summary

The proposed project meets the definition of a major development, in accordance with N.J.A.C. 7:7-16.6 and the Stormwater Management Rules. The total area of disturbance for the proposed project is anticipated to be approximately 44 acres. The proposed improvements will result in approximately 31.4 acres of newly installed impervious surface (including the crushed stone areas) for a total impervious area of 310.4 acres covering 49% of the CAFRA Utility Node. Development of the project will result in both temporary and permanent impacts to coastal wetlands and freshwater wetlands for which a Coastal Wetland Individual Permit and Freshwater Wetland Individual Permit are being requested. Construction of the project will result in 1.3 acres of permanent impacts and 0.6 acres of temporary impacts to Coastal Wetlands for the development of Parcel C1 and the HH Road, and permanent impacts to approximately 1.4 acres of freshwater wetlands and 3.6 acres of wetland transition area, and temporary impacts to 0.1 acre of freshwater wetlands and 0.1 acre of transition area for the development of Parcel G. A plan showing all proposed temporary and permanent impacts to coastal and freshwater wetlands as a result of the development is included in Attachment C.

Chapter 3: Coastal Zone Management Rules Compliance Statement

The rules under New Jersey's Coastal Zone Management program are each provided in whole or in part in italicized font. The rule is followed by a description of how the proposed project is consistent with the Coastal Zone Management program. In many cases, rules established as part of the program are not directly applicable to the proposed site improvements. The following table provides a listing of the applicable policies, and the compliance statement for all of the policies are provided below. As noted below, because the project does not involve in-water impacts, many of the policies set forth in N.J.A.C. 7:7 do not apply to the project.

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES **Date last amended: February 20, 2020**	**Project Applicability**
7:7-1.4 Standards for evaluating permit applications	**See Compliance**
SUBCHAPTER 9. SPECIAL AREAS	***
7:7-9.1 Purpose and scope	***
7:7-9.2 Shellfish habitat	Not Applicable
7:7-9.3 Surf clam areas	Not Applicable
7:7-9.4 Prime fishing areas	Not Applicable
7:7-9.5 Finfish migratory pathways	Not Applicable
7:7-9.6 Submerged vegetation habitat	Not Applicable
7:7-9.7 Navigation channels	Not Applicable
7:7-9.8 Canals	Not Applicable
7:7-9.9 Inlets	Not Applicable
7:7-9.10 Marina moorings	Not Applicable
7:7-9.11 Ports	**See Compliance**
7:7-9.12 Submerged infrastructure routes	Not Applicable
7:7-9.13 Shipwreck and artificial reef habitats	Not Applicable
7:7-9.14 Wet borrow pits	Not Applicable
7:7-9.15 Intertidal and subtidal shallows	Not Applicable
7:7-9.16 Dunes	Not Applicable

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES Date last amended: February 20, 2020	Project Applicability
7:7-9.17 Overwash areas	Not Applicable
7:7-9.18 Coastal high hazard areas	**See Compliance**
7:7-9.19 Erosion hazard areas	**See Compliance**
7:7-9.20 Barrier island corridor	Not Applicable
7:7-9.21 Bay islands	Not Applicable
7:7-9.22 Beaches	Not Applicable
7:7-9.23 Filled water's edge	**See Compliance**
7:7-9.24 Existing lagoon edges	**See Compliance**
7:7-9.25 Flood hazard areas	**See Compliance**
7:7-9.26 Riparian zones	**See Compliance**
7:7-9.27 Wetlands	**See Compliance**
7:7-9.28 Wetlands buffers	**See Compliance**
7:7-9.29 Coastal bluffs	Not Applicable
7:7-9.30 Intermittent stream corridors	Not Applicable
7:7-9.31 Farmland conservation areas	Not Applicable
7:7-9.32 Steep slopes	**See Compliance**
7:7-9.33 Dry borrow pits	Not Applicable
7:7-9.34 Historic and archaeological resources	**See Compliance**
7:7-9.35 Specimen trees	**See Compliance**
7:7-9.36 Endangered or threatened wildlife or plant species habitats	**See Compliance**
7:7-9.37 Critical wildlife habitats	**See Compliance**
7:7-9.38 Public open space	**See Compliance**
7:7-9.39 Special hazard areas	**See Compliance**
7:7-9.40 Excluded Federal lands	**See Compliance**
7:7-9.41 Special urban areas	Not Applicable
7:7-9.42 Pinelands National Reserve and Pinelands Protection Area	Not Applicable
7:7-9.43 Hackensack Meadowlands District	Not Applicable

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES Date last amended: February 20, 2020	Project Applicability
7:7-9.44 Wild and scenic river corridors	**See Compliance**
7:7-9.45 Geodetic control reference marks	**See Compliance**
7:7-9.46 Hudson River waterfront area	Not Applicable
7:7-9.47 Atlantic City	Not Applicable
7:7-9.48 Lands and waters subject to public trust rights	**See Compliance**
7:7-9.49 Dredged material management areas	**See Compliance**
SUBCHAPTER 10. STANDARDS FOR BEACH AND DUNE ACTIVITIES	Not Applicable
SUBCHAPTER 11. STANDARDS FOR CONDUCTING AND REPORTING THE RESULTS OF AN ENDANGERED OR THREATENED WILDLIFE OR PLANT SPECIES HABITAT IMPACT ASSESSMENT AND/OR ENDANGERED OR THREATENED WILDLIFE SPECIES HABITAT EVALUATION	***
7:7-11.1 Purpose and scope	***
7:7-11.2 Standards for conducting endangered or threatened wildlife or plant species habitat impact assessments	Not Applicable
7:7-11.3 Standards for conducting endangered or threatened wildlife species habitat evaluations	Not Applicable
7:7-11.4 Standards for reporting the results of impact assessments and habitat evaluations	Not Applicable
SUBCHAPTER 12. GENERAL WATER AREAS	***
7:7-12.1 Purpose and scope	***
7:7-12.2 Shellfish aquaculture	Not Applicable
7:7-12.3 Boat ramps	Not Applicable
7:7-12.4 Docks and piers for cargo and commercial fisheries	Not Applicable
7:7-12.5 Recreational docks and piers	Not Applicable
7:7-12.6 Maintenance dredging	Not Applicable
7:7-12.7 New dredging	Not Applicable
7:7-12.8 Environmental dredging	Not Applicable
7:7-12.9 Dredged material disposal	Not Applicable

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES Date last amended: February 20, 2020	Project Applicability
7:7-12.10 Solid waste or sludge dumping	Not Applicable
7:7-12.11 Filling	Not Applicable
7:7-12.12 Mooring	Not Applicable
7:7-12.13 Sand and gravel mining	Not Applicable
7:7-12.14 Bridges	Not Applicable
7:7-12.15 Submerged pipelines	Not Applicable
7:7-12.16 Overhead transmission lines	Not Applicable
7:7-12.17 Dams and impoundments	Not Applicable
7:7-12.18 Outfalls and intakes	Not Applicable
7:7-12.19 Realignment of water areas	Not Applicable
7:7-12.20 Vertical wake or wave attenuation structures	Not Applicable
7:7-12.21 Submerged cables	Not Applicable
7:7-12.22 Artificial reefs	Not Applicable
7:7-12.23 Living shorelines	Not Applicable
7:7-12.24 Miscellaneous uses	Not Applicable
SUBCHAPTER 13. REQUIREMENTS FOR IMPERVIOUS COVER AND VEGETATIVE COVER FOR GENERAL LAND AREAS AND CERTAIN SPECIAL AREAS	***
7:7-13.1 Purpose and scope	**See Compliance**
7:7-13.2 Definitions	***
7:7-13.3 Impervious cover requirements that apply to sites in the upland waterfront development and CAFRA areas	**See Compliance**
7:7-13.4 Vegetative cover requirements that apply to sites in the upland waterfront development areas and CAFRA areas	**See Compliance**
7:7-13.5 Determining if a site is forested or unforested	**See Compliance**
7:7-13.6 Upland waterfront development area regions and growth ratings	Not Applicable
7:7-13.7 Determining the environmental sensitivity of a site in the upland waterfront development area	Not Applicable
7:7-13.8 Determining the developmental potential for a site in the upland waterfront development area	Not Applicable

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES Date last amended: February 20, 2020	Project Applicability
7:7-13.9 Determining the developmental potential for a residential or minor commercial development site in the upland waterfront development area	Not Applicable
7:7-13.10 Determining the development potential for a major commercial or industrial development site in the upland waterfront development area	Not Applicable
7:7-13.11 Determining the development potential for a campground development site in the upland waterfront development area	Not Applicable
7:7-13.12 Determining the development intensity of a site in the upland waterfront development area	Not Applicable
7:7-13.13 Impervious cover limits for a site in the upland waterfront development area	Not Applicable
7:7-13.14 Vegetative cover percentages for a site in the upland waterfront development area	Not Applicable
7:7-13.15 Coastal Planning Areas in the CAFRA area	**See Compliance**
7:7-13.16 Boundaries for Coastal Planning Areas, CAFRA centers, CAFRA cores, and CAFRA nodes; Non-mainland coastal centers	**See Compliance**
7:7-13.17 Impervious cover limits for a site in the CAFRA area	**See Compliance**
7:7-13.18 Vegetative cover percentages for a site in the CAFRA area	**See Compliance**
SUBCHAPTER 14. GENERAL LOCATION RULES	
7:7-14.1 Rule on location of linear development	**See Compliance**
7:7-14.2 Basic location rule	**See Compliance**
7:7-14.3 Secondary impacts	**See Compliance**
SUBCHAPTER 15. USE RULES	***
7:7-15.1 Purpose and scope	***
7:7-15.2 Housing	Not Applicable
7:7-15.3 Resort/recreational	Not Applicable
7:7-15.4 Energy facility	**See Compliance**
7:7-15.5 Transportation	**See Compliance**

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES Date last amended: February 20, 2020	Project Applicability
7:7-15.6 Public facility	**See Compliance**
7:7-15.7 Industry	**See Compliance**
7:7-15.8 Mining	Not Applicable
7:7-15.9 Port	Not Applicable
7:7-15.10 Commercial facility	Not Applicable
7:7-15.11 Coastal engineering	Not Applicable
7:7-15.12 Dredged material placement on land	Not Applicable
7:7-15.13 National defense facilities use rule	Not Applicable
7:7-15.14 High rise structures	**See Compliance**
SUBCHAPTER 16. RESOURCE RULES	***
7:7-16.1 Purpose and scope	**See Compliance**
7:7-16.2 Marine fish and fisheries	Not Applicable
7:7-16.3 Water quality	**See Compliance**
7:7-16.4 Surface water use	**See Compliance**
7:7-16.5 Groundwater use	**See Compliance**
7:7-16.6 Stormwater management	**See Compliance**
7:7-16.7 Vegetation	**See Compliance**
7:7-16.8 Air quality	**See Compliance**
7:7-16.9 Public access	**See Compliance**
7:7-16.10 Scenic resources and design	**See Compliance**
7:7-16.11 Buffers and compatibility of uses	**See Compliance**
7:7-16.12 Traffic	**See Compliance**
7:7-16.13 Subsurface sewage disposal systems	Not Applicable
7:7-16.14 Solid and hazardous waste	**See Compliance**
SUBCHAPTER 17. MITIGATION	**See Compliance**
SUBCHAPTER 18. CONSERVATION RESTRICTIONS	Not Applicable

A. 7:7-1.4 Standards for evaluating permit applications

(b) The Department shall issue a permit pursuant to CAFRA only upon a finding as required by N.J.S.A. 13:19-10 that the development:

1. *Conforms with all applicable air, water and radiation emission and effluent standards and all applicable water quality criteria and air quality standards;*

As described within this Chapter (specifically N.J.A.C. 7:7 16.3, 16.8 and 16.14 of this compliance document), the proposed project is expected to be in compliance with all applicable air, water, and radiation emission and effluent standards. The proposed development is not expected to increase levels of air emissions during operation. For the improvements within the development area, air emissions will generally be limited to typical construction vehicle and equipment emissions only during construction and operation when it is supporting an Offshore Wind Project and are expected to meet thresholds of NJDEP permits as required. Neither construction nor operation of the project will not result in the generation of radiation emissions or impact operation of the adjacent Nuclear Generating Station. Also, as described within this application (N.J.A.C. 7:7 16.6 of this compliance document), discharges as result of the project will be limited to treated stormwater discharges that, as described herein, will meet the NJDEP Stormwater Management Rules at N.J.A.C. 7:8.

2. *Prevents air emissions and water effluents in excess of the existing dilution, assimilative and recovery capacities of the air and water environments at the site and within the surrounding region;*

As described above and throughout this Chapter (N.J.A.C. 7:7-16.8 of this compliance document), the project will generate limited air emissions during construction and operation which will be regulated via coordination with the NJDEP for issuance of applicable general permits. Water effluents (N.J.A.C. 7:7-16.3 and 16.6 of this compliance document) will primarily be limited to treated stormwater and are not anticipated to adversely impact air or water quality of the region. The proposed light manufacturing building in Parcel G will be connected to existing water and sewer utilities currently operating at the existing Salem and Hope Creek Station. No new process industrial wastewater discharges are proposed as part of the development which could have the potential to adversely affect air and/or water quality in the surrounding region.

3. *Provides for the collection and disposal of litter, recyclable and solid waste in such a manner as to minimize adverse environmental effects and the threat to the public health, safety and welfare;*

Construction and operating activities will produce solid wastes, as documented in the compliance statement for N.J.A.C. 7:7-16.14 in this Chapter. Otherwise, the primary types of solid wastes that will be generated during operation will be consistent with current operations and generally include:

- normal refuse;
- recyclable materials; and,

- universal wastes.

Normal refuse consists primarily of trash, but does not include non-refuse solid waste materials identified above. The NJWP facility tenants will collect normal refuse at the site in large containers and it will be transported offsite for disposal. This is in accordance with the New Jersey Solid Waste Management Act and implementing regulations at N.J.A.C. 7:26.

4. *Would result in minimal feasible impairment of the regenerative capacity of water aquifers or other ground or surface water supplies;*

As described in great detail in this chapter, specifically the compliance statement for N.J.A.C. 7:7-16.4 and 16.5 within this document, the project is proposed within the tidal watershed of the Delaware River within the boundary of the Salem and Hope Creek Generating Station. The improvements will be constructed in areas of reduced permeability which results in limited recharge of groundwater in its current condition. Surrounding tidal marshes and wetlands which serve a vital function of recharging regional groundwater aquifers will not be impacted by development or operation of the constructed facilities. A dedicated water allocation is in place to support PSEG Nuclear operations. Expansion of NJWP activities is expected to require the installation of potable water wells to support personnel needs. Modification or utilization of the existing water allocation is anticipated to support these needs.

5. *Would cause minimal feasible interference with the natural functioning of plant, animal, fish and human life processes at the site and within the surrounding region;*

As described in detail in this compliance document (N.J.A.C. 7:7 subchapters 9 through 16 of this compliance document), the proposed improvements will be constructed within the site boundary of the existing Salem and Hope Creek Generating Station. Minimal impacts to vegetation are proposed, and improvements are proposed within either previously disturbed areas of the Salem and Hope Creek Generating Station property or in degraded undeveloped areas in close vicinity to existing facilities. Development and operation of the proposed improvements will not introduce additional interferences or impacts to the existing industrial facility.

6. *Is located or constructed so as to neither endanger human life or property nor otherwise impair the public health, safety and welfare;*

The proposed project is located within previously disturbed areas at the existing Salem and Hope Creek Generating facility. The development and operation will not result in the introduction of additional or new potential hazards to human health or property. The goal of the project is to support sustainable energy practices through the development of offshore wind energy which should have net benefits to public health, safety, and welfare.

7. *Would result in minimal practicable degradation of unique or irreplaceable land types, historical or archaeological areas and existing public scenic attributes at the site and within the surrounding region; and*

The proposed improvements are located within generally developed areas or degraded undeveloped areas of the existing Salem and Hope Creek Generating Station. As described in Chapter 1 of this application, the wetland areas that will be disturbed for the development of the project are coastal and freshwater wetlands located within previously disturbed areas. The majority of impacts will occur to freshwater wetlands associated with drainage features that convey stormwater from existing gravel and parking areas. Impacts to wetland I1 will occur to a small portion of a larger wetland complex that has been previously disturbed by other development within the Facility. As such, the proposed areas of disturbance will not degrade unique or irreplaceable land types. The proposed development will occur in previously disturbed areas and have the same general character of existing structures within the Station. As such, the proposed improvements are not anticipated to adversely impact existing viewsheds within the Station and surrounding area. Additionally, as described in further detail in the compliance statement for N.J.A.C. 7:7-9.34, there are no historic properties within the boundaries of Artificial Island. Due to the relative recent history of Artificial Island as a dredge spoil disposal location, it was not expected that any cultural resources would be present at the project site.

8. *Provides, pursuant to standards established in this chapter, onsite public access to the waterfront and adjacent shoreline, or offsite public access to the waterfront and adjacent shoreline if on-site public access is not feasible as determined by the Department.*

Security and public safety requirements preclude PSEG from providing public access to the Delaware River at the existing Salem and Hope Creek Generating Station (N.J.A.C. 7:7-9.48). In accordance with N.J.A.C. 7:7-16.9(n)3i, for existing industrial or public development, where the proposed activity consists of the maintenance, rehabilitation, renovation, redevelopment, or expansion that remains entirely within the parcel containing the existing development, no public access is required if there is no existing public access onsite. The proposed improvements will be wholly located within the existing Generating Station and no public access currently exists onsite. PSEG also maintains an extensive regional network of environmental restoration and public access facilities generated through the PSEG Estuary Enhancement Project. These facilities which have been developed and maintained by PSEG allow for continuous access to public areas in the vicinity of the Salem and Hope Creek Generating Station and within the regional Delaware Estuary.

B. Subchapter 9 - Special Areas

1. 7:7-9.11 Ports

Ports are water areas having, or lying immediately adjacent to, concentrations of shoreside marine terminals and transfer facilities for the movement of waterborne cargo (including fluids), and including facilities for loading, unloading and temporary storage. Port locations in New Jersey include, among others, Newark, Elizabeth, Bayonne, Jersey City, Weehawken, Hoboken, Woodbridge, Perth Amboy, Camden, Gloucester City, Paulsboro and Salem.

Any use which would preempt or interfere with port uses of this water area is prohibited.

The proposed development is not located within the immediate vicinity of any port facilities. Regionally, port facilities are located in Salem, Paulsboro, and Camden. However, the construction and operation of the facility will not adversely impact on-going operations of existing ports within the area. While the proposed project does not involve construction of a port, it will expand operations at the existing NJWP and will be utilized specifically to support offshore wind development projects. Between active offshore wind development project, the NJWP will remain inactive. As a result, periods where impacts to regional port facilities could be observed would be limited to active offshore wind construction. The anticipated vessel traffic at peak operation of the NJWP would be 10 to 12 vessels per month. For the anticipated 6 to 12-month span of an offshore wind project supported by the proposed port, approximately 160 vessels will moor at the Port, which amounts to less than 1 percent of the typical vessel traffic within the Delaware River. Therefore, compliance with **N.J.A.C. 7:7-9.11** is met because no existing Port facilities are located adjacent to the proposed development and regional Port facilities would not be adversely impacted.

2. 7:7-9.18 Coastal High Hazard Areas

Coastal high hazard areas are flood prone areas subject to high velocity waters (V zones) as delineated on the FIRM, and areas within 25 feet of oceanfront shore protection structures, which are subject to wave run-up and overtopping. The Coastal High Hazard Area extends from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. The inland limit of the V zone is defined as the V zone boundary line as designated on the FIRM or the inland limit of the primary frontal dune, whichever is most landward.

Residential development, including hotels and motels, is prohibited in coastal high hazard areas except for single family and duplex infill developments that meet the standards of N.J.A.C. 7:7-15.2(e) or (f) or development in Atlantic City. In general, commercial development is discouraged in coastal high hazard areas. Beach use related commercial development in coastal high hazard areas is conditionally acceptable within areas that are already densely developed. All permanent structures shall be set back a minimum of 25 feet from oceanfront shore protection structures, typically including bulkheads, revetments and seawalls and occasionally jetties and groins if constructed at inlets. This condition is applicable only to shore protection structures that are of sufficient height and strength to provide resistance to storm waves.

The Salem and Hope Creek Generating Station is located along the Delaware River. According to Federal Emergency Management Agency ("FEMA") Flood Insurance Rate Map 34033CO256C, dated 6/16/2016, the shoreline along the Delaware River is mapped as the VE Zone, or coastal high hazard zone to an elevation of 13 feet NAVD 88 (Figure 8). The proposed improvements are located outside of the VE zone, and therefore are not likely to receive high velocity floodwaters or impacts from storm surges. Therefore, compliance with **N.J.A.C. 7:7-9.18** is met because the proposed improvements are not located in any coastal high hazard area.

3. 7:7-9.19 Erosion Hazard Areas

Erosion hazard areas are shoreline areas that are eroding and/or have a history of erosion, causing them to be highly susceptible to further erosion, and damage from storms. Development is prohibited in erosion hazard areas.

The Salem and Hope Creek Generating Station has tidal shorelines along the western and southern boundaries. Most of these shorelines have existing industrialized development or some type of maintained erosion protection (i.e. rip rap, timber piles, steel bulkhead, etc.). As a result, the shoreline areas of the Station are limited to minimal impact from erosion. The Salem and Hope Creek Station does not currently meet the definition of an erosion hazard area and the proposed improvements are also located further inland where the effects of erosion are not expected. Compliance with **N.J.A.C. 7:7-9.19** is met because the activities are not located in any erosion hazard area and proposed improvements will include appropriate erosion control design measures.

4. 7:7-9.23 Filled Water's Edge

Filled water's edge areas are existing filled water, wetland, or upland areas lying between wetlands or water areas, and either (a) 1 or 2 below, whichever is closer to the water.

1. the upland limit of fill, or

2. the first paved public road or railroad landward of the adjacent water area.

The "waterfront portion" is defined as a contiguous area at least equal in size to the area within 100 feet of navigable water, measured from the mean high water line. This contiguous area must be accessible to a public road and occupy at least 30 percent of its perimeter along the navigable water's edge.

On filled water's edge sites with direct water access (that is, those sites without extensive intertidal shallows or wetlands between the upland and navigable water), development shall comply with the following:

1. Except as provided below, the waterfront portion of the site shall be:

i. Developed with a water dependent use

ii. Developed with an at-grade deck provided the deck is open to the general public, the use of the deck is water oriented, the deck is not enclosed and a public walkway is provided around the deck landward of the mean high water line at the water's edge or:

iii. Left undeveloped for future water dependent uses.

On the remaining non-waterfront portion of the site, provision of additional area devoted to water dependent or water-oriented uses may be required as a special case at locations which offer a particularly appropriate combination of natural features and opportunity for waterborne commerce and recreational boating.

On filled water's edge sites without direct access to navigable water, the area to be devoted to water related uses will be determined on a case-by-case basis.

Because Artificial Island was developed through the deposit of dredge spoils, the entire site can be defined as a filled waters edge area. No portion of the proposed improvements are located within 100 feet of the navigable Delaware River. The closest improvement to the River is Parcel C1 which is greater than 1000 feet from the mean high water line of the Delaware River. The proposed development is intended to improve capabilities at the existing NJWP facility to better support offshore wind development in New Jersey and along the Eastern United States.

Security and public safety requirements preclude PSEG from providing public access to the Delaware River at the existing Salem and Hope Creek Generating Station. In accordance with **N.J.A.C. 7:7-16.9(n)3i**, for existing industrial or public development, where the proposed activity consists of the maintenance, rehabilitation, renovation, redevelopment, or expansion that remains entirely within the parcel containing the existing development, no public access is required if there is no existing public access onsite. The project is consistent with **N.J.A.C. 7:7-16.9** because the proposed project will be located within the parcel containing the existing plant and no public access currently exists onsite.

The proposed activities are in compliance with **N.J.A.C. 7:7-9.23** because the proposed activities are to support a port which is a direct water dependent use and public access is not required as discussed in **N.J.A.C. 7:7-16.9** Public Access.

5. 7:7-9.24 Existing Lagoon Edges

Existing lagoon edges are defined as existing man-made land areas resulting from the dredging and filling of wetlands, bay bottom and other estuarine water areas for the purpose of creating waterfront lots along lagoons for residential and commercial development.

1. Existing Lagoon Edges extend upland to the limit of fill, or the first paved public road or railroad generally parallel to the water area, whichever is less.

Development of existing lagoon edges is acceptable provided the proposed development is compatible with existing adjacent land and water uses; existing retaining structures are adequate to protect the proposed development; new or reconstructed retaining structures are consistent with the filling rule at N.J.A.C. 7:7-12.11 and structural shore protection rule N.J.A.C. 7:7-15.11(g); and the development complies with the requirements for impervious cover and vegetative cover that apply to the site under N.J.A.C. 7:7-13.

By definition, Artificial Island can be considered an existing lagoon edge as the land was created by filling a portion of the Delaware River with dredge spoils by the USACE in the early twentieth century. However, the purpose of the proposed project is not to create a new development within an existing lagoon edge, but rather to re-develop previously disturbed areas within the existing facility to expand capabilities at the NJWP. As demonstrated in the compliance statement for N.J.A.C. 7:7-13, the project meets the requirements for impervious and vegetative cover. As such, the project is in compliance with **N.J.A.C. 7:7-9.24**.

6. 7:7-9.25 Flood Hazard Areas

Flood hazard areas are areas subject to flooding from the flood hazard area design flood, as defined by the Department under the Flood Hazard Area Control Act rules at N.J.A.C. 7:13. Flood hazard areas include those areas mapped as such by the Department, areas defined or delineated as an A or a V zone by FEMA, and any unmapped areas subject to flooding by the flood hazard area design flood. Flood hazard areas are subject to either tidal or fluvial flooding and the extent of flood hazard areas shall be determined or calculated in accordance with the procedures at N.J.A.C. 7:13-3.

In a tidal flood hazard area below the mean high water line, this rule applies only to the development of habitable buildings and the construction of railroads, roadways, bridges and/or culverts. Dedication of flood hazard areas for purposes of public open space is encouraged. In an undeveloped portion of a flood hazard area that is within 100 feet of a navigable water body, development is prohibited unless the development is one or two single-family homes or duplexes in accordance with N.J.A.C. 7:7-15.2 or is for a water dependent use. In a portion of an undeveloped flood hazard area that is 100 feet or farther from a navigable waterway, development is conditionally acceptable provided the development would not prevent potential water-dependent use in any portion of the flood hazard area within 100 feet of a navigable water body.

Development in flood hazard areas shall conform with the applicable design and construction standards of the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., and implementing rules at N.J.A.C. 7:13, except in lands regulated under the Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq., pursuant to N.J.S.A. 58:16A- 60; the Uniform Construction Code, N.J.A.C. 5:23; and the Federal flood reduction standards, 44 C.F.R. Part 60.

Development in a flood hazard area shall also comply with the requirements for impervious cover and vegetative cover under N.J.A.C. 7:7-13.

The flood hazard area design flood elevation is equal to the FEMA 100-year flood elevation at the project site location (Zone AE). Method 2 (FEMA tidal method) for delineating the flood hazard area is applicable due to the fact that the project area is located within the tidal zone of the Delaware River for which flood elevations have been established by FEMA. In accordance with N.J.A.C. 7:13-3.4(d), the flood hazard area design flood elevation is equal to the FEMA 100-year flood elevation of 9.0 feet NAVD88 (as shown on Figure 8) and the floodway limit is the top of the Delaware River bank at the site.

Figure 8 shows the location of the FEMA delineated 100-year (AE, 1% annual chance of occurrence) floodplain and the 500-year (X, 0.2% annual chance of occurrence) floodplain at the site. However, as illustrated in Figure 8, much of the proposed development area is located within the 100-year and 500-year floodplain. According to the Flood Insurance Rate Map (FEMA FIRM Panel No. 34033CO256C, dated 6/16/2016), the 100-year flood elevation is 9.0 feet NAVD88 at the site. As noted, all elevations in this report reference the National Geodetic Vertical Datum of 1988. The lower elevations are stillwater elevations and the higher elevations (13 feet NAVD88) are due to wave runup in areas mapped as the "VE" Zone along the Delaware River

shoreline. Figure 8 also shows the FEMA-delineated limit of moderate wave action ("VE" Zone) which is associated with conditions that presently exist on the site. Transect 3 on page 25 of the Flood Insurance Study gives the 500-year flood stillwater elevation (highest value in range) as 10.8 feet.

The project does not involve any activities within the regulated channel or floodway of the Delaware River, the VE Zone, or the regulated riparian zone. The Proposed improvements within Parcel C1, the HH Road, and a small area along the northern boundary of Parcel G are located within flood hazard areas regulated under the Flood Hazard Area Control Act Rules at N.J.A.C. 7:13. The proposed improvements do not require significant excavations or require the construction of a basement or other subsurface structures that would be located below the 100 year flood elevation. Following surcharge activities, the elevations within the proposed development areas will be raised above the flood hazard elevations as shown on the attached Engineering Design Drawings prepared by Moffatt & Nichol, dated November 4, 2022.

Additionally, no portion of the proposed improvements are located within 100 feet of the navigable Delaware River. The closest improvement to the River is the development within Parcel C1 which is greater than 500 feet from the mean high water line of the Delaware River. These improvements are proposed to expand capabilities within the existing NJWP to support offshore wind development and are therefore water dependent.

7:13-11.4 Requirements for a regulated activity in a flood fringe

In accordance with 7:13-11.4(d), project within a tidal flood fringe are not subject to the flood storage volume displacement limits of this section.

7:13-11.6 Requirements for a regulated activity in a documented habitat for threatened or endangered species

As discussed in the compliance statement for N.J.A.C. 7:7-9.36, Endangered or Threatened Wildlife or Plant Species Habitats, the proposed Project footprint contains areas mapped as potential habitat for threatened and/or endangered species along the northern boundary of Parcel C1 and the northern and eastern boundaries of Parcel G by NJDEP Landscape Project. However, because the areas of proposed disturbance are limited to previously disturbed areas comprised of dense stands of Common Reed (*Phragmites australis*), it is not anticipated that these area provides suitable foraging or nesting habitat for the Bald Eagle or foraging habitat for the Great Blue Heron, as mapped by Landscape Project. As such, adverse impacts to threatened and/or endangered species or associated habitat is not anticipated as a result of the proposed project.

7:13-12.2 Requirements for stormwater management

This project is located on an existing industrial site immediately adjacent to the tidal waters of the Delaware River. Accordingly, no groundwater recharge is proposed in accordance with N.J.A.C. 7:8-5.4(a)2.iii. The project is exempt from the runoff quantity standards in accordance with N.J.A.C. 7:8-5.4(a)3.iv. The project meets the water quality standards using a manufactured treatment device approved by the State of New

Jersey and which has been designed in accordance with the requirements of N.J.A.C. 7:8-5.5. Stormwater quality calculations are provided as required in Attachment B.

7:13-12.3 Requirements for excavation, fill and grading activities

The project involves filling to support the construction of laydown areas, an access road, and a light manufacturing facility for the NJWP above the flood hazard elevation. The project involves ground improvement such as gravel cover and asphalt to provide temporary construction support for offshore wind projects. Although the project area will be raised to maintain the site above the 100-year flood hazard elevation for storm hardening, the proposed development includes a stormwater management system that will collect, convey, and treat stormwater on the entire impervious area. The stormwater system will ensure water quality requirements are met for the ultimate discharge into the Delaware River and prevent overland flooding from stormwater.

The project does not involve slopes of greater than 50 percent. In addition, there are no existing structures within the project area that would be adversely affected by the proposed filling. In addition, the proposed project will not impact existing structures of the Salem and Hope Creek Generating Station including the stormwater facilities.

The project development requires minimal excavation for the installation of the stormwater system. The soils from these excavations will be utilized as fill onsite to raise the site elevation, in addition to the surcharged material, as such, they will not require disposal.

Therefore, the project is in compliance with **N.J.A.C. 7:13-12.3**.

7:13-12.4 Requirements for a structure

The project does not propose the construction of any structures within the flood hazard area. The proposed structure to be constructed within Parcel G is located outside of the flood hazard area. Therefore, the project is in compliance with **N.J.A.C. 7:13-12.4**.

7. 7:7-9.26 Riparian Zones

A riparian zone exists along every regulated water, except there is no riparian zone along the Atlantic Ocean nor along any manmade lagoon, stormwater management basin, or oceanfront barrier island, spit or peninsula. Regulated waters are defined in the Flood Hazard Area Control Act rules at N.J.A.C. 7:13-2.2.

The riparian zone includes the land and vegetation within each regulated water, as well as the land and vegetation within a certain distance of each regulated water. The portion of the riparian zone that lies outside of a regulated water is measured landward from the top of bank. If a discernable bank is not present along a regulated water, the portion of the riparian zone outside the regulated water is measured as described in this section.

Development in riparian zones shall conform with the requirements for a flood hazard area individual permit under the Flood Hazard Area Control Act rules at N.J.A.C. 7:13-9, 10 and 11 or, in the alternative as applicable, a flood hazard area permit-by-rule at N.J.A.C. 7:13-7 or a flood hazard Parcel General permit at N.J.A.C. 7:13-8.

In accordance with N.J.A.C. 7:13, "The Flood Hazard Area Control Act Rules", the width of the riparian zone ranges from 50 feet to 300 feet. The proposed activities are greater than 300 feet from any regulated water on site. Accordingly, compliance with **N.J.A.C. 7:7-9.26** will be met because there are no impacts to riparian zones.

8. 7:7-9.27 Wetlands

Wetlands or wetland means an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.

Development in wetlands defined under the Freshwater Wetlands Protection Act is prohibited unless the development is found to be acceptable under the Freshwater Wetlands Protection Act Rules, N.J.A.C. 7:7A. Development of all kinds in all other wetlands is prohibited unless the Department can find that the proposed development requires water access or is water oriented as a central purpose of the basic function of the activity (this rule applies only to development proposed on or adjacent to waterways); has no prudent or feasible alternative on a non-wetland site; will result in minimum feasible alteration or impairment of natural tidal circulation (or natural circulation in the case of non-tidal wetlands); and will result in minimum feasible alteration or impairment of natural contour or the natural vegetation of the wetlands.

The site contains both freshwater wetlands and mapped coastal wetlands. A delineation of the jurisdiction boundary of wetlands and waters was conducted for the entire Salem and Hope Creek Generating Station property in April 2020. The Wetland Delineation Report is included in this application as Attachment A. As described in Chapter 2 and in further detail in Chapter 4 of this application, the proposed project will result in 1.3 acres of permanent impacts and 0.6 acres of temporary impacts to Coastal Wetlands for the development of Parcel C1 and the HH Road, and permanent impacts to approximately 1.4 acres of freshwater wetlands and 3.6 acres of wetland transition area, and temporary impacts to 0.1 acre of freshwater wetlands and 0.1 acre of transition area for the development of Parcel G. Accordingly, NJEDA is requesting authorization under a Coastal Wetland Individual Permit, and a Freshwater Wetland Individual Permit in accordance with the Freshwater Wetland Protection Act Rules at N.J.A.C. 7:7A. Compliance with these rules is provided in Chapter 4 of this application.

NJEDA proposes to mitigate for these impacts through the purchase of mitigation bank credits from the Evergreen Environmental, LLC Abbot Creek mitigation bank in Fairfield, New Jersey. The Abbot Creek Bank is the only bank with a service area that includes Artificial Island and has coastal wetland credits authorized for sale.

Based on the proposed mitigation measures associated with the project, the project is in compliance with **N.J.A.C. 7:7-9.27**.

9. 7:7-9.28 Wetlands Buffers

Wetlands buffer or transition area means an area of land adjacent to a wetland which minimizes adverse impacts on the wetlands or serves as an integral component of the

wetlands ecosystem. Wider buffers than those noted below may be required to establish conformance with other Coastal Rules, including, but not limited to, 7:7-9.36 and 9.37.

1. *A wetlands buffer or transition area of up to 150 feet in width shall be established adjacent to all wetlands defined and regulated under the Freshwater Wetlands Protection Act.*

2. *For all other wetlands, including wetlands regulated under the Coastal Wetlands Act of 1970, a wetlands buffer of up to 300 feet shall be established.*

   All wetlands buffers associated with wetlands subject to the Freshwater Wetlands Protection Act shall be regulated in accordance with the Freshwater Wetlands Protection Act Rules, N.J.A.C. 7:7A Development is prohibited in a wetlands buffer around all other wetlands, unless it can be demonstrated that the proposed development will not have a significant adverse impact and will cause minimum feasible adverse impact, through the use of mitigation where appropriate on the wetlands, and on the natural ecotone between the wetlands and surrounding upland. The precise geographic extent of the actual wetlands buffer required on a specific site shall be determined on a case-by-case basis using these standards.

The site contains both freshwater wetlands and mapped coastal wetlands. A delineation of the jurisdiction boundary of wetlands and waters was conducted for the entire Salem and Hope Creek Generating Station property in April 2020. The Wetland Delineation Report is included as Attachment A of this application. Based on the Letter of Interpretation previously approved for this property, the wetlands located within and adjacent to the proposed Parcel G development are classified as intermediate resource value wetlands. Based on this determination, the proposed project will result in permanent impacts to approximately 1.4 acres of freshwater wetlands and 3.6 acres of wetland transition area, and temporary impacts to 0.1 acre of freshwater wetlands and 0.1 acre of transition area. These impacts and compliance with the Freshwater Wetland Protection Act Rules at N.J.A.C. 7:7A are provided in the compliance statement in Chapter 4 of this application. As such, the project is in compliance with **N.J.A.C. 7:7-9.28**.

10. 7:7-9.32 Steep Slopes

Steep slopes are land areas with slopes greater than 15 percent, which are not adjacent to the shoreline and therefore not coastal bluffs (see N.J.A.C. 7:7-9.29). Steep slopes include natural swales and ravines, as well as manmade areas, such as those created through mining for sand, gravel, or fill, or road grading. Slopes of less than 15 percent are not considered to be steep slopes.

Development on steep slopes is discouraged where wetlands, wetland buffers, intermittent stream corridors, threatened and endangered species habitats, riparian zones or water areas are located adjacent to or at the base of the slope and on steep slopes which are forested as defined at N.J.A.C. 7:7-13.5(c).

The proposed activities will be located completely within the site boundary of the Salem and Hope Creek Generating Station. Steep slopes do not occur at the facility. Compliance with **N.J.A.C. 7:7-9.32** is not applicable.

11. 7:7-9.34 Historic and Archaeological Resources

Historic and archaeological resources include objects, structures, shipwrecks, buildings, neighborhoods, districts, and man-made or man-modified features of the landscape and seascape, including historic and prehistoric archaeological sites, which either are on or are eligible for inclusion on the New Jersey or National Register of Historic Places.

Development that detracts from, encroaches upon, damages, or destroys the value of historic and archaeological resources is discouraged. Development that incorporates historic and archaeological resources in sensitive adaptive reuse is encouraged.

A Phase I evaluation, Paleosol evaluation, visual impact evaluation, and underwater survey have recently been completed as part of previous efforts to support potential future development at Artificial Island (MACTEC 2009). The evaluation has previously been reviewed in respective state historic preservation offices (NJ and DE). Phase I and II archaeological studies and submerged cultural resources studies and a visual impact assessment have been completed and submitted to the New Jersey Historic Preservation Office (NJHPO) and Delaware State Historic Preservation Office (DESHPO) as appropriate. Additional information and further assessments were also developed and submitted as requested by NJHPO and DESHPO. NJHPO concluded in a memo to the NRC dated December 6, 2013 that no historic properties were affected by the project as described in the ESP application (which includes the location of the proposed improvements) and subsequent cultural and historic submittals. Similarly, the DESHPO provided NRC a Finding of No Adverse Effects letter on September 25, 2013.

As a result of this study, no historic properties were found within the boundaries of Artificial Island. Due to the relative recent history of Artificial Island as a dredge spoil disposal location, it was not expected that any cultural resources would be present at the project site. Additionally, according to the New Jersey and National Registers of Historic Places, there are no Historic and Archaeological Resources located on the project site that would be impacted by the proposed development.

As a result, there will be no impacts to Historic and Archaeological Resources as a result of the proposed project and therefore compliance with **N.J.A.C. 7:7-9.34** is met.

12. 7:7-9.35 Specimen Trees

Specimen trees are the largest known individual trees of each species in New Jersey. The Department's Division of Parks and Forestry maintains a list of these trees (see "New Jersey's Biggest Trees", published by the Department's Division of Parks and Forestry, Summer 1991 for a listing of specimen trees). In addition, large trees approaching the diameter of the known largest tree shall be considered specimen trees. Individual trees with a circumference equal to or greater than 85 percent of the circumference of the record tree, as measured 4.5 feet above the ground surface, for a particular species shall be considered a specimen tree.

Development is prohibited that would significantly reduce the amount of light reaching the crown, alter drainage patterns within the site, adversely affect the quality of water reaching the site, cause erosion or deposition of material in or directly adjacent to the site, or otherwise injure the tree. The site of the tree extends to the outer limit of the buffer area necessary to avoid adverse impacts, or 50 feet from the tree, whichever is greater.

No trees on the site are identified in "New Jersey's Biggest Trees" nor are there any trees on the site with a circumference equal to or greater than 85 percent of the circumference of the NJDEP specified record tree. The impacts to existing vegetation are limited to herbaceous vegetation and shrubs. Compliance with **N.J.A.C. 7:7-9.35** is met because the activities will not impact specimen trees.

13. 7:7-9.36 Endangered or Threatened Wildlife or Plant Species Habitats

Endangered or threatened wildlife or plant species habitats are terrestrial and aquatic (marine, estuarine, or freshwater) areas known to be inhabited on a seasonal or permanent basis by or to be critical at any stage in the life cycle of any wildlife or plant identified as "endangered" or "threatened" species on official Federal or State lists of endangered or threatened species, or under active consideration for State or Federal listing. The definition of endangered or threatened wildlife or plant species habitats include a sufficient buffer area to ensure continued survival of the population of the species as well as areas that serve an essential role as corridors for movement of endangered or threatened wildlife. Absence of such a buffer area does not preclude an area from being endangered or threatened wildlife or plant species habitat.

Development of endangered or threatened wildlife or plant species habitat is prohibited unless it can be demonstrated, through an endangered or threatened wildlife or plant species impact assessment as described at N.J.A.C. 7:7-11, that endangered or threatened wildlife or plant species habitat would not directly or through secondary impacts on the relevant site or in the surrounding area be adversely affected.

The proposed activities are located at the existing Salem and Hope Creek Generating Station situated along the Delaware River on Artificial Island. The development is proposed within an existing, maintained CDF, as well as developed areas or previously disturbed open land at the Salem and Hope Creek Generating Station.

A detailed review was conducted to identify the potential presence of State or federally listed threatened or endangered plants or animals. As part of this review, available GIS databases were consulted including available NJDEP Landscape Project (v. 3.3) GIS information and United States Fish and Wildlife Service's Information for Planning and Conservation (IPaC); the IPAC species list generated for the project site is included in Attachment D. Additionally, a letter request to the NJDEP Natural Heritage letter was submitted and a response was received on October 5, 2022 (Attachment E), regarding the presence of State listed rare, threatened, or endangered wildlife and plant species on site and within one mile of the site.

Based on a review of NJDEP's Landscape Project Database, potential habitat for threatened and/or endangered species is mapped within the Project site (See Figure 9). The species and habitat mapped by NJDEP include State endangered Bald Eagle (*Haliaeetus leucocephalus*) nesting and foraging habitat and special concern species Great Blue Heron (*Ardea Herodias*) foraging habitat, as shown on Figure 9.

Because the area of proposed disturbance is limited previously disturbed areas and fringe portions of wetlands dominated by a monoculture of common reed (*Phragmites australis*), it is not anticipated that this area provides suitable foraging and nesting habitat for the Bald Eagle or foraging habitat for the Great Blue Heron, as mapped by Landscape Project. As such, adverse impacts to threatened and/or endangered species or associated habitat is not anticipated as a result of the proposed project.

Bald eagles (*Haliaeetus leucocephalus*) and peregrine falcons (*Falco peregrinus*) are occasionally seen in the vicinity of PSEG Site, but are not known to nest on the Salem and Hope Creek Generating Station structures; however, elevated structures and open fields near the Station could support nesting. Due to its successful recovery, the bald eagle has been de-listed and is no longer a federally listed species by the USFWS. Peregrine falcons were also removed from the federal list of endangered and threatened wildlife in 1999 (USFWS 1999), but the species remains on the NJ list of endangered species. The bald eagle was identified as important because of its status as a federally protected species (Migratory Bird Treaty Act, and Bald and Golden Eagle Protection Act) and state listed threatened species. Although bald eagles are occasionally observed onsite, there are no known bald eagle nests or suitable roosting habitat at the Station, primarily due to the absence of large trees or suitable structures that support nesting activities. Therefore, the proposed construction activities are not anticipated to impact bald eagle or peregrine falcon nesting or roosting habitat.

Osprey, a threatened species in New Jersey, is occasionally observed both onsite and in the vicinity of the Station. Active osprey nests were observed on transmission towers along the existing access road, on the transmission towers that run from the plant north towards Money Island Road, and on man-made nesting platforms constructed by PSEG along Alloways Creek. Natural osprey nesting sites such as large trees are not present onsite or within the proposed development area. The location of the proposed project is within a highly disturbed portion of the site, and no impacts to existing nesting platforms are expected by the proposed construction.

The results of the Natural Heritage data response indicate that aquatic species Atlantic sturgeon (*Acipenser oxyrinchus*), shortnose sturgeon (*Acipenser brevirostrum*), Atlantic green turtle (*Chelonia mydasreview*), Atlantic loggerhead (*Caretta caretta*), and Kemp's or Atlantic Ridley (*Lepidochelys kempii*) migration corridors and occupation habitat are identified as being on site and within one mile of the site. Since no work will be conducted in water, the proposed construction activities will not impact aquatic species.

As such, the project is in compliance with **N.J.A.C. 7:7-9.36**.

14. 7:7-9.37 Critical Wildlife Habitats

Critical wildlife habitats are specific areas known to serve an essential role in maintaining wildlife, particularly in wintering, breeding, and migrating. These include:

1. *Rookeries for colonial nesting birds, such as herons, egrets, ibis, terns, gulls, and skimmers; stopovers for migratory birds, such as the Cape May Point region; and natural corridors for wildlife movement merit a special management approach through designation as a Special Area.*
2. *Ecotones, or edges between two types of habitats, are a particularly valuable critical wildlife habitat. Many critical wildlife habitats, such as salt marsh waterfowl wintering areas, and muskrat habitats, are singled out as water or water's edge areas.*
3. *Definitions and maps of critical wildlife habitats are currently available only for colonial waterbird habitat in the 1979 Aerial Colony Nesting Waterbird Survey for New Jersey (NJDEP, Division of Fish and Wildlife). Until additional maps are available, sites will be considered on a case-by-case basis by the Division of Fish Wildlife.*

   Development that would directly or through secondary impacts on the relevant site or in the surrounding region adversely affect critical wildlife habitats is discouraged, unless minimal feasible interference with the habitat can be demonstrated; there is no prudent or feasible alternative location for the development; and the proposal includes appropriate mitigation measures. The Department will review proposals on a case-by-case basis.

The proposed improvements are not located along the edge of the Delaware River or within habitat areas mapped as valued wintering, breeding, and migrating habitat. As such, the proposed improvement areas do not meet the definition of critical wildlife habitats, and as such, the project is in compliance with **N.J.A.C. 7:7-9.37**.

15. 7:7-9.38 Public Open Space

Public open space constitutes land areas owned or maintained by State, Federal, county and municipal agencies or private groups (such as conservation organizations and homeowner's associations) and used for or dedicated to conservation of natural resources, public recreation, visual or physical public access or, wildlife protection or management. Public open space also includes, but is not limited to, State Forests, State Parks, and State Fish and Wildlife Management Areas, lands held by the New Jersey Natural Lands Trust (N.J.S.A. 13:1B-15.119 et seq.), lands held by the New Jersey Water Supply Authority (N.J.S.A. 58:1B-1 et seq.) and designated Natural Areas (N.J.S.A. 13:1B-15.12a et seq.) within DEP-owned and managed lands.

New or expanded public or private open space development is encouraged at locations compatible or supportive of adjacent and surrounding land uses. Development that adversely affects existing public open space is discouraged.

The proposed activities are completely located within the site boundary of the Salem and Hope Creek Generating Station and will not be located on lands that are used for or

dedicated to conservation of natural resources, public recreation, visual or physical public access, wildlife protection or management.

Accordingly, the proposed activities will be consistent with **N.J.A.C. 7:7-9.38** because the activities will not occur on areas that are public open spaces.

16. 7:7-9.39 Special Hazard Areas

Special hazard areas include areas with a known actual or potential hazard to public health, safety, and welfare, or to public or private property, such as the navigable air space around airports and seaplane landing areas, potential evacuation zones and areas where hazardous substances as defined at N.J.S.A. 58:10-23.11b-k are used or disposed, including adjacent areas and areas of hazardous material contamination.

Coastal development, especially residential and labor-intensive economic development, within special hazard areas is discouraged. All development within special hazard areas must include appropriate mitigating measures to protect the public health and safety.

The Salem and Hope Creek Generating Station is an operating Nuclear Generating Station which includes various potential hazards common to large industrial/power generation facilities. Safeguards are in place from a safety as well as security stand point to minimize these potential hazards. These safeguards are regulated and routinely reviewed through compliance programs of the NJDEP, USEPA, and USNRC.

Transformers typically contain varying quantities (depending on size) of mineral oil used for cooling. Circuit breakers and other smaller pieces of equipment commonly found within switchyards no longer contain liquid coolants and are referred to as “dry”. In all cases use of PCBs, which were previously utilized in these types of equipment, have been eliminated. All pieces of equipment that contain liquid materials, will include appropriate secondary containment and leak detection components as required and regulated through the USEPA SPCC program and NJDEP DPCC/DCR program. The proposed improvements are not located within areas of the facility that operate for electric generation.

The proposed development of Parcel C1 and the HH Road are located in a portion of the Salem and Hope Creek Station which has remained relatively undeveloped throughout the operation of the facility. The site is currently utilized for disposal of material from maintenance dredging activities for the Salem and Hope Creek intake structures as well as desilting of intake bays and the Hope Creek cooling tower. The proposed Development of Parcel G is located in a portion of the PSEG facility which previously existed as open space for laydown and storage of materials, and undeveloped land. No industrial activities were located within these areas.

Public health and safety will be protected because PSEG management is deeply committed to properly managing all of its facilities in accordance with applicable regulatory requirements, and in a manner that protects the public health, maximizes worker safety, and protects the environment. Compliance with **N.J.A.C. 7:7-9.39** is met

because the proposed project will not present a special hazard area, nor will it impact any special hazards areas on site.

17. 7:7-9.40 Excluded Federal Lands

Excluded Federal lands are those lands, the use of which is, by law, subject solely to the discretion of or held in trust by the Federal Government, its officers or agents. These lands are excluded from the coastal zone as required by Section 304 of the Federal Coastal Zone Management Act.

Federal actions on excluded Federal lands that affect any land or water use, or natural resource of the coastal zone shall be consistent with the Coastal Zone Management rules to the maximum extent practicable. The effects on the land or water use or natural resource may be direct, indirect, cumulative, secondary or reasonably foreseeable effects.

The proposed improvements are not proposed on Federal Lands. Although Artificial Island was created by the USACE from the placement of dredge spoils in the early twentieth century, the majority of Artificial Island is owned and operated by PSEG as a nuclear generating facility and will be leased by the NJEDA. The remaining portions of Artificial Island are owned and operated by Federal agencies, such as the USCAE and the U.S. Department of Agriculture. These properties will not be affected by the proposed site improvements.

Therefore, the proposed project is in compliance with **N.J.A.C. 7:7-9.40**.

18. 7:7-9.44 Wild and Scenic River Corridors

Wild and scenic river corridors are all rivers designated into the National Wild and Scenic Rivers System and any rivers or segments thereof being studied for possible designation into that system pursuant to the National Wild and Scenic Rivers Act (16 U.S.C. 1271-1278). For rivers designated into the national system, the wild and scenic river corridor shall include the river and adjacent areas located within one-quarter mile from the mean high water line on each side of the river until a Federal River Management Plan has been adopted, after which time the wild and scenic corridor shall be the area defined in the adopted plan. For rivers under study for possible designation into the national system, the wild and scenic river corridor shall include the river and adjacent areas extending one-quarter mile from the mean high water line on each side of the river.

Development that would have a direct and adverse effect on any "outstandingly remarkable resource value" for which the river was designated or is being studied for possible designation into the National Wild and Scenic Rivers System is prohibited.

Portions of the Delaware River are designated for inclusion in the National Wild and Scenic Rivers System. The proposed Port will be developed at the Salem and Hope Creek Generating Station which is located in the lower portions of the Delaware River. In this location the river is not classified as a wild, scenic, or recreational river segments under the criteria of the National Wild and Scenic Rivers System. Compliance with

N.J.A.C. 7:7-9.44 is met because the activities will not affect any wild and scenic river corridors.

19. 7:7-9.45 Geodetic Control Reference Marks

Geodetic control reference marks are traverse stations and benchmarks established or used by the New Jersey Geodetic Control Survey pursuant to P.L.1934, c.116.

The disturbance of a geodetic control reference mark is discouraged. When a geodetic control reference mark must be moved, raised or lowered to accommodate construction, the New Jersey Geodetic Control Survey shall be contacted at least 60 days prior to disturbance, and arrangements shall be made to protect the position. If the position can not be protected, it may be altered in position after approval by the New Jersey Geodetic Control Survey and under the supervision of a licensed professional engineer or land surveyor using standard methods.

There are no Geodetic Control Reference Marks within the proposed improvement areas. According to mapping provided by the National Oceanic and Atmospheric Administration (NOAA) National Geodetic Survey, there are several markers located within the Salem and Hope Creek Generating Station Facility, located along the shoreline of the Delaware River. None of these markers are located within the areas of proposed improvements, as none of the activities are proposed along the shoreline. Therefore, compliance with **N.J.A.C. 7:7-9.45** will be met because protection of existing geodetic control reference marks, or their subsequent replacement, will be provided as necessary.

20. 7:7-9.48 Lands and Waters Subject to Public Trust Rights

Lands and waters subject to public trust rights are tidal waterways and their shores, including both lands now or formerly below the mean high water line, and shores above the mean high water line. Tidal waterways and their shores are subject to the Public Trust Doctrine and are held in trust by the State for the benefit of all the people, allowing the public to fully enjoy these lands and waters for a variety of public uses.

Development that adversely affects lands and waters subject to public trust rights is discouraged. Public access to lands and waters subject to public trust rights shall be provided in accordance with the public trust rights rule, N.J.A.C. 7:7-16.9.

The proposed improvements will be located within the Salem and Hope Creek Generating Station and completely bounded by the property boundary of the operating power plant. Due to the sensitive nature of the Nuclear power generating facility and the inherent security and safety considerations, public access has previously and will continue to be restricted to authorized personnel only. Public access to the facility and associated lands is not possible and could result in significant public security and safety issues. PSEG Nuclear has previously developed and currently manages a series of public access facilities associated with the Estuary Enhancement Project which included restoration of large areas of coastal wetland communities and management of public access fishing piers, interpretive boardwalks, and boat ramps. These public access facilities are located in the immediate vicinity of the Salem and Hope Creek Station as

well as regional within the Delaware Estuary. The proposed development will not result in impacts to the existing security and safety considerations which prevent public access to the facility or limitations on pre-existing public access facilities managed by PSEG Nuclear.

As noted, security and public safety requirements preclude PSEG from providing public access to the Delaware River at the existing Salem and Hope Creek Generating Station. In accordance with **N.J.A.C. 7:7-16.9(n)3i**, for existing industrial or public development, where the proposed activity consists of the maintenance, rehabilitation, renovation, redevelopment, or expansion that remains entirely within the parcel containing the existing development, no public access is required if there is no existing public access onsite. The project is consistent with **N.J.A.C. 7:7-16.9** because the proposed project will be located entirely within the parcel containing the existing plant and no public access currently exists onsite.

21. 7:7-9.49 Dredged Material Management Areas

A dredged material management area is an area documented through historical data, including, but not limited to, aerial photography, historic surveys, and/or previously issued permits, as having been previously used for the placement of sediment associated with the dredging of State and/or Federal navigation channels and marinas.

Development that changes the land use of a dredged material management area owned by a State or Federal agency is discouraged.

The proposed improvements to Parcel C1 will be developed on a portion of the existing dredge material management CDF licensed and operated by PSEG Nuclear for placement of maintenance dredge material from intake structures and desilt from intake bays and the Hope Creek cooling tower. The CDF is an approximately 60 acre facility that will be divided to include the NJWP and a reconfigured CDF to continue to support maintenance dredge and desilt operation for the Salem and Hope Creek Generating Station. The reconfigured PSEG Nuclear CDF will be sized to have sufficient capacity to meet the operational needs of the Salem and Hope Creek Generating Station while complying with USACE and NJDEP requirements and guidelines for CDF operation and maintenance.

Accordingly, compliance with **N.J.A.C 7:7-9.49** is met because while an existing private dredge material management facility will be included as part of the proposed development, utilization of the facility for dredge material disposal will be maintained.

C. Subchapter 12 - General Water Areas

General Water Areas are all water areas which are located below either the spring high water line or the normal water level of non-tidal water that are subject to this subchapter and to Special Area rules.

Because the proposed project does not involve improvement within tidal waterbodies (i.e., below the spring high water line), the policies set forth in N.J.A.C. 7:7-12 are not applicable to the project. Impacts proposed to wetland areas are addressed in Chapter 4,

which provides the compliance statement under the Freshwater Wetland Protection Act Rules at N.J.A.C. 7:7A.

D. Subchapter 13 - Requirements for Impervious Cover and Vegetative Cover for General Land Areas and Certain Special Areas

The following sections describe the impervious surface and vegetative disturbance related to the proposed Project and demonstrate compliance with N.J.A.C. 7:7-13 within a CAFRA node.

1. 7:7-13.1 Purpose and scope

This subchapter sets forth requirements applicable in general land areas and certain special areas for impervious cover and vegetative cover on sites in the upland waterfront development area and in the CAFRA area. These requirements are set forth as follows:

1. *For a site in the upland waterfront development area, the applicable impervious cover limits and vegetative cover percentages are determined under N.J.A.C. 7:7-13.6 through 13.14, based on the site's growth rating, development potential, and environmental sensitivity; and*
2. *For a site in the CAFRA area, the applicable impervious cover limits and vegetative cover percentages are determined under N.J.A.C. 7:7-13.15 through 13.19, based on the site's location in a coastal center; in a Coastal Planning Area; in a CAFRA center, CAFRA core, or CAFRA node; or on a military installation.*

The following sections demonstrate compliance with the impervious cover limits and vegetative cover percentages of the site in the site in a CAFRA Node.

2. 7:7-13.3 Impervious cover requirements that apply to sites in the upland waterfront development and CAFRA areas

This section sets forth impervious cover requirements that apply to sites in the upland waterfront development and CAFRA areas. Impervious cover limits, specific to each of these areas, are found at N.J.A.C. 7:7-13.13 and 13.17.

The proposed Project is located within the site boundary of the Salem and Hope Creek Generating Station located on Artificial Island. The Station is located entirely within the CAFRA review zone and specifically within the PSE&G Energy Facility CAFRA Node according to CAFRA Planning Maps (Figure 4). The allowable impervious cover for a CAFRA Node is 80%.

3. 7:7-13.4 Vegetative cover requirements that apply to sites in the upland waterfront development and CAFRA areas

This section sets forth vegetative cover requirements that apply to sites in the upland waterfront development and CAFRA areas. Vegetative cover percentages, specific to each of these areas, are found at N.J.A.C. 7:7-13.14 and 13.18. More trees may be planted or preserved than required, and if so, the herb/shrub area shall be reduced proportionately.

The area (in acres) of the site that shall be planted in trees and/or preserved in trees is calculated under N.J.A.C. 7:7-13.18.

4. 7:7-13.5 Determining if a site is forested or unforested

The vegetative cover percentage that applies to a site in the upland waterfront development area or CAFRA area varies depending on whether the site is forested. If only a portion of a site is forested, separate vegetative cover percentages shall be calculated for the forested and unforested portions of the site.

The site is considered unforested as defined under this section.

5. 7:7-13.16 Boundaries for Coastal Planning Areas, CAFRA centers, CAFRA cores, and CAFRA nodes; non-mainland coastal centers

The boundaries of the Planning Areas, the community development boundaries of centers, and the boundaries of cores and nodes formally approved by the State Planning Commission as of August 1, 1999, are incorporated by reference into this subchapter. These boundaries are the boundaries of the Coastal Planning Areas, CAFRA centers, CAFRA cores, and CAFRA nodes and shall be operative for the purposes of applying the requirements for impervious cover and vegetative cover under this subchapter, unless the Department, in accordance with (b) and (c) below, accepts a State Planning Commission formally approved new or changed boundary, or unless the Department, in accordance with (b) and (e) below, rejects a State Planning Commission formally approved new or changed boundary and subsequently promulgates a revised boundary.

On July 24, 2002, the New Jersey State Planning Commission adopted Resolution 2002-11 approving amendment of the State Plan Policy Map to delineate a "Heavy Industry-Transportation-Utility Node" within the Environmentally Sensitive Planning Area 5 on site. Further, the State Planning Commission adopted NJDEP recommendations that the boundary of the Node include 483 acres of the approximately 734 acre site. On December 2, 2002, NJDEP amended the CAFRA Planning Map to include the PSE&G Energy Facility Node. Following a land exchange between USACE and PSEG in 2022, a request was made to the New Jersey State Planning Commission to revise the CAFRA Energy Facility Node boundary to include all lands within the Salem and Hope Creek Generating Station property. On September 1, 2021, the State Planning Commission Resolution 2021-14 passed which added all areas within the Facility to the State Plan Industrial/Utility Node map. A review by NJEP of CAFRA consistency was completed and an amendment to the CAFRA planning area was published in the New Jersey Register on June 6, 2022. The Node boundary at the Salem and Hope Creek site is shown on Figure 4

6. 7:7-13.17 Impervious cover limits for a site in the CAFRA area

The impervious cover limit for a site in the CAFRA area shall be determined as follows: 1. If a site is located in a CAFRA center, CAFRA core, or CAFRA node, the impervious cover limit is determined under (c) below. Note that the impervious cover limit for such a site is calculated based on the acreage of the total land area on the site, as opposed to the acreage of the net land area on the site.

As determined in Table H (Percentages for Calculating Impervious Cover Limits under N.J.A.C. 7:7-13.17) under this section, the impervious cover limit for a site in a CAFRA Node is 80%. The existing impervious cover for the site is 44% (Figure 10). The project proposes an increase in impervious cover within the CAFRA Node of approximately 31.4 acres, including new pavement, building foundations, and crushed gravel installation. As such the project will result in an increase in impervious surface, for a total impervious surface of 310.4 or 49% of the site.

Therefore, compliance with **N.J.A.C. 7:7-13.7** is met.

7. 7:7-13.18 Vegetative cover percentages for a site in the CAFRA area

The area (in acres) on a site in the CAFRA area in which trees and/or herb/shrub vegetation shall be planted or preserved is calculated under this section.

2. To determine the area (in acres) of herb/shrub vegetation preservation or planting on the site, subtract both the acreage of the impervious cover allowed under N.J.A.C. 7:7-13.17 and the acreage of tree planting and/or preservation required under (a)1 above from the acreage of the net land area on the site.

(b) If the sum of the acreage of tree planting required under (a)1 above plus the acreage of either the existing impervious cover on the site as determined under N.J.A.C. 7:7-13.17(c), (d), (e)3, or (f) or the acreage covered by buildings and/or asphalt or concrete pavement as determined under N.J.A.C. 7:7-13.17(e)2, exceeds the net land area on the site, as determined under N.J.A.C. 7:7- 13.3(e), then trees shall be planted in area (in acres) remaining after the acreage of impervious cover or acreage covered by buildings and/or asphalt or concrete pavement is subtracted from the acreage of the net land area on the site.

As determined in Table I (Tree Preservation and Planting Percentages for Forested and Unforested Sites) under this section, the vegetative cover percentage for an unforested site in a CAFRA Node is 0%. Therefore, no vegetation needs to be planted or preserved for the proposed improvements and compliance with **N.J.A.C. 7:7-13.18** is met.

E. Subchapter 14 – General Location Rules

1. 7:7-14.1 Rule on Location of Linear Development

A linear development shall comply with the specific location rules to determine the most acceptable route, to the maximum extent practicable.

The proposed project consists of the development of facilities to expand capabilities at the NJWP to support the offshore wind industry. The project does not involve linear development and therefore, this rule is not applicable.

2. 7:7-14.2 Basic Location Rule

A location may be acceptable for development under N.J.A.C. 7:7-9, 12, 13, and 14, but the Department may reject or conditionally approve the proposed development of the location as reasonably necessary to:

1 Promote the public health, safety, and welfare;

2. Protect public and private property, wildlife and marine fisheries; and

3. Preserve, protect and enhance the natural environment.

One of the key provisions of the state planning goals is to encourage development, redevelopment and economic growth in locations that are well situated with respect to present or anticipated public services or facilities and to discourage development where it may impair or destroy natural resources or environmental qualities.

In accordance with the CAFRA Planning Map, the project site is designated as an Energy Facility Node. The proposed NJWP is in alignment with the designation of the site as an Energy Facility Node. Although the project does not propose an electric generating facility, it is being developed to support offshore wind construction, which is a renewable source of energy generation that is generally new to the east coast and will result in energy production from a clean, renewable source. Accordingly, the proposed project is in compliance with **N.J.A.C. 7:7-14.2**.

3. 7:7-14.3 Secondary Impacts

Secondary impacts are the effects of additional development likely to be constructed as a result of the approval of a particular proposal. Secondary impacts can also include traffic increases, increased recreational demand and any other offsite impacts generated by onsite activities which affect the site and surrounding region.

Coastal development that induces further development shall demonstrate, to the maximum extent practicable, that the secondary impacts of the development will satisfy this chapter. The Department may restrict coastal development from connecting to an approved infrastructure in order to prevent adverse impacts to special areas as defined at N.J.A.C. 7:7-9 and to protect and preserve coastal resources.

The proposed Project will be developed at the existing Salem and Hope Creek Generating Station. The new development will be located in portions of the facility which are currently utilized for the placement of dredge spoils from maintenance dredging and desilting of power plant intake structures, or previously disturbed areas utilized for the laydown or storage of equipment and materials. Operation of the proposed facilities will include receiving delivery of large components of offshore wind turbines via ocean going vessel, final preparation of the components, and loading onto specialized installation vessels. It is anticipated that most deliveries to the Port will be delivered via ocean going vessel with few deliveries by over the road transportation. It is also anticipated that access to the NJWP for the relatively small work force will be via the existing access road and security check point. No improvements beyond repaving or updates to signage are anticipated to the existing access. Nominal secondary impacts will occur as a result of the proposed project. The proposed project will have no impacts to public infrastructure or recreational demand. There will be a temporary increase in traffic and noise during construction due to the anticipated construction work force and delivery and installation of project materials and components. It is not anticipated that these increases in traffic during construction will result in the need to require improvements to local roads.

Therefore, there will not be any adverse Secondary Impacts related to the proposed development and the development is consistent with **N.J.A.C. 7:7-14.3.**

F. Subchapter 15 - Use Rules

1. 7:7-15.4 Energy Facility

Energy facilities include facilities, plants or operations for the production, conversion, exploration, development, distribution, extraction, processing, or storage of energy or fossil fuels. Energy facilities also include onshore support bases and marine terminals. Energy facilities do not include operations conducted by a retail dealer, such as a gas station, which is considered a commercial development.

Standards relevant to siting of new energy facilities, including all associated development activities, are as follows:

1. Energy facilities shall not be sited in special areas as defined at N.J.A.C. 7:7-9.1 through 9.40, 9.42, and 9.44, and marine fish and fisheries areas defined at N.J.A.C. 7:7-16.2, unless site-specific information demonstrates that such facilities will not result in adverse impacts to these areas;

2. Except for water dependent energy facilities, energy facilities shall be sited at least 500 feet inland of the mean high water line of tidal waters in the following areas:

i. The CAFRA area; and

ii. The Western Ocean, Southern, Mullica-Southern Ocean, Great Egg Harbor River and Delaware Estuary regions, as defined at N.J.A.C. 7:7-13.6(d);

3. Notwithstanding (b)2 above, wind and solar energy facilities, including blades, towers and site disturbance shall be sited at least 50 feet inland of the mean high water line of tidal waters, excluding manmade lagoons and manmade ditches.

4. Public access shall be provided in accordance with the lands and waters subject to public trust rights rule, N.J.A.C. 7:7-9.48, and the public access rule, N.J.A.C. 7:7-16.9; and

5. The scenic and visual qualities of coastal areas shall be maintained as important public resources in the siting of energy facilities, pursuant to N.J.A.C. 7:7-16.10.

The proposed improvements will not result in a change in land use. They are proposed to expand operations at the existing NJWP. The proposed improvements have been designed to utilize previously developed areas of the existing Station to the greatest extent practicable. In accordance with this policy, all proposed improvements are located greater than 500 feet from the mean high water line of the Delaware River.

Security and public safety requirements preclude PSEG from providing public access to the Delaware River at the existing Salem and Hope Creek Generating Station. In accordance with **N.J.A.C. 7:7-16.9(n)3i**, for existing industrial or public development, where the proposed activity consists of the maintenance, rehabilitation, renovation, redevelopment, or expansion that remains entirely within the parcel containing the

existing development, no public access is required if there is no existing public access onsite. The project is consistent with **N.J.A.C. 7:7-16.9** because the proposed project will be located within the parcel containing the existing plant and no public access currently exists onsite.

2. 7:7-15.5 Transportation

New road construction must be consistent with the rule on location of linear development at N.J.A.C. 7:7-14.1, and shall be limited to situations where:

i. A clear need exists, taking into account the alternatives of upgrading existing roads and of using public transportation to meet the need;

ii. Provision is made to include construction of bicycle and foot paths, except where these would not be feasible;

iii. Provision is made to include, where appropriate, catwalks and parking access to nearby water bodies.

iv. Provision is made for coordinated construction of public transportation rights-of-way and facilities, such as bus lanes, rail lines, and related transit stop or station facilities and parking, except where such construction would not be feasible;

v. Visual and physical access to the coastal waters is maintained, to the maximum extent practicable; and

vi. Induced development in conflict with coastal rules would not be expected to result.

The proposed Project will be developed at the existing Salem and Hope Creek Generating Station. The new development will be located in portions of the facility which are currently utilized for the placement of dredge spoils from maintenance dredging and desilting of power plant intake structures, or previously disturbed areas utilized for the laydown or storage of equipment and materials. Operation of the proposed facilities will include receiving delivery of large components of offshore wind turbines via ocean going vessel, final preparation of the components, and loading onto specialized installation vessels. It is anticipated that most deliveries to the Port will be delivered via ocean going vessel with few deliveries by over the road transportation. It is also anticipated that access to the NJWP for the relatively small work force will be via the existing access road and security check point. No improvements beyond repaving or updates to signage are anticipated to the existing access. Nominal secondary impacts will occur as a result of the proposed project. The proposed project will have no impacts to public infrastructure or recreational demand. There will be a temporary increase in traffic and noise during construction due to the anticipated construction work force and delivery and installation of project materials and components. It is not anticipated that these increases in traffic during construction will result in the need to require improvements to local roads.

Accordingly, compliance with **N.J.A.C. 7:7-15.5** is met because the project will not involve any new transportation routes.

3. 7:7-15.6 Public Facility

Public facilities include a broad range of public works for production, transfer, transmission, and recovery of water, sewerage and other utilities. The presence of an adequate infrastructure makes possible future development and responds to the needs created by present development.

The proposed development is entirely located within the existing Salem and Hope Creek Generating Station and will not include activities that affect public facilities. The utility demand will be consistent with current operating conditions as the proposed improvements are intended to replace existing facilities at the Station. Accordingly, compliance with **N.J.A.C. 7:7-15.6** is met because the project will not involve any new or impact existing public facilities.

4. 7:7-15.7 Industry

Industry uses are uses that involve industrial processing, manufacturing, storage or distribution activities. These uses include, but are not limited to, electric power production, food and food by-product processing, paper production, agri-chemical production, chemical processes, storage facilities, metallurgical processes, mining and excavation processes, and processes using mineral products. Industrial uses do not include petroleum refining which is considered an energy use and, therefore subject to the standards of N.J.A.C. 7:7-15.4.

Industrial uses are encouraged in special urban areas. Elsewhere, industrial uses are conditionally acceptable provided they comply with all applicable location and resource rules. New industrial development is encouraged to locate at or adjacent to existing industrial sites, to the maximum extent practicable. Industry that is easily accessible to its labor force by foot or public transportation is encouraged. Marine resource-dependent industry, such as commercial fishing, is encouraged and shall have priority over other waterfront uses, except for recreation. The cogeneration of electricity with process steam is encouraged.

The proposed project is subject to **N.J.A.C. 7:7-15.4 Energy Facility** and has been addressed accordingly. The project is consistent with **N.J.A.C. 7:7-15.7** because no new industry uses are proposed and no changes to existing operations at the Salem and Hope Creek Generating Station are required. The project location meets the intent of this rule in that access to the work area is available by existing public and private roadways. As such, the project is in compliance with **N.J.A.C. 7:7-15.7**.

5. 7:7-15.14 High Rise Structures

High-rise structures are structures which are more than six stories or more than 60 feet in height as measured from existing preconstruction ground level.

High-rise structures are encouraged to locate in an urban area of existing high density, high-rise and/or intense settlements. High-rise structures within the view of coastal waters shall be separated from coastal waters by at least one public road or an equivalent area (at least 50 feet) physically and visually open to the public except as provided by N.J.A.C. 7:7-9.46. The longest lateral dimension of any high-rise structure

must be oriented perpendicular to the beach or coastal waters, except for a high-rise structure that is located in the Redevelopment Zone of the City of Long Branch and authorized pursuant to the Long Branch Redevelopment Zone Permit at N.J.A.C. 7:7-7. The proposed structure must not block the view of dunes, beaches, horizons, skylines, rivers, inlets, bays, or oceans that are currently enjoyed from existing residential structures, public roads or pathways, to the maximum extent practicable. High-rise structures outside of the Hudson River waterfront special area as defined by N.J.A.C. 7:7-9.46 shall not overshadow the dry sand beach between 10:00 A.M. and 4:00 P.M. between June 1 and September 20, and shall not overshadow waterfront parks year round. The proposed structure must be in character with the surrounding transitional heights and residential densities, or be in character with a municipal comprehensive development scheme requiring an increase in height and density which is consistent with all applicable Coastal Zone Management rules. The proposed structure must not have an adverse impact on air quality, traffic, and existing infrastructure. The proposed structure must be architecturally designed so as to not cause deflation of the beach and dune system or other coastal environmental waterward of the structure. The high-rise structures rule shall not apply to utility structures that have a demonstrated need.

The proposed development of Parcel C1 is designed as a marshalling port to support offshore wind development in New Jersey and the eastern United States. The facility will consist primarily of open gravel area connected to the existing port facility which will have a concrete open deck wharf structure for mooring of ocean going delivery and wind turbine installation vessels. During off periods with no active offshore wind development projects, the NJWP will be mostly open space with light towers that are approximately 100 feet tall. In support of an active offshore wind development project, the facility will accommodate multiple mobile cranes which will exceed 200 feet in height and will include staging of wind turbine towers which will range from 200 to nearly 500 feet in height. These towers will be temporarily staged at the marshalling facility for final preparation and load out onto installation vessels for offshore installation. It is anticipated that active period durations will range from 6 to 12 months with a minimum period of 6 to 12 months between offshore installation projects.

The light manufacturing facility to be constructed within Parcel G is proposed to be 95 feet tall and therefore meets the definition of a high-rise structure. The structure is proposed within a previously disturbed area on the northeast corner of the PSEG Facility to the east of the cooling tower and north of the PSEG Learning and Development Center. Since the facility will be constructed within a previously disturbed portion of the facility adjacent to other existing high-rise structures at the PSEG facility, the proposed construction will not impact surrounding view sheds and will be consistent with the existing conditions present at the facility. No residential areas are located in close proximity to the development area and the proposed manufacturing facility will be located over 2,500 feet from the Delaware River. Therefore, the proposed project is in compliance with **N.J.A.C 7:7-15.14.**

G. Subchapter 16 – Resource Rules

1. 7:7-16.3 Water Quality

As required by Section 307(f) of the Federal Coastal Zone Management Act (P.L. 92-583), Federal, State and local water quality requirements established under the Clean Water Act (33 U.S.C., 1251) shall be the water resource standards of the coastal management program. These requirements include not only the minimum requirements imposed under the Clean Water Act but also the additional requirements adopted by states, localities, and interstate agencies pursuant to Section 510 of the Clean Water Act and such statutes as the New Jersey Water Pollution Control Act. In the Delaware River Basin, the requirements include the prevailing "Basin Regulations-Water Quality" adopted by the Delaware River Basin Commission as part of its Comprehensive Plan. In the waters under the jurisdiction of the Interstate Environmental Commission in the New Jersey-New York metropolitan area, the requirements include the Interstate Environmental Commission's Water Quality Regulations. Department rules related to water pollution control and applicable throughout the entire coastal zone include, for example, the Surface Water Quality Standards (N.J.A.C. 7:9B), the Ground-Water Quality Standards (N.J.A.C. 7:9C), and the New Jersey Pollutant Discharge Elimination System rules (N.J.A.C. 7:14A).

Coastal development which would violate the Federal Clean Water Act, or State laws, rules and regulations enacted or promulgated pursuant thereto, is prohibited. In accordance with N.J.A.C. 7:15 concerning the Water Quality Management Planning and Implementation process, coastal development that is inconsistent with an approved Water Quality Management (208) Plan under the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A-1 et seq., is prohibited.

The proposed project will be located in generally developed portions of the existing Salem and Hope Creek Generating Station. PSEG has previously obtained a permit for a new sewage treatment plant (CAFRA Permit #1704-02-0001.3 CAF 100001), which ties into the permitted discharge point currently utilized by the existing on-site sewage treatment plant. Additionally, the proposed improvements will not require additional onsite personnel (following completion of construction activities) or increase the amount of effluents generated on the site. The project is consistent with **N.J.A.C. 7:7-16.3** because the project will not violate applicable Federal or State water quality standards.

2. 7:7-16.4 Surface Water Use

Surface water is water in lakes, ponds, streams, rivers, bogs, wetlands, bays, and ocean that is visible on land.

Coastal development shall demonstrate that the anticipated surface water demand of the facility will not exceed the capacity, including phased planned increases, of the local potable water supply system or reserve capacity, and that construction of the facility will not cause unacceptable surface water disturbances, such as drawdown, bottom scour, or alteration of flow patterns.

The proposed improvements will not require a surface water diversion or withdrawals. The improvements will not significantly alter the current water supply demand at the Station. Additional potable water wells will be required to support personnel usage. These withdrawal wells will not impact surface water in the vicinity of Artificial Island. The project is consistent with **N.J.A.C. 7:7-16.4** because the proposed activities will not

use surface water that will violate existing NJDEP requirements nor create unacceptable surface water disturbances, such as drawdown, bottom scour, or alteration of flow pattern.

3. 7:7-16.5 Groundwater Use

Groundwater is all water within the soil and subsurface strata that is not at the surface of the land. It includes water that is within the earth that supplies wells and springs.

Coastal development shall demonstrate, to the maximum extent practicable, that the anticipated groundwater withdrawal demand of the development, alone and in conjunction with other groundwater diversions proposed or existing in the region, will not cause salinity intrusions into the groundwaters of the zone, will not degrade groundwater quality, will not significantly lower the water table or piezometric surface, or significantly decrease the base flow of adjacent water sources. Groundwater withdrawals shall not exceed the aquifer's safe yield. Coastal development shall also conform with all applicable Department and, in the Delaware River Basin, Delaware River Basin Commission requirements for groundwater withdrawal and water diversion rights.

The proposed nacelle manufacturing facility proposed for Parcel G will include provisions for restrooms and locker facilities for personnel. Potable water requirements will be met through the installation of a new potable water well. PSEG Nuclear maintains a large water allocation through the NJDEP for operation of the Nuclear power plant. It is anticipated that the existing Water Allocation permit will be modified to include the additional well to supply potable water for Parcel G. It should be noted that all potable water needs for the proposed development would be for personnel and fire protection needs. There are no anticipated industrial supply requirements. The project is consistent with **N.J.A.C. 7:7-16.5** because an existing water allocation is in place to satisfy the requirements of the proposed development and the applicant will coordinate directly with the NJDEP Bureau of Water Allocation and Delaware River and Basin Commission to complete the required review and approval..

4. 7:7-16.6 Stormwater Management

If a project or activity meets the definition of "major development" at N.J.A.C. 7:8-1.2, then the project or activity shall comply with the Stormwater Management rules at N.J.A.C. 7:8.

"Major development" means any "development" that provides for ultimately disturbing one or more acres of land or increasing impervious surface by one-quarter acre or more. Disturbance for the purpose of this rule is the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting, or removing of vegetation.

The proposed project meets the definition of a major development because the total area of disturbance for the project will be 44 acres and the new impervious surface will be 31.4 acres. As such, the structural stormwater management system described here-in is designed to: reduce flood damage, minimize soil erosion and properly manage runoff quality characteristics in accordance with NJDEP stormwater management requirements

(N.J.A.C. 7:8). The proposed stormwater management system has been designed to adequately collect, treat locally, and convey channelized runoff from the development site to satisfy all applicable NJDEP stormwater management requirements for major development using both structural and non-structural best management practices (BMPs). Proposed features include: cover stabilization practices, a stormwater collection and conveyance system, green infrastructure and manufactured treatment devices, and discharge control practices. Details of the stormwater management system is provided as Attachment B

With the design proposed for the stormwater collection, conveyance, and treatment infrastructure and implementation of non-structural BMPs as part of an approved SPPP the project is consistent with **N.J.A.C. 7:7-16.6.**

5. 7:7-16.7 Vegetation

Vegetation is the plant life or total plant cover that is found on a specific area, whether indigenous or introduced by humans.

Coastal development shall preserve, to the maximum extent practicable, existing vegetation within a development site. Coastal development shall plant new vegetation, particularly appropriate coastal species native to New Jersey to the maximum extent practicable.

The project development footprint has been minimized to the greatest extent practicable. The disturbance to vegetation is limited to a previously disturbed and undeveloped area within the PSEG facility on the eastern side of Parcel G. Vegetation within this area consists of the invasive Common reed with sporadic woody vegetation. Minor clearing of vegetation for development within Parcel C1 and the HH Road will be required within the area currently operating as the licensed CDF supporting operations at the Salem and Hope Creek Generating Station. Similar to vegetated portions of Parcel G, this vegetation consists primarily of dense stands of invasive common reed with sporadic woody vegetation. It is estimated that less than 9 acres of vegetation will need to be removed throughout the extent of the 44-acre project area with a vast majority consisting of invasive Common reed. Due to the project's location within the PSE&G Energy Facility CAFRA Node, the requirement for tree preservation/planting is 0%. As such, the project does not involve replacement of vegetation. However, because the development will impact freshwater wetlands and transition areas, the project will involve mitigation through the purchase of mitigation bank credits. As such, the project is generally consistent with **N.J.A.C. 7:7-16.7**.

6. 7:7-16.8 Air Quality

The protection of air resources refers to the protection from air contaminants that injure human health, welfare or property, and the attainment and maintenance of State and Federal air quality goals and the prevention of degradation of current levels of air quality.

Coastal development shall conform to all applicable State and Federal regulations, standards and guidelines and be consistent with the strategies of New Jersey's State Implementation Plan (SIP). See N.J.A.C. 7:27 and New Jersey SIP for ozone,

particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, lead, and visibility.

The proposed Project includes development to expand the existing NJWP. These improvements will not alter power generation operations that would modify air emissions from the Salem and Hope Creek Generating Station. The facility currently operates per a Title V air operating permit issued by NJDEP, and the proposed improvements will not require modifications of this operating permit.

As the proposed development includes temporary storage of materials and parts, offloading and loading of equipment to vessels, assembly of components, limited maintenance activities, and limited office and warehouse facilities, impacts to air quality are anticipated to be minimal. The emissions resulting from vessels to support the offshore wind construction projects are anticipated to be permitted through the individual construction projects utilizing the Port.

The facility will not support any processes or process equipment that would result in gross impacts to air quality. Temporary impacts due to construction equipment will not be significant. Therefore, the project is in compliance with **N.J.A.C. 7:7-16.8**.

7. 7:7-16.9 Public Access

Public access to the waterfront is the ability of the public to pass physically and visually to, from, and along tidal waterways and their shores and to use such shores, waterfronts and waters for activities such as navigation, fishing, and recreational activities including, but not limited to, swimming, sunbathing, surfing, sport diving, bird watching, walking, and boating. Public accessways and public access areas include streets, paths, trails, walkways, easements, paper streets, dune walkovers/walkways, piers and other rights-of-way. No authorization or approval under this chapter shall be deemed to relinquish public rights of access to and use of lands and waters subject to public trust rights in accordance with N.J.A.C. 7:7-9.48. Further, no authorization or approval under this chapter shall be considered a Tidelands approval or shall exempt an applicant from the obligation to obtain a Tidelands approval, if needed.

The improvements will be located within the interior portions of the Salem and Hope Creek Generating Station and completely bounded by the property boundary of the operating power plant. Due to the sensitive nature of the Nuclear power generating facility and the inherent security and safety considerations, public access has previously and will continue to be restricted to authorized personnel only. Public access to the facility and associated lands is not possible and could result in significant public security and safety issues. PSEG Nuclear has previously developed and currently manages a series of public access facilities associated with the Estuary Enhancement Project which included restoration of large areas of coastal wetland communities and management of public access fishing piers, interpretive boardwalks and boat ramps. These public access facilities are located in the immediate vicinity of the Salem and Hope Creek Station as well as regional within the Delaware Estuary. The proposed development will not resulted in impacts to the existing security and safety considerations which prevent public access to the facility or limitations on pre-existing public access facilities managed by PSEG Nuclear.

As noted, security and public safety requirements preclude PSEG from providing public access to the Delaware River at the existing Salem and Hope Creek Generating Station.

In addition, pursuant to **N.J.A.C. 7:7-16.9(n)3i**, for existing industrial or public development, where the proposed activity consists of the maintenance, rehabilitation, renovation, redevelopment, or expansion that remains entirely within the parcel containing the existing development, no public access is required if there is no existing public access onsite. The project is consistent with **N.J.A.C. 7:7-16.9** because the proposed project will be located within the parcel containing the existing plant and no public access currently exists onsite.

8. 7:7-16.10 Scenic Resources and Design

Scenic resources include the views of the natural and/or built landscape.

New coastal development that is visually compatible with its surroundings in terms of building and site design, and enhances scenic resources is encouraged. New coastal development that is not visually compatible with existing scenic resources in terms of large-scale elements of building and site design is discouraged.

The Salem and Hope Creek Generating Station is an existing extensively developed site. The proposed improvements are consistent and compatible with the existing design and character of the operating Station. The proposed improvements will not alter the viewsheds of the surrounding natural environment of the coastal Delaware River. Accordingly, the construction of the proposed improvements will be consistent with **N.J.A.C. 7:7-16.10** because it is visually compatible with adjacent uses.

9. 7:7-16.11 Buffers and Compatibility of Uses

Buffers are natural or man-made areas, structures, or objects that serve to separate distinct uses or areas. Compatibility of uses is the ability for uses to exist together without aesthetic or functional conflicts.

Development shall be compatible with adjacent land uses to the maximum extent practicable.

The construction of the proposed improvements will be consistent with **N.J.A.C. 7:7-16.11** because the site provides minimal functional conflicts with adjoining land owners, is consistent with both State and local land use planning designations, and no substantial changes to existing land use at the site will occur.

10. 7:7-16.12 Traffic

Traffic is the movement of vehicles, pedestrians or ships along a route.

Coastal development shall be designed, located and operated in a manner to cause the least possible disturbance to traffic system.

The proposed improvements are designed to support offshore wind development in New Jersey and the eastern United States. During periods of active offshore development, the facility will see its largest workforce. It is anticipated that for the largest projects, total onsite personnel will be approximately 250 people. Personnel will travel to the facility and access the Port through the existing access to the Salem

and Hope Creek Generating Station. The increase in personnel anticipated during a large active offshore wind development will be a small percentage of typical increases in personnel from routine refueling outages at the power plant. As a result, increases in traffic will be well within the limits of current operations.

Temporary increases in traffic resulting from construction personnel or delivery of equipment and materials is anticipated. These impacts are anticipated to be minimal and will be eliminated once construction is completed. The proposed activities will be consistent with **N.J.A.C. 7:7-16.12** because the largest increase in traffic will be temporary in nature and will have minimal impact on local roads. Operational impacts to traffic will be minimal and temporary as well.

11. 7:7-16.13 Subsurface Sewage Disposal Systems

Subsurface sewage disposal system means a system for disposal of sanitary sewage into the ground which is designed and constructed to treat sanitary sewage in a manner that will retain most of the settleable solids in a septic tank and to discharge the liquid effluent to a disposal field.

Construction of the subsurface sewage disposal system is acceptable provided it meets all the provisions of the standards for Individual Subsurface Sewage Disposal Systems (N.J.A.C. 7:9A) and receives approval from the appropriate administrative authority; For areas subject to tidal flooding, the bottom elevation of the disposal bed must be at or above the 10 year flood elevation as determined by the Federal Emergency Management Agency Flood Insurance Study Reports, and construction of subsurface sewage disposal systems must comply with flood hazard areas rule at N.J.A.C. 7:7-9.25.

The proposed improvements will not include the construction of sanitary septic systems or subsurface sewage disposal systems. The proposed manufacturing facility will be connected to existing water and sewer utilities currently operating at the existing Salem and Hope Creek Station. The project will not affect the existing Salem and Hope Creek Generating Station NJPDES permitted sanitary sewage treatment plant which is designed to manage the sanitary sewage needs of the facility. There are no Subsurface Sewage Disposal Systems at the existing Salem and Hope Creek Station and none are proposed as part of the proposed improvements. Therefore, the project is consistent with **N.J.A.C. 7:7-16.13** because issuance will not necessitate construction or continued operation of any subsurface sewage disposal system.

12. 7:7-16.14 Solid and Hazardous Waste

Solid waste means any garbage, refuse, sludge or other waste material, including solid, liquid, semi-solid or contained gaseous material. A material is a solid waste if it is "disposed of" by being discharged, deposited, injected, dumped, spilled, leaked or placed into or on any land or water so that such material or any constituent thereof may enter the environment or be emitted into the air or discharged into ground or surface waters. Solid waste becomes a hazardous waste when it exhibits any of the characteristics which are specified in the Federal Regulations on Identification and Listing of Hazardous Waste (40 C.F.R. 261). The general characteristics of hazardous

waste include, but are not limited to, characteristics of ignitibility, characteristics of corrosivity, characteristics of reactivity and characteristics of toxicity.

Coastal development shall conform with all applicable State and Federal regulations, standards and guidelines for the handling and disposal of solid and hazardous wastes, including the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., the Solid Waste Management rules, N.J.A.C. 7:26, the Recycling rules, N.J.A.C. 7:26A, and the Hazardous Waste rules, N.J.A.C. 7:26G.

Construction and operation of the Project will produce solid wastes.

The primary types of solid wastes that will be generated during operation will be consistent with current operations and generally include:

- normal refuse;
- recyclable materials; and,
- universal wastes.

Normal refuse consists primarily of trash, but does not include non-refuse solid waste materials identified above, in accordance with existing Station operations and procedures. Recyclable materials include such materials as:

- metals;
- glass;
- paper;
- plastics;
- cardboard;
- construction and demolition debris;
- vegetative wastes; and,
- used oils.

Recyclable materials will be managed in accordance with the New Jersey Solid Waste Management Act, its implementing regulations at N.J.A.C. 7:26A, and the State Wide Solid Waste Management Plan. The State Wide Solid Waste Management Plan sets a recycling goal for solid waste of greater than 50 percent. NJEDA will work with the municipality, Lower Alloways Creek Township, to support that goal.

As such, the project is consistent with **N.J.A.C. 7:7-16.14** because it will not authorize activities that will contravene applicable Federal and State requirements for handling and disposal of solid and hazardous wastes.

Chapter 4: Freshwater Wetlands Protection Act Rules Compliance Statement

This Chapter provides the compliance with the Freshwater Wetlands Protection Act Rules at N.J.A.C. 7:7A, which applies to the proposed development within Parcel G. As shown on Figure 6, the proposed development is located within an area that contains four freshwater wetlands. The wetlands within the development Parcel Generally consist of degraded freshwater wetlands associated with stormwater drainage channels from the adjacent PSEG facility and are dominated by the invasive common reed (*phragmites australis*). The four wetlands located within the development area are described in greater detail below.

Wetland B1

Wetland B1 is a freshwater wetland predominantly vegetated with common reed. Other species observed in Wetland B1 included broomsedge *(Andropogon virginicus),* and marsh elder *(Iva frutescens).* A linear drainage feature extends in a southeasterly direction into the main portion of Wetland B1.

Wetlands H1 and G1

Wetlands G1 and H1 are freshwater wetlands predominantly vegetated with common reed and olive. Wetland G1 and H1 include stormwater ditches that were constructed or formed along the northern edge of a dirt access road that runs behind the chiller buildings at the Salem and Hope Creek Generating Station. Over time, portions of the stormwater ditch overflowed and caused the wetland area to expand in the northeastern direction. The result is large wetland areas that narrows to more defined stormwater ditches as the flows converge into culverts that runs under a paved access road.

Wetland I1

Wetland I1 is a large expansive wetland community predominantly vegetated with common reed. Areas on the western portion of the wetland within Parcel G are characterized as a freshwater wetland community predominantly dominated by common reed. Portions on the easternmost extent of the wetland outside of the Project area contain tidally influenced ditches and support relic tidal marsh communities.

Based on previous LOIs issued for the Salem and Hope Creek Generating Station, the wetlands within Parcel G are classified as intermediate value wetlands with a regulated 50-foot transition area. Development of the project will result in 1.4 acres of permanent impacts to freshwater wetlands and 3.6 acres of permanent impacts to wetland transition area, and 0.1 acre of temporary impacts to freshwater wetlands and 0.1 acre of temporary impacts to wetland transition area.

The sections below provide the applicable policies set forth in the Freshwater Wetland Protection Act Rules, specifically the requirements for all individual permits at N.J.A.C. 7:7A-10.2, the requirements for non-water dependent activities at N.J.A.C. 7:7A-10.3, and the conditions that apply to all permits at N.J.A.C. 7:7A-20.2 followed by an associated compliance statement.

1. 7:7A-10.2 Standard requirements for all individual permits

(b) The Department shall issue an individual freshwater wetlands or open water fill permit only if the regulated activity:

1. Has no practicable alternative which would meet the requirements at (b)1i and ii below:

> *i. The alternative would have a less adverse impact on the aquatic ecosystem or would not involve a freshwater wetland or State open water; and*
>
> *ii. The alternative would not have other significant adverse environmental consequences, that is, it shall not merely substitute other significant environmental consequences for those attendant on the original proposal;*

NJEDA considered three (3) alternatives for the development of the light manufacturing facility, which are depicted on the Figure 11. These options were considered because they are located in undeveloped areas of the existing Salem and Hope Creek Generating Station.

Option 1

Option 1 involves the construction of the light manufacturing facility and laydown area within Parcel G and reducing the size of the facility and laydown area to avoid wetlands and keep the facilities entirely within the existing gravel parking area. Due to the large size of the nacelle components and quantity needed for the Ocean Wind 1 and other proposed offshore wind projects in the northeast, the space would not be adequate to safely stage, assemble, and test the equipment and provide room for equipment to efficiently maneuver and transport the materials to the wharf.

Option 2

Option 2 involves moving the construction of the light manufacturing facility to the existing gravel parking area to avoid impacts to wetlands within Parcel G, and using the laydown area at wharf to stage and test the nacelle components. While the gravel lot in Parcel G is adequate in size to house the light manufacturing facility, the laydown area at the wharf will not provide enough space for the storage and testing of the nacelle components. This area will be used to store other offshore wind components including large blades, steel monopiles, cable, and other materials for the construction of the offshore wind facilities.

Option 3

Option 3 involves the construction of the light manufacturing facility and laydown area in an area of undeveloped land located on the southeast side of the station. Although this alternative would only result in 0.8 acre of impact to freshwater wetlands, the alternative

development area contains two overhead 500 kV transmission ROWs. The overhead transmission ROWs require strict compliance with clearance adjacent to and below the conductors which would prevent staging, and transport of the wind turbine components upright as is the preferred method. There is no alternative path to transport the materials from the area that would not involve crossing under the transmission lines. Due to these restraints, Option 3 was not a suitable location for the development of the light manufacturing facility and staging area.

2. Will result in the minimum feasible alteration or impairment of the aquatic ecosystem including existing contour, vegetation, fish and wildlife resources, and aquatic circulation of the freshwater wetland and hydrologic patterns of the HUC 11 in which the activity is located;

The freshwater wetlands that would be disturbed as a result of the development within Parcel G consist mainly of stormwater drainage ditches that are composed almost entirely of the invasive common reed. The portion of wetland I1 that will be impacted by the project is the western most extent of a large wetland complex that has been previously disturbed by the creation of artificial island. This portion of the wetland is more degraded than the larger wetland complex to the north and east which contain relic tidal wetland communities. The area where impacts are proposed consist of freshwater wetlands dominated by common reed, which does not provide the same habitat value as the rest of the wetland complex with more native vegetation to the east and north. Because the proposed impacts will occur at the westernmost extent of the wetland complex, the proposed impacts will not result in adverse impacts to hydrologic patterns within the wetland area or the overall HUC11 watershed or the aquatic ecosystem. Additionally, the proposed construction will not impact open water areas that sustain aquatic species.

3. Will not destroy, jeopardize or adversely modify a present or documented habitat for threatened or endangered species; and shall not jeopardize the continued existence of a local population of a threatened or endangered species;

As describe in Chapter 3 in the compliance statement for N.J.A.C. 7:7-9.36, this portion of the wetlands where the impacts are proposed are more degraded than the eastern and northern and portions of the wetland area. Although the area is mapped as potential nesting and foraging habitat for Bald Eagle (*Haliaeetus leucocephalus*) and foraging habitat for the special concern species Great Blue Heron (*Ardea Herodias*), more suitable habitat is available for these species in the remaining portions of the wetland farther north and east. As such, the proposed impacts are not anticipated to eliminate habitat for these species in the area as the majority of the wetland will remain intact.

4. Will not be likely to result in the destruction or adverse modification of a habitat which is determined by the Secretary of the United States Department of the Interior or

the Secretary of the U.S. Department of Commerce, as appropriate, to be a critical habitat under the Endangered Species Act of 1973, 16 U.S.C. § 1531 et seq.;

Based on a review of the U.S. Fish and Wildlife Service's (USFWS's) Information Planning and Consultation (IPaC) mapping database (Attachment D), the development area is not mapped as critical wildlife habitat.

5. Will not cause or contribute to a violation of any applicable State water quality standard;

The proposed improvements will not result in impacts to water quality. As described in Chapter 3, subchapter 16, section 7:7-16.6 Stormwater Management, a stormwater management system has been designed for the proposed development to adequately collect, treat locally, and convey channelized runoff from the development site to satisfy all applicable NJDEP stormwater management requirements for major development using both structural and non-structural best management practices (BMPs). Details of the stormwater management system is provided as Attachment B.

6. Will not cause or contribute to a violation of any applicable toxic effluent standard or prohibition imposed pursuant to the Water Pollution Control Act;

The proposed project will not result in any violations of toxic effluent standards or the Water Pollution Control Act. The proposed improvements will not alter industrial processes at the existing generating station nor introduce new waste streams. As such, the project is in compliance with this condition.

7. Will not violate any requirement imposed by the United States government to protect any marine sanctuary designated pursuant to the Marine Protection, Research and Sanctuaries Act of 1972, 33 U.S.C. §§ 1401 et seq.;

The proposed project does not involve impacts to marine areas. As such, this condition is not applicable to the project.

8. Will not cause or contribute to a significant degradation, as defined at 40 C.F.R. 230.10(c), of ground or surface waters;

The proposed project will require potable water to support personnel needs at the proposed nacelle manufacturing facility. Installation of a new potable water well include coordination with the NJDEP and DRBC to comply with limitations with existing water allocations.

9. Will not adversely affect a property that is listed or is eligible for listing on the New Jersey or National Register of Historic Places unless the applicant demonstrates to the Department that the proposed activity avoids or minimizes impacts to the maximum

extent practicable or the Department determines that any impact to the affected property would not impact the property's ability to continue to meet the criteria for listing at N.J.A.C. 7:4-2.3 or otherwise negatively impact the integrity of the property or the characteristics of the property that led to the determination of listing or eligibility. The Department shall not issue a conditional permit if it finds that the mitigation proposed is inadequate to compensate for the adverse effect. Any permit for an activity which may adversely affect a property listed or eligible for listing on the New Jersey or National Register of Historic Places shall contain conditions to ensure that any impact to the property is minimized to the maximum extent practicable and any unavoidable impact is mitigated;

> *i. If the permittee, before or during the authorized work, encounters a possible historic property, as described at N.J.A.C. 7:7A-19.5(l), that is or may be eligible for listing on the New Jersey or National Register, the permittee shall preserve the resource, immediately notify the Department and proceed as directed by the Department;*

As discussed in the compliance statement for N.J.A.C. 7:7-9.34 in Chapter 3, the project is not anticipated to result in impacts to historic resources. Based on previous studies conducted at Artificial Island, there are no historic or archaeological resources located at Artificial Island.

10. Will not violate the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., or implementing rules at N.J.A.C. 7:13;

As demonstrated in the compliance statement for N.J.A.C. 7:7-9.25 in Chapter 3, the proposed project is in compliance with the Flood Hazard Area Control Act Rules at N.J.A.C. 7:13.

11. Is otherwise lawful;

As demonstrated throughout this application, the proposed project will not violate applicable laws or regulations.

12. Is in the public interest, as determined by the Department in consideration of the following:

> *i. The public interest in preservation of natural resources and the interest of the property owners in reasonable economic development. In determining whether a proposed activity is in the public interest, the Department shall consider, as one source of guidance, the goals, strategies, policy objectives and policies of the New Jersey State Development and Redevelopment Plan, adopted and/or readopted by the State Planning Commission pursuant to the New Jersey State Planning Act, N.J.S.A. 52:18A-196 et seq., and the State Planning Act rules, N.J.A.C. 5:85;*

ii. The relative extent of the public and private need for the proposed regulated activity;

iii. Where there are unresolved conflicts as to resource use, the practicability of using reasonable alternative locations and methods, to accomplish the purpose of the proposed regulated activity; iv. The extent and permanence of the beneficial or detrimental effects which the proposed regulated activity may have on the public and private uses for which the property is suited;

v. The quality and resource value classification pursuant to N.J.A.C. 7:7A-3.3 of the wetland, which may be affected and the amount of freshwater wetlands to be disturbed;

vi. The economic value, both public and private, of the proposed regulated activity to the general area; and

vii. The functions and values provided by the freshwater wetlands and probable individual and cumulative impacts of the regulated activity on public health and fish and wildlife;

This proposed project is being submitted by the NJEDA to support sustainable energy development in the State of New Jersey. The proposed Port is part of a larger sustainable energy initiative put forth by the State of New Jersey and is designed to support offshore wind energy development in New Jersey and along the entire eastern United States. The development of this project will help New Jersey meet its intended goals of combatting climate change through the encouragement of sustainable energy sources. The expansion of development at the New Jersey Wind Port provides New Jersey with critical infrastructure to achieve the climate change goals and to make New Jersey a leader in the offshore wind supply chain market. Although wetland impacts are proposed, they are generally minimal and located within the more degraded portion of a larger overall wetland complex. The minimal loss in function and value of this wetland area will be compensated through the purchase of wetland mitigation bank credits, as discussed in Chapter 5 of this application.

Although public facilities are not proposed as part of the project, due to safety and security limitation of the existing nuclear generating station, public access within the existing Salem and Hope Creek Generating Station is not feasible.

Therefore, the proposed project is in compliance with this condition.

13. Will not involve a discharge of dredged material or a discharge of fill material, unless the material is clean, suitable material free from toxic pollutants in toxic amounts, which meets Department rules for use of dredged or fill material;

The proposed project does not involve the discharge of dredged materials.

14. Is consistent with the applicable approved Water Quality Management Plan (208 Plan) adopted under the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A-1 et

seq., unless the activities are not subject to the Department's Water Quality Management Planning rules at N.J.A.C. 7:15; and

The proposed project will be consistent with existing development and current land use of the property. The proposed manufacturing facility will be connected to existing water and sewer utilities currently operating at the existing Salem and Hope Creek Station. The project will not affect the existing Salem and Hope Creek Generating Station NJPDES permitted sanitary sewage treatment plant which is designed to manage the sanitary sewage needs of the facility. The Station currently complies with the Water Quality Management Plan Rules and will continue to do so once the development is completed.

15. In accordance with N.J.A.C. 7:7A-2.7, is part of a project that in its entirety complies with the Stormwater Management rules at N.J.A.C. 7:8.

The proposed improvements will comply with the Stormwater Management rules at N.J.A.C 7:8. As described in Chapter 3, subchapter 16, section 7:7-16.6 Stormwater Management, a stormwater management system has been designed for the proposed development to adequately collect, treat locally, and convey channelized runoff from the development site to satisfy all applicable NJDEP stormwater management requirements for major development using both structural and non-structural best management practices (BMPs). Details of the stormwater management system is provided as Attachment B.

(c) The following shall apply to the Department's consideration of whether an alternative is practicable under (b)1 above:

1. An alternative shall be practicable if it is available and capable of being carried out after taking into consideration cost, existing technology, and logistics in light of overall project purposes;

> *i. In considering cost in accordance with (c)1 above, the Department shall consider the acquisition history of the property as a whole and the amount, nature, and date of investments that the applicant has made in the property as a whole; and*

The project is proposed within property owned and operated by PSEG that will be leased by the NJEDA. The improvements are proposed within previously disturbed areas on the PSEG property.

2. An alternative shall not be excluded from consideration under this provision merely because it includes or requires an area not owned by the applicant which could reasonably have been or be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity.

No portion of the proposed project is located within property not owned by PSEG which will be leased by the NJEDA.

2. 7:7A-10.3 Additional requirements for a non-water dependent activity in a wetland or special aquatic site

(b) There shall be a rebuttable presumption that there is a practicable alternative to a non-water dependent activity in a freshwater wetland or in a special aquatic site, which alternative does not involve a freshwater wetland or special aquatic site, and that such an alternative would have less of an impact on the aquatic ecosystem.

Based on the alternatives analysis discussed above, there are no feasible alternative that will support the construction of the proposed light manufacturing facility and laydown area that will avoid impacts to wetlands. In addition, the impacts to wetlands from the proposed improvements will only result in impacts to stormwater draining channels dominated by invasive species, and minimal impacts to a degraded portion of a much larger wetland complex.

(c) In order to rebut the presumption established in (b) above, an applicant must demonstrate all of the following:

1. That the basic project purpose cannot reasonably be accomplished using one or more other sites in the general region that would avoid or reduce the adverse impact on an aquatic ecosystem;

As demonstrated in the alternatives analysis discussed earlier in this Chapter, there are no portions of the Salam and Hope Creek Generating Station Property that will support the size requirements of light manufacturing facility while avoiding overhead power transmission line clearance requirements and allowing for safe transport of materials while minimizing impacts to onsite wetlands.

2. That the basic project purpose cannot reasonably be accomplished if there is a reduction in the size, scope, configuration, or density of the project as proposed;

The proposed development of the light manufacturing and laydown area must be the proposed size and configuration to allow for the storage, assembly, testing, and transportation of large offshore wind components.

3. That the basic project purpose cannot reasonably be accomplished by an alternative design that would avoid or reduce the adverse impact on an aquatic ecosystem;

The proposed facility must be the proposed size and configuration to ensure for safe and efficient assembly, testing, and transportation of large offshore wind components.

4. That in cases where the applicant has rejected alternatives to the project as proposed due to constraints such as inadequate zoning, infrastructure, or parcel size, the applicant has made reasonable attempts to remove or accommodate such constraints; and

The majority of the undeveloped portions of the existing Salem and Hope Creek Generating Station property and artificial island consist of tidal and freshwater wetlands. As such, by removing parcel and infrastructure restraints, additional wetland impacts would be required.

5. If any portion of the proposed activity will take place in an exceptional resource value wetland or in trout production waters, that the requirements of N.J.A.C. 7:7A-10.4 are met.

No portion of the project is proposed within exceptional resource value wetlands or trout production waters.

3. 7:7A-20.2 Conditions that apply to all permits

(c) The following conditions apply to all permits, including all waivers and general permit authorizations:

1. The issuance of a permit shall in no way expose the State of New Jersey or the Department to liability for the sufficiency or correctness of the design of any construction or structure(s). Neither the State nor the Department shall, in any way, be liable for any loss of life or property that may occur by virtue of the activity or project conducted as authorized under a permit;

NJEDA recognizes that the State of New Jersey is not liable for the design or construction of the proposed improvements.

2. The issuance of a permit does not convey any property rights or any exclusive privilege;

The project is proposed on land owned and operated by PSEG that will be leased by NJEDA. No conveyance of property rights are required to support the proposed improvements.

3. The permittee shall obtain all applicable Federal, State, and local approvals prior to commencement of regulated activities authorized under a permit;

NJEDA will obtain all applicable Federal, State, and local approvals to support the proposed project, including construction permits, including construction stormwater permits, Soil Erosion and Sediment Control approvals, Site Plan approval, and Building permits.

4. A permittee conducting an activity involving soil disturbance, the creation of drainage structures, or changes in natural contours shall obtain any required approvals from the Soil Conservation District having jurisdiction over the site;

A Soil Erosion and Sediment Control Approval will be obtained by NJEDA from the Cumberland Salem Conservation District.

5. The permittee shall take all reasonable steps to prevent, minimize, or correct any adverse impact on the environment resulting from activities conducted pursuant to the permit, or from noncompliance with the permit;

NJEDA will employ best management practices to prevent, minimize, and correct adverse impacts to the environment.

6. The permittee shall immediately inform the Department of any unanticipated adverse effects on the environment not described in the application or in the conditions of the permit. The Department may, upon discovery of such unanticipated adverse effects, and upon the failure of the permittee to submit a report thereon, notify the permittee of its intent to suspend the permit, pursuant to N.J.A.C. 7:7A-20.8;

NJEDA will immediately inform the NJDEP of any unanticipated adverse impacts not included within this application.

7. The permittee shall immediately inform the Department by telephone at (877) 927-6337 (WARN DEP hotline) of any noncompliance that may endanger public health, safety, and welfare, or the environment. The permittee shall inform the Division of Land Use Regulation by telephone at (609) 292-0060 of any other noncompliance within two working days of the time the permittee becomes aware of the noncompliance, and in writing within five working days of the time the permittee becomes aware of the noncompliance. Such notice shall not, however, serve as a defense to enforcement action if the project is found to be in violation of this chapter. The written notice shall include:

i. A description of the noncompliance and its cause;

ii. The period of noncompliance, including exact dates and times;

iii. If the noncompliance has not been corrected, the anticipated length of time it is expected to continue; and

iv. The steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance;

NJEDA will notify the Department in the event of any noncompliance that may endanger public health, safety, and welfare, or the environment within two (2) days NJEDA becomes aware of the activity.

8. Any noncompliance with a permit constitutes a violation of this chapter and is grounds for enforcement action under N.J.A.C. 7:7A-22, as well as, in the appropriate case, suspension and/or termination of the permit;

NJEDA understands this condition.

9. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the authorized activity in order to maintain compliance with the conditions of the permit;

NJEDA understands this condition. NJEDA will construct the proposed project in accordance with the approved permit plans.

10. The permittee shall employ appropriate measures to minimize noise where necessary during construction, as specified in N.J.S.A. 13:1G-1 et seq., and N.J.A.C. 7:29;

NJEDA will minimize noise impacts from construction the greatest extent practicable. However, it should be noted that the nearest residential receptor to the proposed Project is greater than 2.5 miles northeast of the development area. As such, impacts from construction noise to the nearest residential receptor are not anticipated

11. The issuance of a permit does not relinquish the State's tidelands ownership or claim to any portion of the subject property or adjacent properties;

The project does not involve impacts to tidelands or formerly flowed areas.

12. The issuance of a permit does not relinquish public rights to access and use tidal waterways and their shores;

The project does not propose public access or use of tidal waterways or the shoreline of the Delaware River. The proposed improvements are located greater than 1000 feet from the mean high water line of the Delaware River.

13. The permittee shall allow an authorized representative of the Department, upon the presentation of credentials, to:

> *i. Enter upon the permittee's premises where a regulated activity is located or conducted, or where records must be kept under the conditions of the permit;*
>
> *ii. Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit;*
>
> *iii. Inspect, at reasonable times, any facilities, equipment, practices, or operations regulated or required under the permit. Failure to allow reasonable*

access under this paragraph shall be considered a violation of this chapter and subject the permittee to enforcement action under N.J.A.C. 7:7A-22; and

iv. Sample or monitor at reasonable times, for the purposes of assuring compliance or as otherwise authorized by the Federal Act, by the Freshwater Wetlands Protection Act, or by any rule or order issued pursuant thereto, any substances or parameters at any location;

NJEDA recognizes that the NJDEP is authorized to inspect the facility during construction and operation of facilities proposed under this Freshwater Wetland Individual Permit. However, to comply with the security requirements of the U.S. Nuclear Regulatory Commission (NRC), NJEDA respectfully requests that NJDEP personnel contact NJEDA and PSEG prior to requiring access to the Facility.

14. The permittee shall not cause or allow any unreasonable interference with the free flow of a regulated water by placing or dumping any materials, equipment, debris or structures within or adjacent to the channel while the regulated activity(ies) is being undertaken. Upon completion of the regulated activity(ies), the permittee shall remove and dispose of in a lawful manner all excess materials, debris, equipment, and silt fences and other temporary soil erosion and sediment control devices from all regulated areas;

NJEDA will not allow contractors to dump materials or store equipment or debris within regulated areas unless previously authorized by NJDEP as part of this permit authorization. Should NJEDA observe any unauthorized placement of materials by PSEG personnel or construction contractors, corrective action will be taken immediately upon observation.

15. The permittee and its contractors and subcontractors shall comply with all conditions, site plans, and supporting documents approved by the permit;

NJEDA recognizes this condition and will monitor contractors and subcontractors to ensure that the project is conducted in accordance with the permit and approved plans.

16. All conditions, site plans, and supporting documents approved by a permit shall remain in full force and effect, so long as the regulated activity or project, or any portion thereof, is in existence, unless the permit is modified pursuant to N.J.A.C. 7:7A-20.6;

NJEDA recognizes this condition.

17. The permittee shall record the permit, including all conditions listed therein, with the Office of the County Clerk (the Registrar of Deeds and Mortgages, if applicable) of each county in which the site is located. The permit shall be recorded within 30 calendar days of receipt by the permittee, unless the permit authorizes activities within two or

more counties, in which case the permit shall be recorded within 90 calendar days of receipt. Upon completion of all recording, a copy of the recorded permit shall be forwarded to the Division of Land Use Regulation at the address set forth at N.J.A.C. 7:7A-1.4;

Upon issuance, NJEDA will record a copy of the permit issued with the Lower Alloways Creek Township Clerk's Office.

18. The permittee shall perform any mitigation required under the permit in accordance with N.J.A.C. 7:7A-11;

NJEDA will perform mitigation in compliance with the Mitigation Plan provided in Chapter 5 of this application.

19. If any condition or permit is determined to be legally unenforceable, modifications and additional conditions may be imposed by the Department as necessary to protect public health, safety, and welfare, or the environment;

NJEDA recognizes this condition.

20. Any permit condition that does not establish a specific timeframe within which the condition must be satisfied (for example, prior to commencement of construction) shall be satisfied within six months of the effective date of the permit;

NJEDA recognizes this condition.

21. A copy of the permit and all approved site plans and supporting documents shall be maintained at the site at all times and made available to Department representatives or their designated agents immediately upon request;

NJEDA will maintain a copy of the permit and approved plans at the site at all times.

22. The permittee shall provide monitoring results to the Department at the intervals specified in the permit;

NJEDA is not anticipating any monitoring requirements as part of this permit.

23. A permit shall be transferred to another person only in accordance with N.J.A.C. 7:7A20.5; 24. A permit can be modified, suspended, or terminated by the Department for cause;

NJEDA recognizes this condition.

25. The submittal of a request to modify a permit by the permittee, or a notification of planned changes or anticipated noncompliance, does not stay any condition of a permit;

NJEDA recognizes this condition.

26. Where the permittee becomes aware that it failed to submit any relevant facts in an application, or submitted incorrect information in an application or in any report to the Department, it shall promptly submit such facts or information; and

NJEDA recognizes this condition.

27. The permittee shall submit written notification to the Bureau of Coastal and Land Use Compliance and Enforcement, 401 East State Street, 4th Floor, PO Box 420, Mail Code 401-04C, Trenton, NJ 08625, at least three working days prior to the commencement of regulated activities.

NJEDA will provide written notification to the to the Bureau of Coastal and Land Use Compliance and Enforcement at least three (3) working days prior to commencement of the construction of Project.

Chapter 5: Mitigation Plan

The project proposes approximately 1.3 acres of permanent impacts and 0.6 acres of temporary impacts to Coastal Wetlands for the development of Parcel C1 and the HH Road, and permanent impacts to approximately 1.4 acres of freshwater wetlands and 3.6 acres of wetland transition area, and temporary impacts to 0.1 acre of freshwater wetlands and 0.1 acre of transition area for the development of Parcel G. The impacted wetlands and transition areas are predominantly comprised of the invasive and hyper-dominant common reed (*Phragmites australis*). As such, the wetland services and functions of the impacted wetlands is low compared to the nearby tidal marsh areas vegetated with native marsh plants such as smooth cordgrass (*Spartina alterniflora*), salt hay (*S. patens*), and salt grass (*Distichlis spicata*).

NJEDA proposes to mitigate for these impacts through the purchase of credits from the Evergreen Environmental, LLC Abbot Creek Mitigation Bank in Fairfield, New Jersey. This bank was originally constructed in 2016 in anticipation for PSEG's need for credits associated with a now abandoned project on Artificial Island, and currently has sufficient credits in its ledger to mitigate for the proposed project's impacts to regulated freshwater wetland resources. As of January 2023, the USACE's Regulatory In lieu fee and Bank Information Tracking System (RiBITS) indicated that the Abbot Creek Bank has 7.6 credits of the 76 credits (ultimately) available for sale from the Bank.

The Abbot Creek Mitigation Bank was designed as a coastal wetland mitigation bank, with saleable credits being a blend from a variety of habitats within the restoration area. These emergent marsh, upland buffer areas, and an NJDEP-requested upland grassland area for quail and other upland bird species. The available mitigation credits from the site are derived from a blending of habitat uplift in these various habitat categories as agreed upon in consultation with the USACE and NJDEP, as well as members of the bank's Interagency Review Team (including NMFS, USEPA, and USFWS). The approved Mitigation Banking Instrument (MBI) for the Bank authorizes these 76 credits to be released in successive increments as annual monitoring targets are met.

NJEDA proposes to provide mitigation at a ratio of one (1) acre of impact to regulated resources to one (1) Bank credit with no higher mitigation ratios or apportionments applied.

FIGURES



Legend

- PSEG Property Boundary
- Port Development
- Existing Port Footprint (Under Construction)

N

NOTE
Project is located withing the Taylors Bridge USGS Quadrangle.

0 2,000 4,000 Feet

1:24,000

NJEDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

USGS SITE LOCATION MAP

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 1	JANUARY 2023



Legend

- PSEG Property Boundary
- Port Development Boundary
- Existing Port Footprint (Under Construction)

N

0 1,000 2,000 Feet

1:12,000

NJEDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

SITE LOCATION AERIAL

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 2	JANUARY 2023



Legend

- Parcel Boundary
- PSEG Property Boundary
- Port Development Boundary
- Existing Port Footprint (Under Construction)

N

0 1,000 2,000 Feet

1:12,000

NJEDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

TAX MAP

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 3	FEBRUARY 2023



Legend

- CAFRA Node Boundary
- Port Development
- Existing Port Footprint (Under Construction)

N

0 1,200 2,400 Feet

1 inch = 1,200 feet

NJEDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

CAFRA NODE MAP

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 4	JANUARY 2023



Legend

- Port Development Boundary
- Edge of Water
- 2020 Freshwater Wetland Delineation (Pending NJDEP Review)
- Coastal Wetland Line (Pending NJDEP Approval)
- Existing Port Footprint (Under Construction)

N

0 1,000 2,000 Feet

1:12,000

NJ EDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

WETLAND LOCATION MAP

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 5	JANUARY 2023



Legend

- Port Development Boundary
- Edge of Water
- 2020 Freshwater Wetland Delineation (Pending NJDEP Review)
- Coastal Wetland Line (Pending NJDEP Approval)
- Existing Port Footprint (Under Construction)

N

0 500 1,000 Feet

1 inch = 500 feet

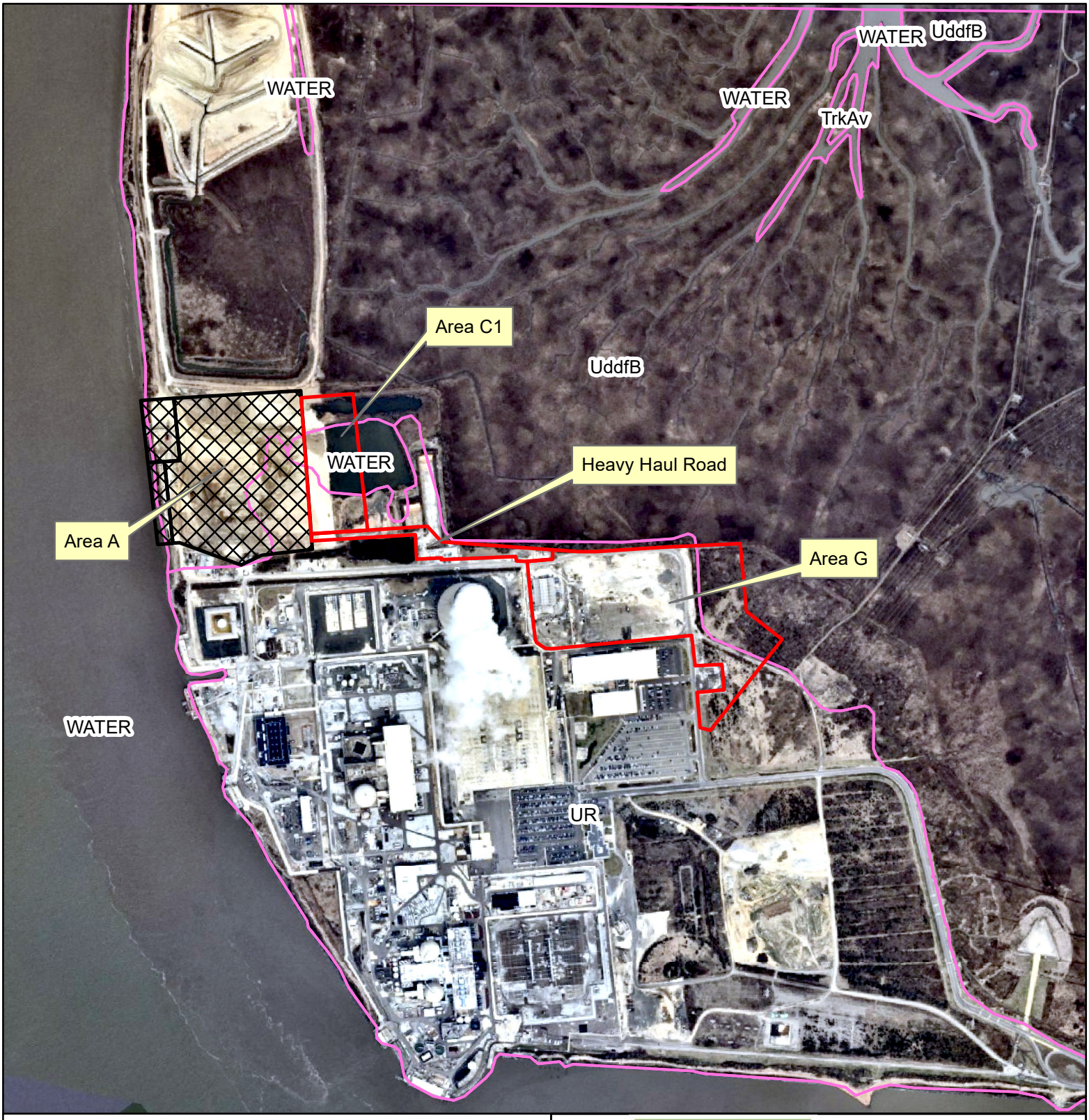
NJEDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

PORT DEVELOPMENT SITE WETLAND LOCATION MAP

NEW JERSEY WIND PORT SALEM COUNTY, NEW JERSEY

FIGURE 6	JANUARY 2023



Legend

- Port Development Boundary
- Existing Port Footprint (Under Construction)
- Soil Class Boundary

N

0 1,000 2,000 Feet

1 inch = 1,000 feet

NJEDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

SOIL SURVEY FIGURE

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 7	JANUARY 2023



Legend

- Port Development Boundary
- Existing Port Footprint (Under Construction)
- FEMA Flood Zone - AE (100 Year)
- FEMA Flood Zone - VE (Limit of Wave Action)
- FEMA Flood Zone - X (500 Year)

N

0 1,000 2,000 Feet

1 inch = 1,000 feet

NJEDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

FEMA FLOOD HAZARD MAP

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 8	JANUARY 2023



Legend

- Port Development Boundary
- Existing Port Footprint (Under Construction)
- Rank 1 - Habitat Specific Requirements
- Rank 2 - Special Concern
- Rank 3 - State Threatened
- Rank 4 - State Endangered
- Rank 5 - Federal Listed

N

0 250 500 Feet

1 inch = 500 feet

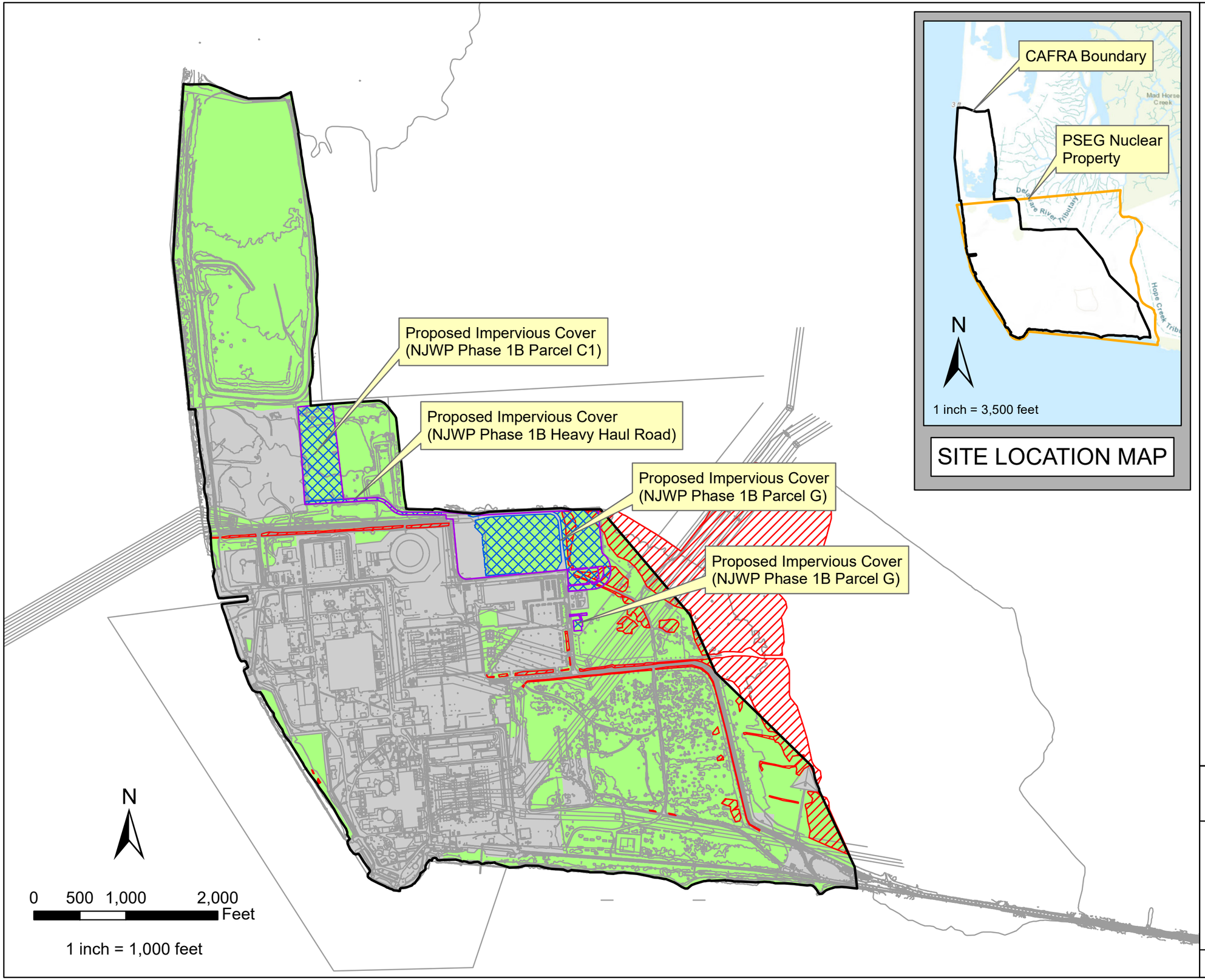
NJEDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

LANDSCAPE PROJECT MAPPING (VERSION 3.3)

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 9	JANUARY 2023



SITE LOCATION MAP

CAFRA Utility Node Calculations

Existing

Area of CAFRA Utility Node: 635 acres
Total Impervious Area: 279 acres
Total Pervious Area: 356 acres
Percent Impervious Cover: 44%
Percent Pervious Cover: 56%
Vegetative Cover: 246 acres (69%)
Pervious Cover (Non-Vegetated): 110 acres (31%)

Proposed

Total Impervious Area: 310.4 acres
Total Pervious Area: 324.6 acres
Percent Impervious Cover: 49%
Percent Pervious Cover: 51%
Vegetative Cover: 214.6 acres (66%)
Pervious Cover (Non-Vegetated): 110 acres (34%)

Legend

- CAFRA Boundary
- Project Area
- Proposed Impervious Cover
- Wetlands
- General Arrangement
- Impervious Cover
- Pervious Cover

Note:
1. Vegetative cover is predominatly phragmites dominated areas with sporatic woody vegetation (shrubs and trees).

NJ EDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

IMPERVIOUS COVER MAP

**PSEG SALEM & HOPE CREEK GENERATING STATION
FACILITY RELOCATION PROJECT
SALEM COUNTY, NEW JERSEY**

FIGURE 10	REV NOVEMBER 2022



Legend

- PSEG Property Boundary
- 2020 Freshwater Wetland Delineation (Pending NJDEP Review)
- Coastal Wetland Line (Pending NJDEP Approval)
- Alternative Option
- Port Development Boundary
- Existing Port Footprint (Under Construction)

N

0 500 1,000 Feet

1:12,000

NJ EDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

ALTERNATIVES ANALYSIS MAP

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 11	JANUARY 2023



Legend

- Photo Location/Direction
- Port Development Boundary
- Existing Port Footprint (Under Construction)

N

0 500 1,000 Feet

1 inch = 500 feet

NJEDA ECONOMIC DEVELOPMENT AUTHORITY

Developed By: AKRF

PHOTO LOCATION MAP

NEW JERSEY WIND PORT
SALEM COUNTY, NEW JERSEY

FIGURE 12	JANUARY 2023

ENGINEERING DESIGN PLAN DRAWINGS

ATTACHMENT A

WETLAND DELINEATION REPORT

WETLAND DELINEATION REPORT

PSEG NUCLEAR LLC
SALEM AND HOPE CREEK GENERATING STATIONS

Prepared By:

AKRF, Inc.
307 Fellowship Road
Suite 214
Mount Laurel, NJ 08054

For:

PSEG Power LLC
End of Alloway Neck Creek Road
Hancocks Bridge, NJ 08038

JUNE 2020

1. INTRODUCTION

This report summarizes the results of jurisdictional wetland delineation efforts performed at the PSEG Nuclear LLC (PSEG) Salem and Hope Creek Generating Stations, Salem County, New Jersey. Wetland delineation activities were performed by AKRF, Inc. environmental scientists in Spring 2020. In accordance with N.J.A.C. 7:7A-2.3, field activities to identify and delineate wetlands were performed as outlined in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989 Manual). Wetlands delineated in the field also were consistent with the guidelines outlined in the 1987 Corps of Engineers Wetland Delineation Manual (1987 Manual) and the Atlantic and Gulf Coastal Plain Region (Version 2.0) Supplement (2010). Both manuals use a three parameter analysis of hydrophytic vegetation, hydric soils, and hydrology for wetland determinations.

This report presents descriptions of wetland and upland communities observed at the proposed site, the methods used as part of the wetland delineation effort, and the results of the wetland field determination. Attachment A of this report presents wetland determination data forms. Attachment B contains site photographs. Attachment C provides the wetland boundaries for the Site (including locations of all sample points).

2. SITE DESCRIPTION

The Salem and Hope Creek Generating Station properties (Block 26, Lots 4, 4.01, 5, and 5.01) are located in the southern region of the Delaware River Valley in Lower Alloways Creek Township, Salem County, New Jersey. The entire facility occupies approximately 734 acres of land along the east bank of the Delaware River and is situated at river mile 50[1]. Approximately 367 acres of the property are undeveloped and comprised of uplands, freshwater wetlands, tidal wetlands, and other undeveloped areas. A portion of the PSEG property also includes approximately 60 acres of land dedicated as a dredge spoil disposal facility for routine facility maintenance dredging activities. This disposal facility was approved by the NJDEP as a disposal site for dredged materials and materials produced as part of routine desilting of the intake structures and other facilities on January 22, 1976 (#74-014). This area is adjacent to a larger confined disposal facility that is used by the Philadelphia District of the United States Army Corps of Engineers during maintenance dredging of the main navigation channel of the Delaware River and Bay.

While a large portion of the project area is undeveloped, much of this undeveloped area displays evidence of anthropogenic disturbances such as the deposit of dredge material and fill, and the creation of ditches. The disturbed nature of the property hosts communities of invasive plant species such as common reed *(Phragmites australis),* mile-a-minute *(Polygonum perfoliatum),* and Japanese honeysuckle *(Lonicera japonica).* Detailed summaries of the wetlands identified on-site are provided below in the Jurisdictional Wetland Determination section of this report.

[1] River mile "O" is at the mouth of the Delaware Bay with miles increasing upstream.

3. PRELIMINARY INFORMATION REVIEW

Prior to performing the on-site delineation efforts, data from publicly available resources and mapping were reviewed. The following presents a list of resources used as part of the preliminary information review task.

- NJGIS Clearinghouse data
- Aerial photography
- U.S. Geological Survey (USGS) 7.5-minute Topographic maps
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps
- New Jersey Department of Environmental Protection (NJDEP) mapped wetlands
- Federal Emergency Management Agency (FEMA) mapped floodplains
- Salem County Soil Survey

Geographic Information Systems (GIS) mapping maintained by the NJDEP shows coastal wetlands throughout much of the undeveloped northern portion of the site and areas east of the property boundary. Mapped freshwater wetlands exist immediately east of the access road and in certain portions of the dredge spoil disposal facility (located in the northwestern portion of the Site).

According to the Soil Survey generated specifically for the Salem and Hope Creek Generating Station Sites, mapped soil series including Transquaking mucky peat, Udorthents (dredged fine material), Urban land, and Water. A brief description of these areas is provided below.

Transquaking mucky peat - Transquaking mucky peat is a very poorly drained soil of herbaceous organic materials over loamy sediments found in tidal flats of the North Atlantic Coastal Plain (NRCS 2008). Within the Project Area, this series is limited to a small area in the southeastern portion of the site.

Udorthents (dredged fine material) - Udorthents dredged fine material is described by the NRCS as well drained dredged fill or excavated borrow materials derived from river channels, pits, or previously unaltered soils (NRCS 2008). Most of the undeveloped areas to the north and east of the Salem and Hope Creek Generating Station property are mapped as Udorthents dredged fine material.

Urban land - According to the Natural Resource Conservation Service (NRCS), Urban land consists of areas where much of the soil surface is covered with asphalt, concrete, buildings, or other impervious cover (NRCS 2008). Most of the Project Area is made up of Urban lands.

Water - Areas mapped as Water are defined by the NRCS as areas inundated with water for most of the year and generally include rivers, ponds or lakes (NRCS 2008). Areas mapped as Water include the River and a ponded area located in the dredge spoil disposal area in the western portion of the Site.

4. JURISDICTIONAL WETLAND DETERMINATION

Wetland delineation activities were performed in the Spring of 2020 (April 14, 15, 16, and 27 and May 4 and 5) to determine the upland-wetland boundaries for freshwater wetland resources occurring at the PSEG Facility. In accordance with applicable state and federal requirements for wetland delineations, field investigations were performed as outlined in the 1989 Manual (and 1987 Manual and 2010 Supplement). Indicator parameters used to identify the presence of wetlands and assess their approximate boundaries included the predominance of hydrophytic vegetation, the presence of hydric soils, and the presence of wetland hydrology or wetland hydrology indicators.

Wetland parameter data were collected within wetland and upland areas of the project area. At each data collection point, vegetation was identified and characterized by stratum (herb, shrub, and canopy layer), the soils were described (hue, value, and chroma), and where applicable, evidence of wetland hydrology was noted. Areas meeting all of the technical criteria set forth in the appropriate guidance documents were flagged and numbered to mark a jurisdictional wetland boundary. Subsequently, GPS points were taken along the wetland boundary at each flag and at each data point location with a Trimble Pathfinder ProXRS GPS. As part of a Quality Assurance/Quality Control measure, points were field verified and subsequently certified by a Professional Land Surveyor (PLS). A description of the wetland systems delineated on-site is provided below. Wetland determination data forms are provided as Attachment A. Photographs of wetlands occurring onsite are provided in Attachment B. A drawing of the wetland boundaries is provided as Attachment C.

During the wetland delineation, freshwater wetland complexes and Waters of the State were identified, flagged, and surveyed with GPS. The flagged areas generally consist of emergent wetlands, mixed open water and emergent wetland complexes, and jurisdictional freshwater ditches and other drainage features located throughout the property. Descriptions of these areas are provided below. Wetland boundaries delineated in the field are presented in Attachment C.

Throughout most of the undeveloped portions of the site, upland areas observed adjacent to delineated wetlands were predominantly vegetated with common reed. These areas were vegetated consistently with other common species found in disturbed uplands including, Japanese honeysuckle and multiflora rose. The key characteristic of these areas was the lack of wetland hydrology, specifically the unsaturated nature of the soils and lack of groundwater infiltration within the first 12 to 18 inches from the ground surface.

WETLAND A1

Wetland A1 was observed in 2009 to be a small freshwater wetland community predominantly vegetated with common reed. Based on field observations, this area appears to be hydrologically isolated from larger, more expansive wetlands also observed in adjacent areas of the facility. Soils observed in Wetland A1 were dark gray in color (10 YR 4/1) with brownish yellow and strong brown mottles (10 YR 6/8 and 7.5 YR 5/8, respectively). Soils were observed to be clayey in texture. Field observations in 2020 following recent mowing indicated that wetland hydrology was not consistent with other wetlands mapped in 2009. The area was much drier with only small scattered depressions with somewhat wet, but not saturated soil conditions. The area was not mapped as a wetland.

WETLAND B1

Wetland B1 was observed to be a freshwater wetland predominantly vegetated with common reed. Other species observed in Wetland B1 included broomsedge *(Andropogon virginicus),* and marsh elder *(Iva frutescens).* A linear drainage feature extended in a southeasterly direction into the main portion of Wetland B1. Ponded water was observed in this feature at the time of field activities. Soils observed in Wetland B1 were gray in color (10 YR 5/1) with strong brown mottles (7.5 YR 5/8). Soils were clayey in texture. Indicators of wetland hydrology observed throughout Wetland B1 included soils saturated near the surface, ponded water, oxidized root channels, and water-stained leaves.

WETLAND F1

Wetland F1 was observed to be a freshwater wetland also predominantly vegetated with common reed. Other species observed in Wetland F1 included sedges *(Carex spp.),* silky dogwood (*Cornus amomum*) and marsh elder *(Iva frutescens).* Wetland F appears to have formed in a topographically low area that is comprised mostly of fill material. §oils observed in Wetland F1 were gray in color (10 YR 5/1) with strong brown mottles (7.5 YR 5/8). Soils were mostly sandy clay in texture. Indicators of wetland hydrology observed throughout Wetland F1 included soils saturated at or near the surface, ponded water in several areas, oxidized root channels, and water-stained leaves.

WETLANDS G1 AND H1

Wetland G1 and H1 were observed to be freshwater wetlands predominantly vegetated with common reed and olive. Other species observed in Wetland G and H included red cedar, blackberry, and marsh elder. Wetland G1 and H1 appear to include stormwater ditches that were constructed or formed along the northern edge of the dirt access road that runs behind the chiller buildings. Over time, portions of the stormwater ditch overflowed and caused the wetland area to expand in the northeastern direction. The result is large wetland areas that narrows to a more defined stormwater ditches as the flows converge into culverts that runs under a paved access road. Ponded water was observed in these ditches at the time of field activities. Soils observed in Wetland G and H were gray in color (10 YR 5/1) with strong brown mottles (7.5 YR 5/8). Soils were mostly sandy clay in texture. Indicators of wetland hydrology observed throughout Wetland G1 and H1 included soils saturated at or near the surface, ponded water in several areas, oxidized root channels, and water-stained leaves.

Similar to the previously identified wetland areas, Wetlands G1 and H1 both were bordered by uplands that were dominated by common reed. However, multiple less defined access roads were observed in the area along the borders of these wetland areas. The access roads are likely used by Station security personnel or maintenance workers requiring access to adjacent transmission towers. Usage of the access roads by motor vehicles has resulted in compacted soils and stunted growth of upland vegetation.

WETLAND I1

Wetland I1 was observed to be a large expansive wetland community predominantly vegetated with common reed with tidally influenced ditches in the easternmost portions of the wetland support relic tidal marsh. However, most of Wetland I1 was characterized as a freshwater wetland community. Soils observed in Wetland I1 generally were dark gray or very dark grayish brown in color (10 YR 4/1 and 10 YR 3/2 respectively) and were characterized as silty clay in texture. Indicators of wetland hydrology observed in Wetland I1 include inundated areas, soils saturated at or near the surface, water marks, ponded water in several areas, and water stained leaves.

Similar to the previously identified wetland areas, Wetlands I1 was bordered by uplands that were dominated by common reed and olive. However, similar to the uplands associated with Wetlands C1 and D1, areas of fill were observed (possibly from past construction associated with the transmission towers) that significantly raised the elevation of portions of the area several feet above the typical wetland elevation. In these areas, wetland vegetation such as common reed were observed, but in fewer quantities and appeared to be stunted similar to other areas. Additionally, these raised fill areas exhibited none of the typical wetland hydrology or soil characteristics observed in other wetland areas.

WETLAND D

The area delineated as Wetland D was observed to be a small open water depression located along the western boundary of the PSEG dredge spoil disposal facility site. This area was bordered to the west and southeast by existing access roadways and to the north by an existing berm. During preliminary wetland delineation efforts, this area was observed to be dry, or nearly dry. Wetland D contained small amounts of water dock *(Rumex veiticillatus)* and algae interspersed throughout. The edges of this area were vegetated sparsely with common reed.

WETLAND G, H, I, AND J

Areas delineated as Wetlands G through J make up a network of vegetated stormwater drainage ditches, connected by culverts, that collect and convey stormwater runoff associated with facility parking areas and other impervious surfaces. These areas were observed to be vegetated predominantly with common reed. These areas were 1 to 12 inches in depth at the time of field investigations, but are known to contain water throughout most of the year. These areas continue via underground pipes towards the drainage channel delineated as "P" and "T" and ultimately flow into the Delaware River (via the drainage feature delineated as "R").

WETLANDS K AND L

Areas delineated as Wetlands K and L are linear stormwater drainage features hydrologically connected to the areas described above as Wetlands G through J. However, due to observed conditions, including a lack of hydric soils, these areas were flagged as Waters of the State, as opposed to wetlands. As described above, these areas continue via underground pipes towards the drainage channel delineated as "P" and "T" and ultimately flow into the Delaware River (via the drainage feature delineated as "R'}

WETLANDS P, Q, R, AND T

Wetland areas delineated as P through R, and T are vegetated stormwater drainage ditches, connected by a culvert. These areas were characterized in the field as Waters of the State. This system of ditches is located in the northern portion of the PSEG Facility, immediately along the existing paved access road. These areas were observed to be vegetated predominantly with common reed along the edges. These areas were 1 to 12 inches in depth at the time of field investigations, but generally contain water throughout most of the year. The portion delineated as Wetland R extends beyond the Upper Wetland Boundary, and into the Delaware River.

WETLAND U

Wetland U was observed to be a vegetated stormwater drainage feature located near the main access road of the facility. This area was predominantly vegetated with common reed and softrush. Areas of standing water within Wetland U also were observed to contain significant amounts of algae. Wetland U contained approximately 6-10 inches of water at the time of field activities.

WETLANDS V AND W

Wetlands V and W include a linear stormwater drainage feature predominantly vegetated with common reed. This feature is located adjacent to the main access road of the facility and contains stormwater runoff from a significant portion of the surrounding upland areas to the south and west. This feature contained approximately 3 to 12 inches of water at the time of field investigations. Soils observed within these areas generally were very dark gray in color (10 YR 4/1), with light brown and light gray mottles with a silty clay texture.

WETANDS X and Y

Wetlands X and Y were both small palustrine emergent wetlands located in an undeveloped area in the central portion of the facility. These areas both were vegetated with common reed, softrush *(Juncus effusus},* and spikerush *(Eleocharis obtusa),* and were observed to have approximately 4 inches of standing water at the time of delineation. Soils observed in these areas were dark gray in color (10 YR 4/1) with brownish yellow and strong brown mottles (10 YR *618* and 7.5 YR 5/8, respectively).

WETLAND Z

Wetland Z is a palustrine emergent wetland located in an undeveloped area in the central portion of the facility. Wetland Z is vegetated with common reed, with lesser amounts of softrush and spikerush interspersed throughout wetter portions of the area. Soils observed in Wetland Z generally were dark gray in color (10 YR 4/1) with brownish yellow mottles (10 YR 6/8). Indicators of wetland hydrology observed in Wetland Z included standing water (up to 4 inches), saturation, water marks, and water stained leaves.

WETLAND AA

Wetland AA is a palustrine emergent wetland, similar to Wetland Z, located in an undeveloped area in the central portion of the facility. Wetland AA is vegetated with common reed, with softrush and spikerush interspersed throughout inundated portions of the area. Soils observed in Wetland AA generally were dark gray in color (10 YR 411) with brownish yellow and strong brown mottles (10 YR *618* and 7.5 YR 5/8, respectively). Indicators of wetland hydrology observed in Wetland AA included standing water (up to 4 inches), saturation, water marks, and water stained leaves.

WETLAND BB

Wetland BB is a palustrine emergent wetland, located in the same undeveloped portion of the facility as Wetlands Z and AA. This area was predominantly vegetated with common reed, with little other wetland species observed. Soils observed in Wetland BB were gray in color (10 YR 5/1) with yellowish brown mottles (10 YR 5/6) and clayey in texture. Standing water was observed ranging from 2 to 6 inches in depth. Additional indicators of wetland hydrology observed within Wetland BB included saturated soils within 12 inches of the surface, water marks, and water stained leaves.

5. CLASSIFICATION OF WETLANDS BY RESOURCE VALUE

Most of the wetlands observed at the Salem and Hope Creek Site have formed as a result of the construction and development of the facility, or as a result of ongoing facility operations. Delineated wetlands include:

- open water and emergent areas located within permitted dredge spoil and desilting disposal facilities routinely disturbed through ongoing authorized facility operations;
- linear drainage ditches that convey runoff from surrounding developed areas (i.e., facilities, roads, parking lots); and
- areas of predominantly emergent vegetation with invasive species (common reed) that exist on historic dredge spoil areas.

A summary of wetland classifications by resource value is provided below.

The areas delineated as G, H, I, J, K, L, P, Q, R, T, U, V, W, and portions of D1 exist as narrow stormwater drainage ditches constructed over the course of the development and expansion of the facility. These areas generally are vegetated with common reed, and convey runoff from surrounding roads, parking lots, and other impervious or developed areas. These areas provide limited value as wetlands or waterbodies, and generally have no buffer other than immediately adjacent impervious surfaces and developed areas. These areas also exist as ordinary wetlands and/or waters not subject to regulated transition areas.

The areas delineated as X, Y, Z, AA, CC, and DD, include small isolated emergent wetlands located within close proximity of existing access roads and other developed facility areas. These areas range in size from 0.02 acres to 0.22 acres (approximately 871 to 9,583 square feet in size), are isolated, and generally are the result of man-made activities including authorized filling, earth disturbances, and adjacent development activities. These areas also exist as ordinary wetlands not subjected to regulated to transition areas.

Wetlands A1, B1, F1, G1, H1, and BB are disturbed wetland areas predominantly vegetated with common reed. These areas generally are located within filled or otherwise disturbed areas of the site, and other areas traversed by commonly used access roads. Due to the disturbed nature of these wetlands and the limited functions and values they provide, combined with the significantly disturbed nature of the immediately surrounding areas, these wetlands function as ordinary wetlands not subject to regulated transition areas.

Wetlands I1 and D1 (including D1a, D1b, D1c, and D1d) are large emergent wetlands predominantly vegetated with common reed. These wetland areas are located in an undeveloped portion of the facility and continue beyond the property boundary as expansive freshwater and tidal wetlands. While mapped as bald eagle foraging habitat by the iMAP Landscape Project, the overall quality of these areas has been degraded as a result of the predominant nature of common reed. In addition, the habitats beyond the property boundaries become much improved, as the wetlands transition from common reed dominated areas to tidal wetlands predominantly vegetated with smooth cordgrass *(Spartina alterniflora)* and other beneficial species. Based on iMAP data, Wetlands I1 and D1 make up approximately 83 acres of the over 93,000 acres of bald eagle *(Haliaeetus leucocephalus)* foraging habitat in the Delaware Bay Landscape Region (http://njgin.state.nj.us/dep/DEP_iMapNJDEP/viewer.htm). Based on the disturbed nature of these wetlands and the limited functions and values provided, combined with the existence of over 93,000 acres of bald eagle foraging habitat in the region, a resource value of exceptional value wetland is not appropriate, making these areas of intermediate value. The NJDEP also has identified species such as osprey *(Pandion haliaetus)* and northern harrier *(Circus cyaneus)* as occurring within the general vicinity of the Salem and Hope Creek Generating Stations. However, the disturbed nature of the site does not offer special habitats for rare species or unique habitats that support listed species.

6. SUMMARY

AKRF has performed jurisdictional wetland delineation activities at the Salem and Hope Creek Generating Stations, Salem County, New Jersey. Wetland delineation activities were performed by AKRF, Inc. environmental scientists in the Spring of 2020 (April 14, 15, 16, and 27 and May 4 and 5). Field activities were performed in accordance with the guidelines presented in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989 Manual) and the 1987 Corps of Engineers Wetland Delineation Manual (1987 Manual) and the Atlantic and Gulf Coastal Plain Region (Version 2.0) Supplement (2010), both of which follow a three parameter analysis of hydrophytic vegetation, hydric soils, and hydrology for wetland determinations. All wetland communities described herein were delineated in the field and surveyed using Trimble GPS technologies.

Wetlands identified and delineated as part of this overall effort ranged from large palustrine emergent and open water complexes to small isolated emergent areas to linear drainage ditches conveying runoff from the facility. In total, approximately 89 acres of the 734 acre facility site were delineated as wetland or Waters of the State. This includes approximately 84 acres of predominantly emergent wetlands, and approximately 5.0 acres of drainage ditches and similar linear features.

Throughout much of the site, upland areas bordering the delineated wetland areas share similar vegetation as the wetland areas, but differ in soil and hydrologic characteristics. The wetland soils were consistently lower chroma or were hydric soils that were saturated at or near the ground surface. In most cases, groundwater could be observed within 6 inches of the ground surface when soil borings were performed. In the upland areas low chroma or hydric soils were not observed and saturated soils were not noted within 12 inches or greater from the ground surface. Based on the results of the field efforts, it was observed that the dominant vegetative communities for both wetland and upland areas were very similar and in some cases indistinguishable. In these disturbed areas, it was determined that soils and hydrology were better indicators.

7. REFERENCES

Environmental Laboratory. 1987. "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Federal Interagency Committee for Wetland Delineation. 1989. Federal Manual for Identifying and Delineating Jurisdictional Wetlands. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S.D.A Soil Conservation Service, Washington, D.C., Cooperative Technical Publication. 76 pp. plus appendices.

Natural Resource Conservation Service (NRCS). 2008. Soil Survey for Salem County, New Jersey. United States Department of Agriculture.

U. S. Army Corps of Engineers. 2008. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-08-30. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Attachment A

Wetland Data Sheets

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: PSEG Salem & Hope Creek Generating Station City/County: Salem Sampling Date: 4/16/20

Applicant/Owner: PSEG Nuclear State: NJ Sampling Point: 2311

Investigator(s): Kurt Philipp & Kevin Dare Section, Township, Range: Lower Alloways Creek Township

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): concave

Slope (%): _____ Lat: 39.464225° Long: -75.520154° Datum: 1983

Soil Map Unit Name: Urban Land (Ur) NWI classification: E2EM5Ps

Are climatic / hydrologic conditions on the site typical for this time of year? Yes Yes No _____ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes Yes No _____

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes Yes No _____	**Is the Sampled Area within a Wetland?** **Yes** Yes **No** _____
Hydric Soil Present? Yes Yes No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present? Yes Yes No _____	

Remarks: (Explain alternative procedures here or in a separate report.)
Dredge spoil area

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☑ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): 0

Water Table Present? Yes X No _____ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: P255

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Phragmites australis	80	yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Onoclea sensibilis	3	yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	83	x 2 =	166
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	83 (A)		166 (B)

Prevalence Index = B/A = 2.0

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** Yes **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: P255

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-2"	2/1 10YR	100					l	
2-20"	5/6 10YR	70					s	oxidized rhizosphere
2-20"	5/2 10YR	30					s	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** Yes **No** _____

Remarks: Natural tidal marsh soil and dredge disposal material

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: PSEG Salem & Hope Creek Generating Station City/County: Salem Sampling Date: 4/15/20

Applicant/Owner: PSEG Nuclear State: NJ Sampling Point: 4310

Investigator(s): Kurt Philipp & Kevin Dare Section, Township, Range: Lower Alloways Creek Township

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): concave

Slope (%): _____ Lat: 39.462896° Long: -75.522241° Datum: 1983

Soil Map Unit Name: Urban Land (Ur) NWI classification: PEM5Rs

Are climatic / hydrologic conditions on the site typical for this time of year? Yes Yes No _____ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes Yes No _____

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes Yes	No _____	**Is the Sampled Area within a Wetland?** **Yes** Yes **No** _____
Hydric Soil Present?	Yes Yes	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes Yes	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

Dredge spoil area

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 3
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): N/A

Wetland Hydrology Present? **Yes** Yes **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: P89

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Phragmites australis	60	yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Polyganum sagitatum	20	no	OBL
2. Cornus alba	30	yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	90	x 2 =	180
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	110 (A)		200 (B)

Prevalence Index = B/A = 1.8

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** Yes **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: P89

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6"	3/2 10YR	100					l	mixed construction fill
6-14"	3/3 10YR	60	5/4	40			s	gravel, bric, concrete

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ☐ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ☐ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ☐ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ☐ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ☐ Dark Surface (S7) (**LRR K, L**)
- ☐ Polyvalue Below Surface (S8) (**LRR K, L**)
- ☐ Thin Dark Surface (S9) (**LRR K, L**)
- ☐ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ☐ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** Yes **No** _____

Remarks:

Attachment B

Photographs



Photo 1 – View of previously delineated wetland ditch R. View looking west.



Photo 2 – View of previously delineated wetland ditch Q. View looking southeast.



Photo 3 – View of previously delineated wetland ditch P. View looking east.



Photo 4 – View of previously delineated wetland ditch P. View looking south.



Photo 5 – View of previously delineated wetland ditch T. View looking east.



Photo 6 - View of previously delineated wetland ditch G. View looking north.



Photo 7 – View of previously delineated wetland ditch H. View looking south.



Photo 8 – View of previously delineated wetland ditch I. View looking east.



Photo 9 – View of previously delineated wetland ditch J. View looking east.



Photo 10 – View of previously delineated wetland ditch K. View looking west.



Photo 11 – View of previously delineated wetland ditch L. View looking west.



Photo 12 – View of previously delineated wetland ditch U. View looking south.



Photo 13 - View of previously delineated wetland ditch V. View looking east.



Photo 14 – View of wetland ditch associated with wetland D1. View looking east.



Photo 15 – View of wetland D1. Notice dense phragmites.



Photo 16 – View of previously delineated wetland ditch Y. View looking west.



Photo 17 – View of previously delineated wetland ditch X. View looking east.



Photo 18 – View of previously delineated wetland ditch W. View looking south.



Photo 19 – View of wetland BB.



Photo 20 – View of wetland wetland F1



Photo 21 – A second view of wetland F1.



Photo 22 – View of wetland Z. View looking south.



Photo 23 - View of wetland AA. View looking west.



Photo 24 – View of wetland B1. Note the area appears to be maintained.



Photo 25 – View of wetland H1.



Photo 26 – View of wetland I1. View taken on portion of wetland underneath maintained ROW.

Attachment C

Figures



Legend

Property Boundary

N

0 4,000 8,000 Feet

1 inch = 4,000 feet

PSEG

Developed By: AKRF

USGS SITE LOCATION MAP

PSEG NUCLEAR, LLC
SALEM COUNTY, NEW JERSEY

FIGURE 1	JUNE 2020



Legend

Property Boundary

N

0 500 1,000 Feet

1 inch = 1,000 feet

PSEG

Developed By: AKRF

SITE LOCATION AERIAL

PSEG NUCLEAR, LLC
SALEM COUNTY, NEW JERSEY

FIGURE 2	JUNE 2020

Attachment D

Soil Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Salem County, New Jersey



June 16, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


75° 32' 54" W
75° 30' 41" W
39° 28' 38" N
39° 27' 31" N
452900
453200
453500
453800
454100
454400
454700
455000
455300
455600
455900
4369800
4369500
4369200
4368900
4368600
4368300
4368000
WATER
UddfB
WATER
WATER
WATER
UR
Hope Creek Rd
WATER
WATER
WATER
WATER
WATER
WATER
WATER
UddfB
Map Scale: 1:14,500 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 200 400 800 1200
Feet
0 500 1000 2000 3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Salem County, New Jersey
Survey Area Data: Version 16, Sep 16, 2019

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

Date(s) aerial images were photographed: Dec 6, 2010—Oct 19, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UddfB	Udorthents, dredged fine material, 0 to 8 percent slopes	275.5	37.4%
UR	Urban land	446.3	60.6%
WATER	Water	15.0	2.0%
Totals for Area of Interest		**736.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The

delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Salem County, New Jersey

UddfB—Udorthents, dredged fine material, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 4k49
Elevation: 0 to 170 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Udorthents, Dredged Fine Materials

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy material transported by human activity; fine-loamy dredge spoils

Typical profile

A - 0 to 12 inches: loam
C - 12 to 80 inches: clay

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Urban land

Percent of map unit: 5 percent
Hydric soil rating: Unranked

Water
Percent of map unit: 5 percent

UR—Urban land

Map Unit Setting
National map unit symbol: 4k4c
Elevation: 0 to 170 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting
Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Udorthents
Percent of map unit: 5 percent
Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

WATER—Water

Map Unit Setting
National map unit symbol: 4k4d
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days

Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: “National Soil Survey Handbook.”

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology)

from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left

behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth’s crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can

occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and

promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5
Extremely acid: 3.5 to 4.4
Very strongly acid: 4.5 to 5.0
Strongly acid: 5.1 to 5.5
Moderately acid: 5.6 to 6.0
Slightly acid: 6.1 to 6.5
Neutral: 6.6 to 7.3
Slightly alkaline: 7.4 to 7.8
Moderately alkaline: 7.9 to 8.4
Strongly alkaline: 8.5 to 9.0
Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
   B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)

High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)

Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)

Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)

Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)

Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1
Moderate: 13-30:1
Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0
Coarse sand: 1.0 to 0.5
Medium sand: 0.5 to 0.25
Fine sand: 0.25 to 0.10
Very fine sand: 0.10 to 0.05
Silt: 0.05 to 0.002
Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated

Prismatic: Vertically elongated and having flat tops

Columnar: Vertically elongated and having rounded tops

Angular blocky: Having faces that intersect at sharp angles (planes)

Subangular blocky: Having subrounded and planar faces (no sharp angles)

Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand

Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field

generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth’s surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.

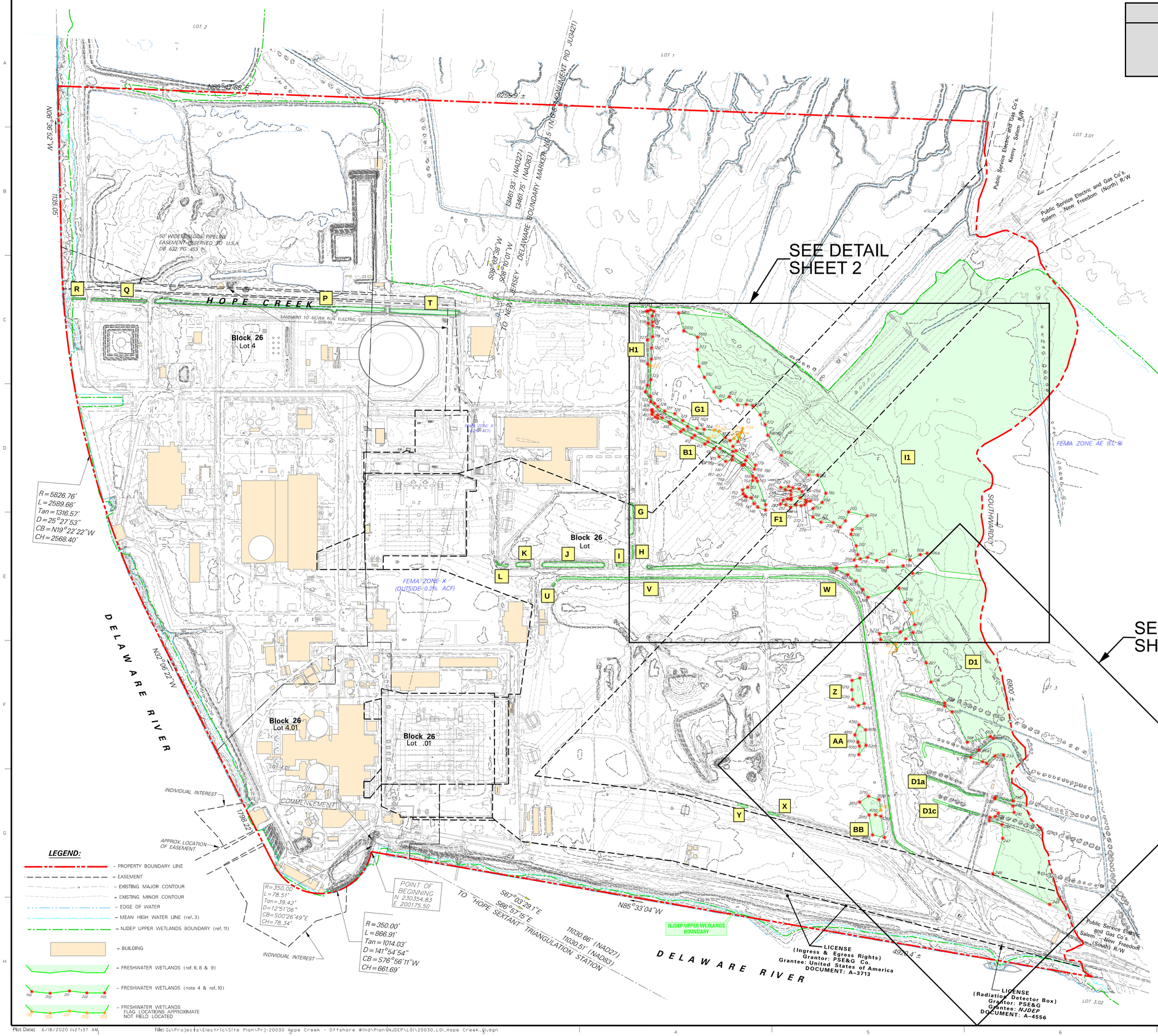
Attachment E

Survey Drawings

FOR NJDEP USE



SITE LOCATION MAP
N.T.S.



NAD83 (2011)

N W E S

NOTES:

1. MAPPING IS BASED ON THE NJ STATE PLANE COORDINATE SYSTEM
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4. WETLANDS WERE DELINEATED BY AKRF, INC. ON MAY 4 TO MAY 6, 2020 AND FIELD LOCATED BY FRALINGER ENGINEERING, PA, BRIDGETON, NJ.

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4. "PARTIAL BOUNDARY, TOPOGRAPHIC & UTILITY SURVEY, SALEM NUCLEAR GENERATING STATION, PSEG PROJECT #4110 (AIP SALEM), BLOCK 26, PORTION LOTS 4.01, 5 & 5.01" PREPARED BY CARROLL ENGINEERING, HILLSBOROUGH, NJ, DATED JUNE 10, 2016.
5. FEMA FIRM: FLOOD INSURANCE RATE MAP; MAP NUMBERS 34033C0256C, 34033C0257C, 34033C0258C & 34033C0259C,; DATED JUNE 16, 2016.
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LEGEND:

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- EASEMENT
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF WATER
- MEAN HIGH WATER LINE (ref. 3)
- NJDEP UPPER WETLANDS BOUNDARY (ref. 11)
- BUILDING
- FRESHWATER WETLANDS (ref. 6, 8 & 9)
- FRESHWATER WETLANDS (note 4 & ref. 10)
- FRESHWATER WETLANDS FLAG LOCATIONS APPROXIMATE NOT FIELD LOCATED

300 150 0 100 200 300 600 FEET
SCALE: 1" = 300'

NO	DATE	DESCRIPTION	DWN	CKD
3				
2				
1				

REVISION

PSEG Services Corporation
SURVEYS & MAPPING

CORPORATE HEADQUARTERS
80 Park Plaza T6B
Newark, NJ. 07102-4194
Phone : (973) 430-6952
Email : surveying@pseg.com

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PSEG SERVICES CORPORATION
80 PARK PLAZA – NEWARK – NEW JERSEY – 07102-4194

I AM A DULY REGISTERED PROFESSIONAL LAND SURVEYOR UNDER THE LAWS OF THE STATE OF NEW JERSEY AND I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED UNDER MY DIRECT SUPERVISION

STATE OF NEW JERSEY No. GS43324 PROFESSIONAL LAND SURVEYOR

Date: 2020.06.18 12:27:49 -04'00'

SHEHZAD C. KHAN

N.J. PROFESSIONAL LAND SURVEYOR No. GS43324
COA No. 24GA28078500

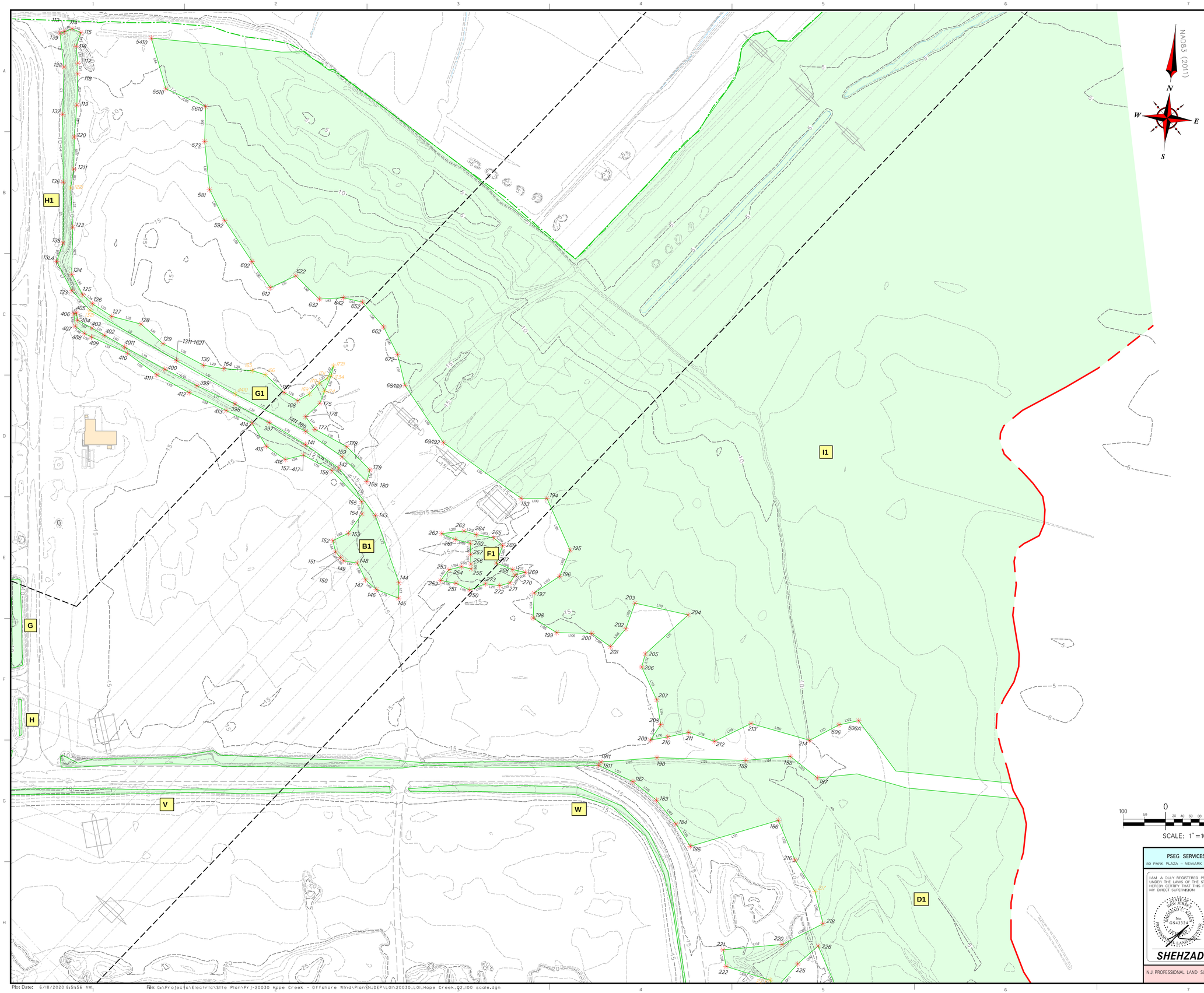
PSE&G's
HOPE CREEK SWITCHYARD
BLOCK 26, LOTS 4, 4.01, 5 & 5.01
HOPE CREEK ROAD

TOWNSHIP OF LOWER ALLOWAYS CREEK — SALEM COUNTY, NJ

LETTER OF INTERPRETATION PLAN (LOI)

DRAWN CMJ — CHECKED AT — SCALE AS SHOWN
DATE 6/18/2020 — EXAMINED BSG — AUTH Proj-19008

Plot Date: 6/18/2020 11:27:37 AM
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FOR NJDEP USE

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100 50 0 20 40 60 80 100 200 FEET
SCALE: 1" = 100'

NO	DATE	DESCRIPTION	DWN	CKD
3				
2				
1				

REVISION

PSEG Services Corporation
SURVEYS & MAPPING
CORPORATE HEADQUARTERS
80 Park Plaza T6B
Newark, N.J. 07102-4194
Phone : (973) 430-6952
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80 PARK PLAZA – NEWARK – NEW JERSEY – 07102-4194

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NEW JERSEY PROFESSIONAL LAND SURVEYOR No. GS43324

Date: 2020.06.18 12:29:26 -04'00'

SHEHZAD C. KHAN

N.J. PROFESSIONAL LAND SURVEYOR No. GS43324
COA No. 24GA28078500

PSE&G's
HOPE CREEK SWITCHYARD

BLOCK 26, LOTS 4, 4.01, 5 & 5.01
HOPE CREEK ROAD

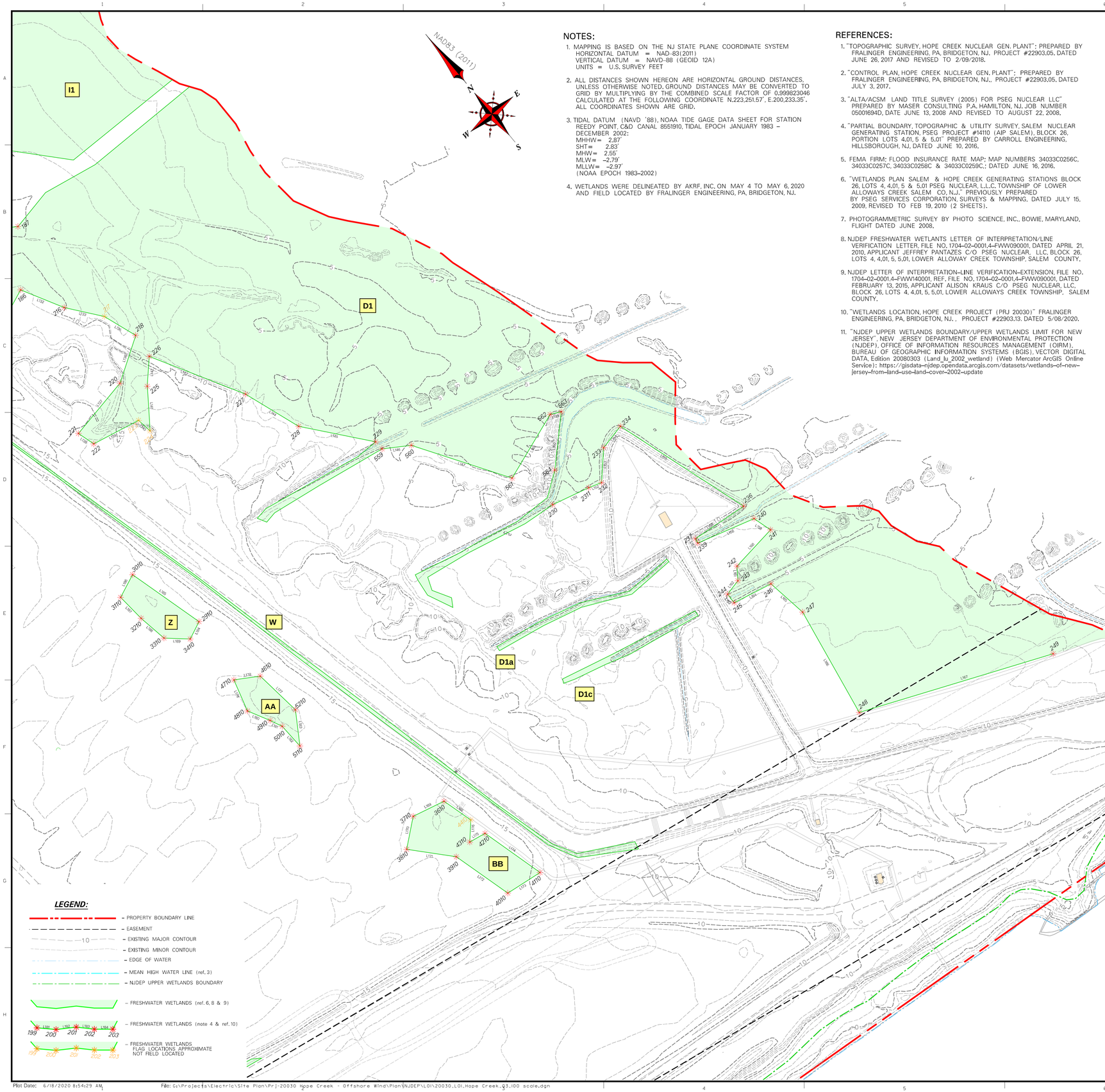
TOWNSHIP OF LOWER ALLOWAYS CREEK — SALEM COUNTY, NJ

LETTER OF INTERPRETATION PLAN (LOI)

DRAWN CMI CHECKED AT SCALE AS SHOWN
DATE 6/16/2020 EXAMINED BSG AUTH Proj-19008

Plot Date: 6/18/2020 8:51:56 AM File: G:\Projects\Electric\Site Plan\Prj-20030 Hope Creek - Offshore Wind\Plan\NJDEP\LOI\20030_LOI_Hope Creek_$2.100 scale.dgn

FOR NJDEP USE



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WETLANDS COORDINATE TABLE
NJSPC NAD'83 (2011)

POINT #	NORTHING	EASTING
113	234147.5	201685.1
114	234156.5	201702.7
115	234148.9	201724.1
116	234116.0	201715.9
117	234076.7	201723.9
118	234051.6	201725.9
119	233977.6	201730.9
120	233902.1	201731.9
123	233689.5	201748.0
124	233578.3	201756.4
125	233532.8	201786.9
126	233513.8	201811.4
127	233488.3	201859.9
128	233476.9	201930.1
129	233435.6	201986.4
130	233393.9	202086.4
1311 1621	233399.1	202022.1
133	233540.0	201760.1
135	233650.5	201728.8
136	233793.3	201715.9
137	233952.9	201699.6
138	234064.6	201692.1
139	234143.4	201674.9
141	233230.2	202343.5
142	233182.2	202427.4
143	233078.6	202523.9
144	232925.5	202594.4
145	232889.3	202597.0
146	232904.6	202542.7
147	232924.8	202515.2
148	232962.6	202492.2
149	232964.7	202459.6
150	232971.6	202451.4
151	232984.1	202438.4
152	233009.7	202429.7
153	233030.9	202464.6
154	233079.3	202492.7
155	233097.0	202512.3
155	233107.9	202488.9
156	233174.5	202411.8
159	233209.3	202433.2
164	233390.3	202135.2
167	233347.7	202282.1
168	233331.3	202315.8
175	233330.4	202368.6
176	233295.3	202338.1
177	233268.0	202362.8
178	233233.1	202442.0
178	233233.9	202441.5
179	233184.5	202501.1
182	232509.5	203189.3
183	232471.2	203248.6
184	232419.8	203299.5
185	232370.3	203338.4
186	232450.6	203539.7
187	232559.2	203622.1
188	232604.0	203553.4
189	232584.7	203450.1
190	232571.4	203240.4
193	233151.4	202863.2
194	233156.8	202923.9
195	233040.2	202990.2
196	232976.5	202971.1

WETLANDS COORDINATE TABLE
NJSPC NAD'83 (2011)

POINT #	NORTHING	EASTING
197	232931.2	202915.1
198	232872.3	202918.1
199	232842.2	202976.0
200	232846.2	203059.5
201	232822.1	203106.4
202	232867.8	203138.5
203	232925.9	203154.3
204	232914.2	203282.1
205	232812.7	203190.0
206	232781.2	203184.4
207	232707.4	203227.0
208	232646.9	203241.7
209	232611.2	203221.1
210	232622.6	203261.2
211	232637.3	203309.6
212	232622.6	203372.3
213	232672.4	203454.0
214	232646.0	203595.5
216	232356.4	203583.0
218	232211.7	203667.7
220	232155.7	203575.8
221	232133.8	203438.5
222	232096.6	203449.4
225	232116.1	203617.3
225	232117.4	203617.1
226	232164.0	203661.2
227	231966.3	203768.9
228	231841.2	203812.7
229	231711.7	203918.9
230	231364.9	204125.7
232	231334.1	204236.7
233	231386.1	204288.4
234	231401.5	204345.2
236	231100.3	204439.5
237	231112.8	204314.8
239	231100.1	204313.3
240	231065.4	204439.9
241	231024.1	204451.5
242	231010.2	204346.3
243	230984.7	204327.8
244	230976.9	204292.3
245	230953.4	204291.4
246	230934.2	204378.3
247	230844.1	204391.9
248	230600.3	204348.0
249	230431.2	204749.4
250	232924.2	202762.6
251	232936.9	202728.9
252	232940.1	202692.2
253	232967.2	202709.1
254	232977.2	202737.9
255	232974.2	202761.4
256	232985.6	202759.5
257	233008.0	202757.0
260	233034.2	202753.5
261	233035.8	202717.5
262	233050.7	202684.1
263	233061.8	202736.1
264	233055.9	202765.9
265	233052.3	202807.7
266	233035.8	202830.3
267	232991.5	202819.5
268	232981.8	202859.1

WETLANDS COORDINATE TABLE
NJSPC NAD'83 (2011)

POINT #	NORTHING	EASTING
269	232978.1	202889.5
270	232969.6	202865.9
271	232950.0	202855.9
272	232941.0	202832.1
273	232942.2	202798.3
397	233273.7	202253.7
398	233310.0	202169.3
399	233344.1	202075.5
400	233376.0	201996.5
4011	233419.2	201896.9
402	233442.2	201846.5
403	233456.5	201815.8
404	233471.8	201780.1
405	233488.8	201776.1
406	233486.2	201770.0
407	233457.4	201776.1
408	233442.2	201799.1
409	233435.3	201816.7
410	233405.2	201904.9
1411 160	233260.8	202341.5
412	233326.2	202058.7
413	233292.4	202149.9
414	233268.3	202213.4
415	233217.2	202252.2
416	233190.4	202299.7
506	232689.1	203661.1
559	231691.4	203919.7
560	231657.2	203973.1
561	231464.4	204094.9
562	231517.5	204245.2
563	231506.8	204267.0
564	231419.0	204176.6
573	233920.5	202039.6
581	233808.4	202061.6
592	233738.7	202104.4
602	233648.6	202177.5
612	233591.1	202226.1
622	233624.7	202283.8
632	233575.3	202344.2
642	233583.8	202400.4
652	233577.7	202446.4
662	233523.8	202501.6
672	233462.0	202540.5
1211	233826.5	201737.9
1811	232540.5	203104.4
1911	232548.6	203109.9
2311	231343.6	204208.3
2910	231656.9	203379.8
3010	231825.8	203334.2
3110	231804.8	203283.3
3210	231742.1	203288.5
3310	231678.0	203299.3
3410	231640.3	203341.4
3610	231023.6	203538.9
3710	231041.0	203467.2
3810	230995.4	203411.1
3910	230914.8	203483.0
4010	230784.1	203518.4
4110	230773.9	203600.1
4111	233360.9	201978.8
4210	230914.2	203562.7
4310	230920.7	203525.6
4610	231482.8	203406.4
4710	231512.7	203357.6
4810	231442.7	203337.5
4910	231396.0	203361.9
5010	231369.7	203373.9
5100	236141.0	197767.2
5110	231312.7	203376.2
5210	231378.9	203418.5
5410	234151.9	201891.3
5510	234035.8	201936.5
5610	234002.6	202033.9
13L4	233605.5	201717.9
157-417	233204.8	202341.3
158 180	233156.7	202496.5
506A	232703.0	203706.6
68/189	233391.3	202565.1
69/192	233264.8	202668.1

100 0 100 200 FEET
50 70 40 60 80
SCALE: 1" = 100'

LEGEND:

- PROPERTY BOUNDARY LINE
- EASEMENT
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF WATER
- MEAN HIGH WATER LINE (ref. 3)
- NJDEP UPPER WETLANDS BOUNDARY
- FRESHWATER WETLANDS (ref. 6, 8 & 9)
- FRESHWATER WETLANDS (note 4 & ref. 10)
- FRESHWATER WETLANDS FLAG LOCATIONS APPROXIMATE NOT FIELD LOCATED

NO	DATE	DESCRIPTION	DWN	CKD
3				
2				
1				

REVISION

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SURVEYS & MAPPING
CORPORATE HEADQUARTERS
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I AM A DULY REGISTERED PROFESSIONAL LAND SURVEYOR UNDER THE LAWS OF THE STATE OF NEW JERSEY AND I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED UNDER MY DIRECT SUPERVISION

NEW JERSEY LICENSED PROFESSIONAL LAND SURVEYOR No. GS43324 SHEHZAD C. KHAN

Date: 2020.06.18 12:30:18 -04'00'

SHEHZAD C. KHAN

NJ. PROFESSIONAL LAND SURVEYOR No. GS43324
COA No. 24GA28078500

PSE&G's

HOPE CREEK SWITCHYARD

BLOCK 26, LOTS 4, 4.01, 5 & 5.01
HOPE CREEK ROAD

TOWNSHIP OF LOWER ALLOWAYS CREEK — SALEM COUNTY, NJ

LETTER OF INTERPRETATION PLAN (LOI)

DRAWN CMI CHECKED AT SCALE AS SHOWN
DATE 6/18/2020 EXAMINED BSG AUTH Proj-19008

ATTACHMENT B

STORMWATER MANAGEMENT REPORT

NJ WIND PORT PARCELS G & C1

STORMWATER MANAGEMENT REPORT

PREPARED FOR:

New Jersey Economic Development Authority

New Jersey Economic Development Authority (NJEDA)
36 West State Street
Trenton, New Jersey 08625

November 4, 2022

Revision	Issue Purpose	Description	Issued By	Date	Checked
0	Client Approval	Prelim. Engineering	D. Cain	11/04/2022	C. Huntley

Prepared by:

moffatt & nichol

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Section 1 - Introduction and Project Description

The offshore wind (OSW) industry in the northeast of the United States (US) is a relatively new industry that is poised for significant growth and development. Multiple states have passed legislation mandating offshore wind power to be included in their energy portfolio. As a result, several power purchasing agreements (PPAs) have been awarded to various offshore wind developers. These new offshore wind farms will be commercial scale (over 300 MW). Additional northeastern states are in process to solicit and award additional PPAs. Due to the awarded power purchases and the pipeline of soon to be awarded work, significant infrastructure retrofits/enhancements will be required to prepare the region to support the offshore wind farm supply chain.

Offshore wind components are extremely large and require port facilities with significant laydown areas and high loading capacities. Due to the size and weight of the components, they are typically transported over water rather than overland. Currently, there are no manufacturing facilities in the northeast US capable of producing the required components; therefore, they will be imported from overseas manufacturers.

The New Jersey Economic Development Authority (NJEDA) is in the process of developing a marine terminal on land owned by Public Service Enterprise Group (PSEG) located directly to the north of the existing Hope Creek Nuclear Generating Station in Lower Alloways Creek, New Jersey. This development, the New Jersey Wind Port (NJWP), is being designed and constructed to serve as a wind turbine generation (WTG) port facility to service the offshore wind industry. WTG port facilities typically serve to import, stage, preassemble and loadout large components for the commercial-scale wind installation sites. These components consist of tower sections, nacelles, and blades. Other components such as transition pieces and monopiles may also be moved through these types of facilities. The marine facilities for this project are referred to as Site A, which is the subject of a separate report.

The NJWP will serve as an import, storage, pre-assembly and loadout facility for wind towers, nacelles, and blades to service the offshore wind market. The marshalling port to be located at Site A will have the potential to import and loadout the new GE Haliade-X 12 MW turbines as well as the associated towers and blades.

This report will address the proposed development of three separate areas: Site G, Site C1, and the electrical substation. The Site G facility will feature three main components: 1) a heavy haul road to connect Site G to Site A, 2) the nacelle manufacturing and assembly plant, and 3) laydown and testing area for the completed nacelles. The Site C1 area will provide additional laydown storage area for the expansion of Site A. The electrical substation will encompass the necessary electrical infrastructure to receive the high voltage transmission electricity and then distribute it to the remaining NJWP sites.

The proposed uses of the Site G and Site C1 areas as nacelle assembly plant and additional laydown areas to support Site A necessitates that the sites be capable of handling heavy surface loadings from self-propelled modular transporters (SPMTs) and OSW components.

The overarching goal of the storm drain collection system proposed for Sites C1 and G is to manage and treat the storm runoff from motor vehicle surfaces close to the area where it accumulates. This goal is achieved through the proper grading of the site to limit the size of proposed drainage basins and the use of green infrastructure (GI) manufactured treatment devices (MTDs) and non-GI MTDs installed locally in the proposed drainage basins on site. The treated stormwater and stormwater overflows will be conveyed through underground reinforced concrete pipes to either underground storage vaults for infiltration or discharged. The discharges for Site C1 will be connected to the outfall pipes of Site A that discharge directly to the Delaware River. Through Site G the stormwater will be discharged towards the adjacent wetlands to the north and the existing PSEG drainage ditch west of the site.

High mast lighting will be installed along the site perimeter. Power for lighting the nacelle laydown area and required building power will be supplied from the substation being provided for the development under a separate scope of work. Underground conduit and duct bank will be installed to create the power distribution network for the site. Infrastructure (e.g. empty conduit) only for telecommunication systems will also be installed.

Fire hydrants will be placed at the base of each light pole for ease in locating and to minimize site obstructions. Water supply to the site, both potable and fire water, will be provided by on-site storage tanks since tie-ins to the adjacent plant are not currently available. Tanks will be refilled by trucked in water. Sanitary sewage service will not be available from the adjacent plant. Temporary restroom facilities with pump-out shall be utilized and are assumed to be provided by the end user of the facility.

The finished surface of the laydown areas and the heavy haul road will be compacted dense graded aggregate. The aggregate will be imported from an offsite source. The site access roadway will have finished asphalt surface and the building parking lot will be a porous asphalt surface to facilitate drainage and stormwater treatment.

This Stormwater Management Report and permit package covers all of Site G, Site C1, and the electrical substation. The NJWP site location is shown in Figure 1-1 below. The limits of the Sites G, C1 and the substation are shown below in Figure 1-2 and described in more detail in Section 1.1.

1.1. Site Location and Project Overview

1.1.1. Existing Site Land Uses

This site is located directly adjacent to the existing Hope Creek Nuclear Generating Station in Lower Alloways Creek Township, in Salem County, New Jersey. Site G is bounded to the north and east by the NJDEP wetlands delineation line, and the south and west by the generating station. Site C1 is bounded by the Site A development to the west, the future Site B to the north, the confined disposal facility (CDF) C on the east, and the proposed heavy haul road of Site G to the south. Refer to Figure 1-1 below for the overall location map and Figure 1-2 for the aerial site photo. Photos of the existing site conditions from site visits are included in Appendix G.

Site G is currently occupied by the Hope Creek Nuclear Generating Station and most of the site is currently used as laydown area and parking. The western section of the site is currently occupied by the PSEG combo shop which is being relocated elsewhere on the Hope Creek site, and the eastern area of Site G is previously developed, unoccupied land overgrown by phragmites. The section of Site G where the electrical substation is proposed is located just south of the existing PSEG chiller plant on unoccupied land overgrown by phragmites. The current land use at Site C1 is dedicated to the existing PSEG security force target ranges and access to the nuclear dredging CDF.

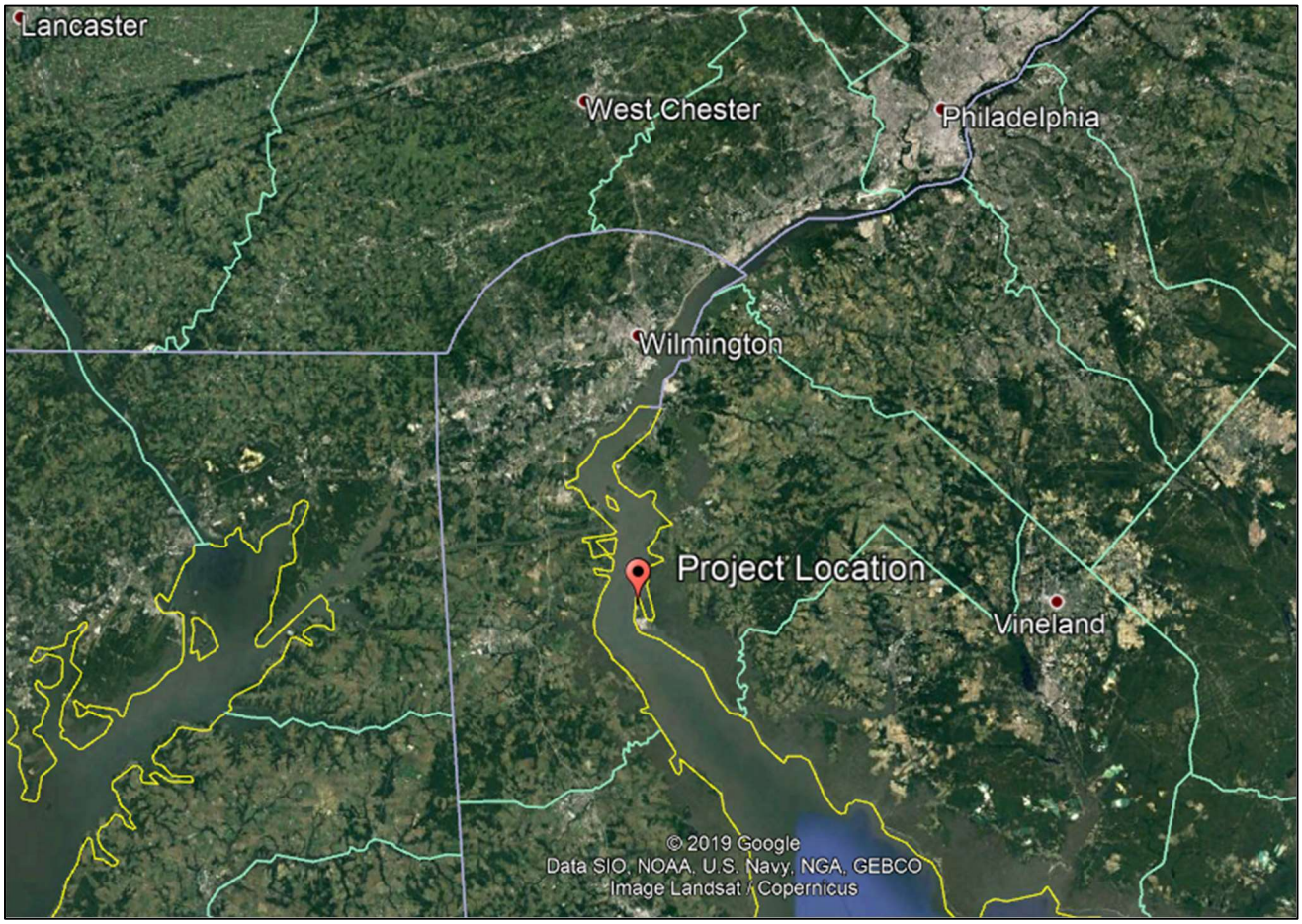


Figure 1-1 - Overall Location Map

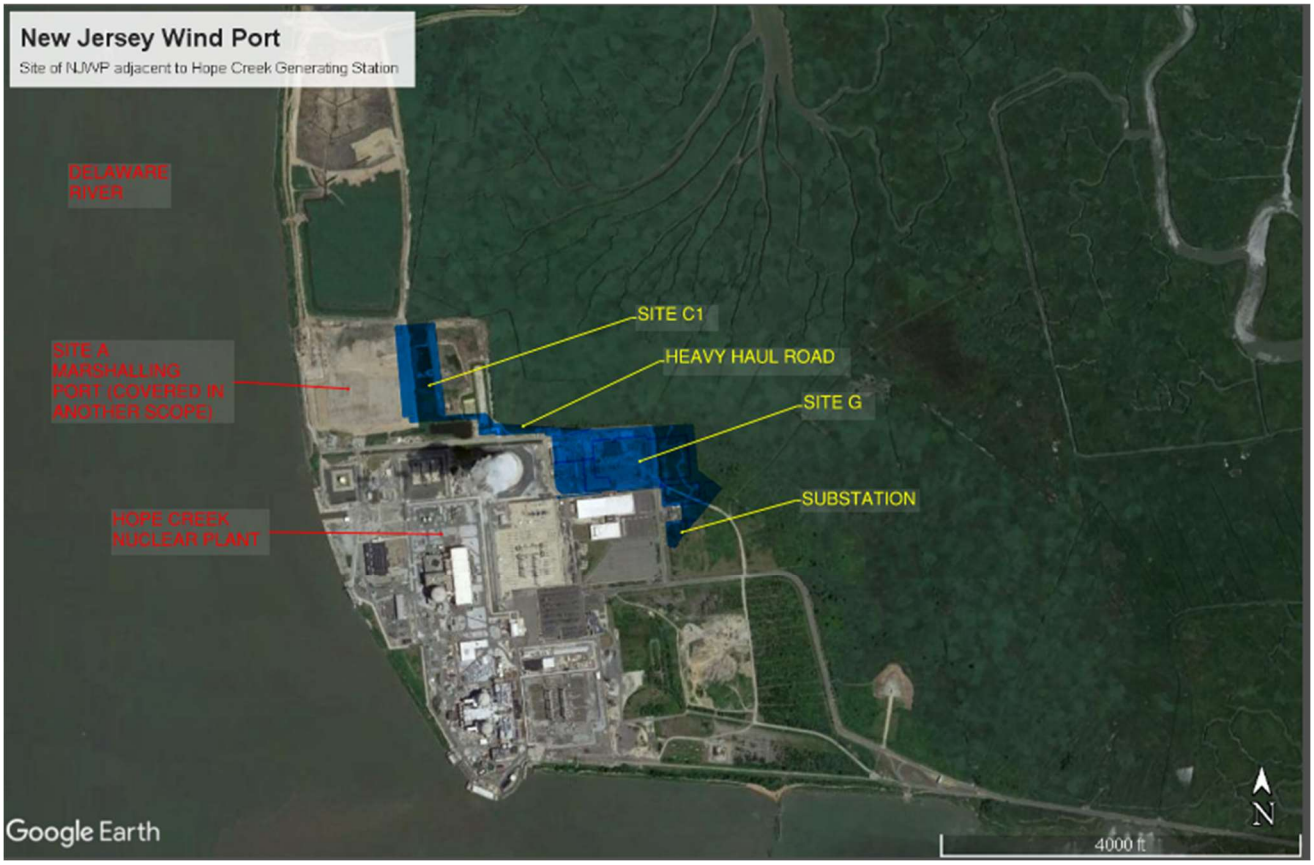


Figure 1-2 - Project Site Aerial

1.1.2. Proposed Site Conditions

Site G is currently being considered for use as a manufacturing and assembly plant for nacelles prior to loadout from the marshalling port at Site A. The vast majority of the site will be occupied by the proposed assembly and warehousing facility with its required access and supplementary office space. The additional area to the west of the site will be dedicated to laydown and testing area for the completed nacelles. The southeastern section of Site G is proposed as the Wind Port electrical substation. Site C1 is proposed as an extension of the Site A marshalling port for use as additional laydown area for the OSW components.

Outside of the building footprint, the site G layout will provide for as much open space as possible, while considering location of utility components such as high mast light poles, fire hydrants, storage tanks, etc. The topping surface in this area shall be compacted dense graded aggregate. The pavement surface around the building and along the access drive shall be asphalt, and the building parking lot will be porous asphalt. The Site C1 layout will provide as much additional open space to Site A as possible while accounting for additional high mast light poles, fire hydrants, and the POV access roadway. The pavement surface of Site C1 shall be dense graded aggregate.

The transport of OSW components will occur via self-propelled modular transporters (SPMT). An existing road utilized by PSE&G, called the Material Center Access Road, crosses the width of Site G at the edge of the existing

paved/laydown area. This road will be rerouted to the southern and western limits of Site G just outside the limits of work.

The continuation of the Material Center Access Road leads from Site G to the berth area at Site A but does not have sufficient loading capacity for these transfers and would require crossing the existing LS Power lines, which would present additional challenges. Therefore, a newly constructed heavy haul road will be required to provide transport between Sites A and G. This proposed heavy haul road is contained within the scope of development of Site G and borders the southern perimeter of Site C1.

1.2. Site Zoning

According to the Township of Lower Alloways Zoning map, the site is listed in an existing "Industrial" Zoning District along with the adjacent properties. Consequently, the proposed wind port facility shall comply with the relevant permitted and condition use regulations (Section 5.15), as well as bulk and area regulations (Section 5.16) of the Land Development Ordinance for the Township of Lower Alloways Creek.

1.3. FEMA Flood Levels

According to the Flood Insurance Rate Map (FIRM) Numbers 34033C0256C and 34033C0257C, published by FEMA and made effective on June 16, 2016, the proposed Site G currently falls within the X zone, with some discrete areas shaded for inclusion within the 0.2% Annual chance flood hazard, which are defined as follows.

- Zone X: The areas of minimal flood hazard, which are the areas outside the Special Flood Hazard Area and higher than the elevation of the 0.2-percent-annual-chance flood (500-year).
- 0.2-percent-annual-chance flood: Areas of 0.2% annual chance flood, also termed 500-year.

In general, Site G is within an area of minimal flood risk.

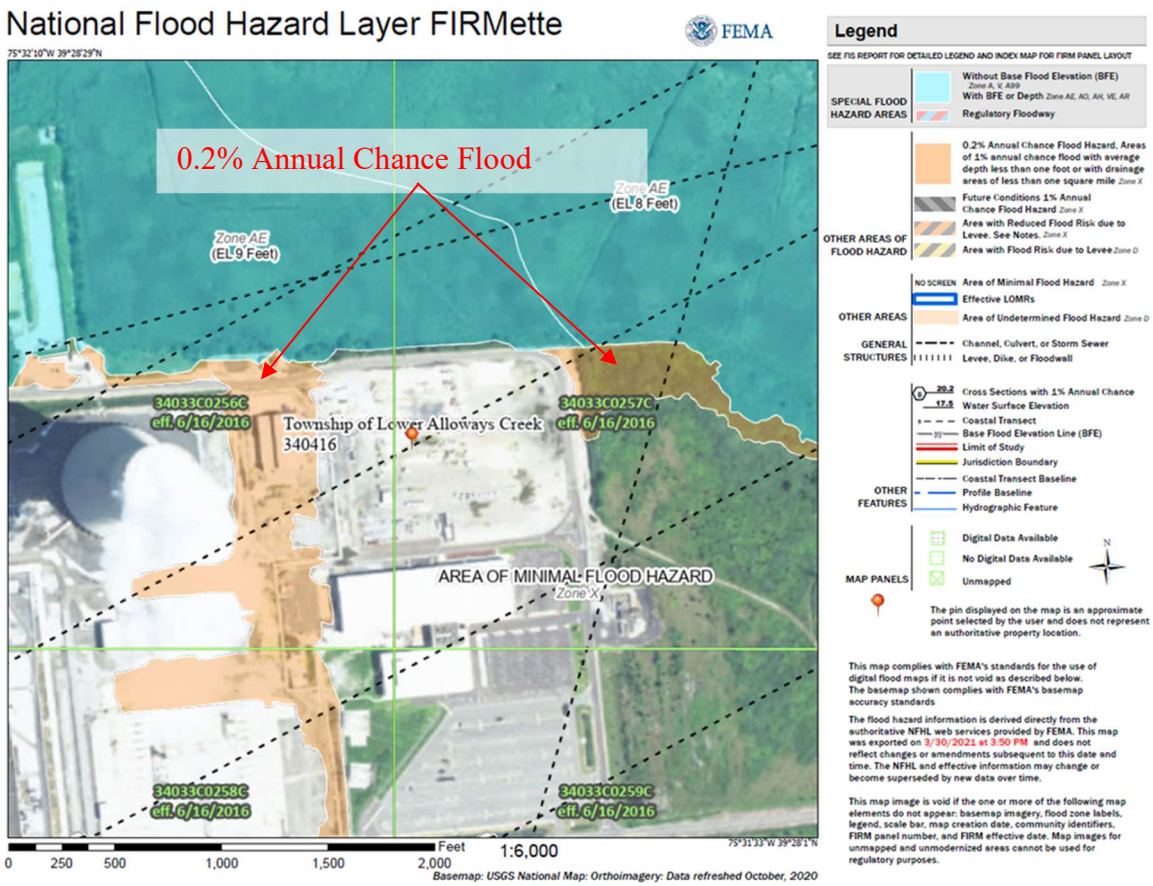


Figure 1-3 - Site G FEMA FIRMette Excerpt

According to the Flood Insurance Rate Map (FIRM) Number 34033C0256C, published by FEMA and made effective on June 16, 2016, the proposed heavy haul road will traverse areas designated as Zone AE, which is defined as follows:

- Zone AE (Site Base Flood Elevation – EL 9ft NAVD 88): Special flood hazard area designation by FEMA as having a 1 percent annual chance of flooding. This flood is also called the 100-year flood.

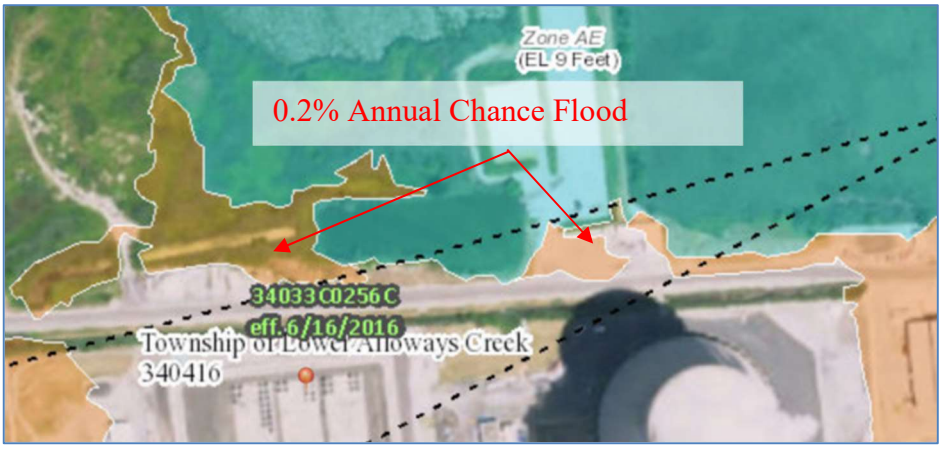


Figure 1-4 – Heavy Haul Road FIRMette

Site C1 is located entirely within the FEMA designated Zone AE with a base flood elevation of 9 feet (NAVD 88). This zone designation can be seen on FIRM Number 34033C0256C, published and made effective on June 16, 2016, and the FIRMette can be seen as Figure 1-5 below.

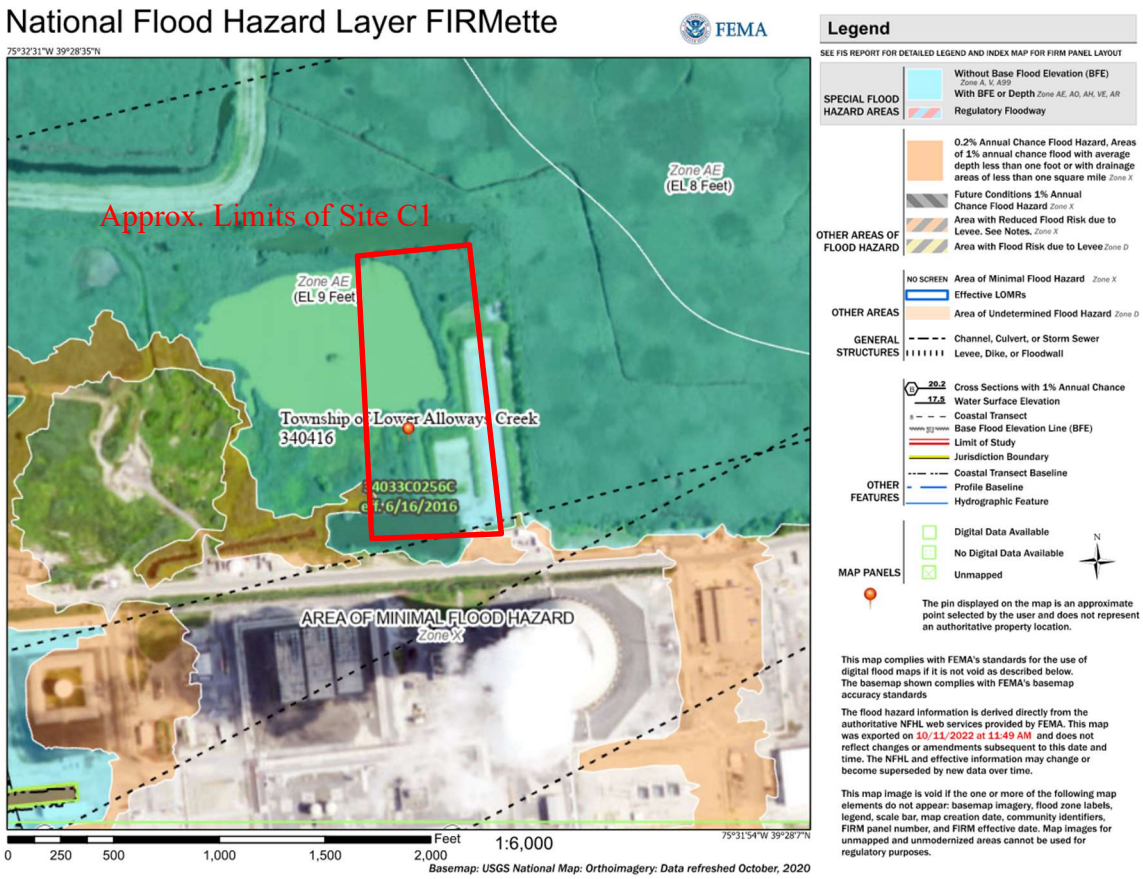


Figure 1-5 – Site C1 FIRMette

Section 2 -Proposed Stormwater Management Measures

All stormwater management plans, and stormwater control ordinances shall, according to the goals and requirements of NJDEP, be designed to:

- Reduce flood damage
- Minimize, to the extent practical, any increase in stormwater runoff from any new development
- Reduce soil erosion from any construction project
- Assure the adequacy of existing and proposed culverts and bridges, and other instream structures
- Maintain groundwater recharge
- Prevent, to the greatest extent feasible, an increase in nonpoint pollution
- Maintain the integrity of stream channels for their biological functions, as well as for drainage
- Minimize pollutants in stormwater runoff from new and existing development
- Protect public safety.

The proposed stormwater management system shall be designed to adequately collect, treat locally, and convey channelized runoff for sites G (+/- 35 acres) and C1 (+/-10 acres), and to satisfy all applicable NJDEP stormwater management requirements for major development. This shall be accomplished using structural and nonstructural stormwater management strategies. Proposed features include: cover stabilization practices, a stormwater collection and conveyance system, green infrastructure and manufactured treatment devices, and discharge control practices. Specific details pertinent to the design elements specified are as follows:

- The stormwater collection system shall be designed to manage the 25-yr, 24-hour storm event consistent with the NJDOT Roadway Drainage Design Manual Table 10-2 and the Township of Lower Alloways Creek Land Development Ordinance Section 4.30.B.2.
- Green infrastructure and Manufactured Treatment Devices (MTDs) shall be incorporated into the proposed system to remove total suspended solids and floating debris prior to discharge. The proposed system for Site G incorporates Contech StormFilters and Filterras capable of achieving an 80% TSS removal efficiency prior to discharge into the tidal channel that ends at the Delaware River. Grassed bioswales and porous asphalt have also been incorporated into the Site G stormwater management system in Site G where applicable. The proposed system for Site C1 utilizes the Jensen Stormvault GI MTDs as underground vaults to achieve the treatment requirement prior to discharging to the outfalls through Site A.
- The existing PSEG stormwater system currently drains through two sections of Site G. The open channel drainage through the eastern section of Site G will be captured and rerouted through buried reinforced concrete pipes that discharge to the adjacent wetlands to the north. The open channel drainage that runs east to west through the adjacent wetlands to the north will remain untouched and until it passes through a culvert to the existing PSEG drainage channel. Existing storm drainage passing through the existing Combo Shop lot will be demolished and removed, and the captured runoff from the south will be rerouted along the shifted Material Center Road to discharge in the PSEG drainage channel.
- To facilitate the green infrastructure localized treatment on Site G, four stormwater outfalls will discharge to the adjacent wetlands to the north. Each outfall will consist of a discharge pipe, a backflow preventer, and a riprap apron (for energy dissipation and scour protection). The full stormwater system will discharge to the tidally connected PSEG drainage channel to the west.

- Because Site C1 will function as an extension of Site A for the end user, the proposed stormwater management system will connect to the two outfall pipes of Site A that discharge directly to the Delaware River.

2.1. Design and Performance Standards for Stormwater Management Measures

NJDEP's objectives for stormwater management are directed at erosion control, groundwater recharge, storm water runoff quantity, and stormwater runoff quality. NJDEP supports and encourages use of non-structural stormwater management measures to satisfy design and performance standards; however, the most recent stormwater rule amendment, which took effect on March 2, 2021, requires the use of green infrastructure to meet these quantity, quality, and recharge design standards. Specifically in New Jersey, the Stormwater Management Rules at N.J.A.C. 7:8-1.2 define green infrastructure as "a stormwater management measure that manages stormwater close to its source by:

1. Treating stormwater runoff through infiltration into subsoil;
2. Treating stormwater runoff through filtration by vegetation or soil; or
3. Storing stormwater runoff for reuse."

There is a wide range of stormwater management measures that are used to address the impacts of development on groundwater, water quality and water quantity to meet the recently updated requirements of NJDEP guidelines. Applicable compliance standards for the new collection system are discussed below.

2.1.1. Erosion Control

The wind port facility will conform to the design and performance standards for erosion control established under the Soil Erosion and Sediment Control Act, NJSA 4:24-39 et eq. and implementing rules. Key structural elements of the Erosion and Sediment Control (ESC) plan include: installation of silt fencing, installation of stabilized construction entrances, use of crushed stone cover in equipment laydown and staging areas, and erosion control for temporary soil stockpiles. All structural ESCs shall be installed in accordance with applicable NJDEP recommended practices, as well as NJDEP's "Standards for Soil and Erosion Sediment Control," and operational prior to initial site disturbance and subsequent construction phasing. The proposed erosion and sediment control plans for the two phases of earthwork movement for Site G are included in Appendix E.

2.1.2. Groundwater Recharge

The groundwater recharge requirements outlined in NJAC 7:8 5.4, or use of infiltration practices for stormwater management at the site, would not be recommended for the following reasons:

- The site is in proximity to the tidal water of the Delaware River. As such, base flow discharge in the river is not at all influenced by local groundwater flow.
- The upper soil stratum at the site consists of very soft to medium stiff silty clays. These soils are unsuitable for infiltration. The thickness of fill after site development will vary but will generally be less than 5' and will be compacted through an extended period of surcharging.
- The saline environment of the Delaware River limits future development of groundwater wells or well field for either potable or industrial water supply purposes.

- Stormwater runoff could be subject to exposure to waste materials, industrial machinery and fuels, lubricants, or other industrial activities.
    - Per NJAC 7:8-5.4. (a).2.iii.(2), site stormwater exposed to "source material," i.e. any material(s) or machinery, located at an industrial facility, that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater, shall not be recharged.

Based on the above considerations, it has been evaluated that groundwater recharge shall not be considered as a principal stormwater management control measure for the wind port facility.

2.1.3. Stormwater Runoff Quantity Standards

In accordance with stormwater design standards established by the New Jersey Department of Transportation (NJDOT), the proposed stormwater management collection system for the wind port site shall be designed to safely manage runoff from the 25-year, 24-hour storm event (See Appendix A for design parameters and model), a flood recurrence level consistent with the NJDOT Roadway Drainage Design Manual Table 10-2 and the Township of Lower Alloways Creek Land Development Ordinance Article VI, Section 4.30.B.2. Water quantity control is not applicable to this site in accordance with the N.J.A.C. 7:8-5.6(b)4 due to the location of the site's point of discharge to the tidal zone of the Delaware Bay.

2.1.4. Stormwater Runoff Quality Standards

2.1.4.1. Total Suspended Solids Reduction

The project is subject to the NJDEP's stormwater quality standards for major development established in N.J.A.C. 7:8 where an 80% reduction in total suspended solids loading is required for new motor vehicle surfaces. This reduction must be achieved for the NJDEP's stormwater quality design storm of 1.25 inches of rainfall falling with a specific distribution over a 2-hour period. The amended stormwater rule establishes that the water quality treatment standards of 80% TSS reduction must be achieved through the implementation of approved green infrastructure techniques as detailed in the NJ BMP manual.

To achieve the mandatory water quality standard for Sites G and C1, multiple strategies are proposed to be implemented distributed throughout the site. Figure 2-1 demonstrates the applicable treatment technology for every proposed drainage area throughout Site G and C1. The techniques proposed for utilization around the site include GI-approved manufactured treatment devices (MTDs), pervious pavement, MTD's as pretreatment to infiltration, bioswales, and GI-approved MTD's as underground vault configurations. The green infrastructure solutions achieve the 80% TSS reduction required for all development proposed within the Sites G and C1; however, the GI MTD's proposed for Site C1 meet the 80% TSS reduction in a configuration not certified as green infrastructure according to the MTD certification. This non-GI configuration necessitates a petition for a green infrastructure requirement exemption for the Site C1.

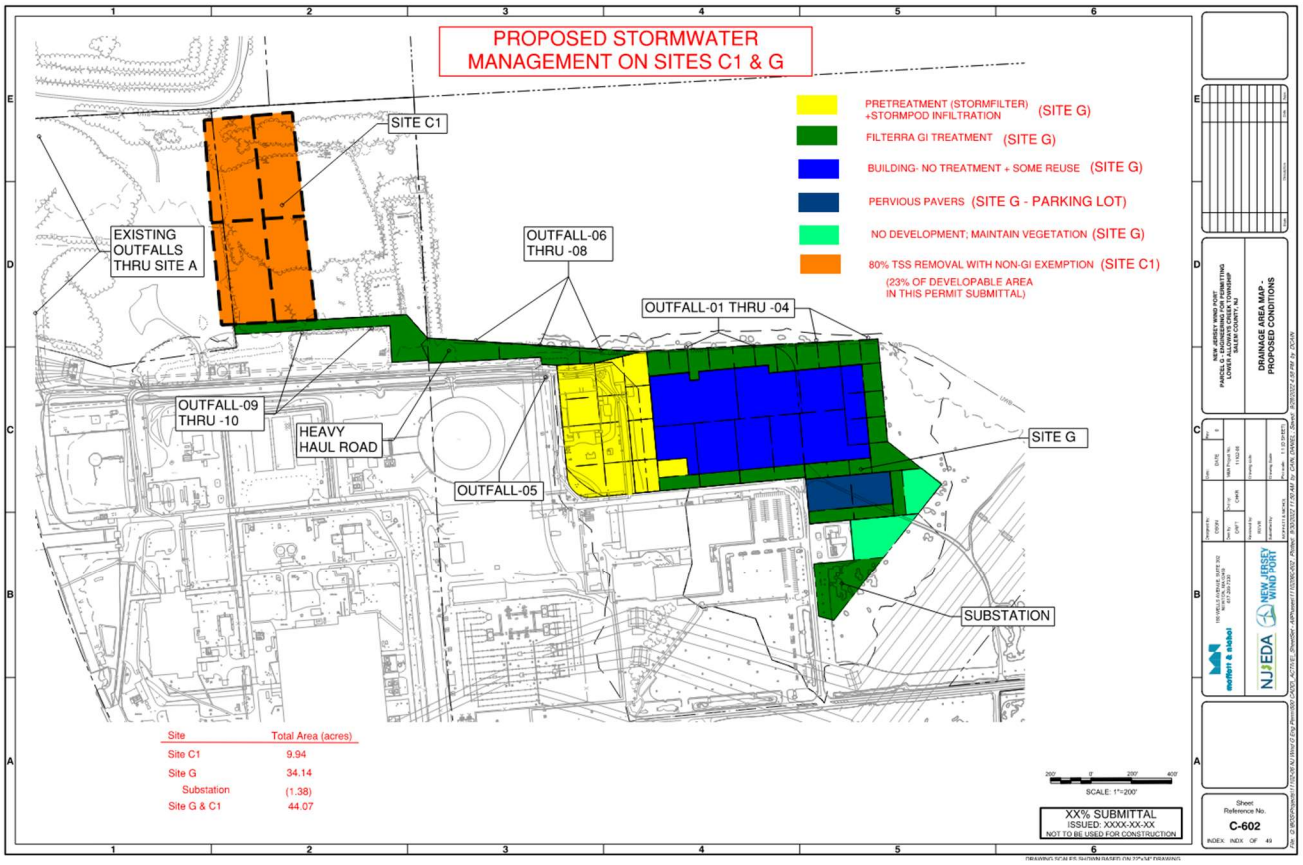


Figure 2-1 – Stormwater Treatment Measure Proposed for Sites C1 and G

2.1.4.2. Manufactured Treatment Device Certification

The manufactured treatment device (MTD) proposed for the OSW component laydown facility on the western half of Site G shall be the Stormwater Management StormFilter by Contech Engineered Solutions LLC. The StormFilter uses rechargeable, media-filled cartridges to absorb and retain pollutants from stormwater runoff including total suspended solids, hydrocarbons, nutrients, metals, and other common pollutants. The MTD proposed for the eastern half of Site G around the perimeter of the nacelle assembly building will be the Filterra Bioretention System (Filterra) by Contech Engineered Solutions LLC. The Filterra uses "physical, chemical, and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff." The MTD proposed for use within Site C1 will be the StormVault BioFiltration (StormVault) with Sierra Blend by Jensen Water Resources. The StormVault is a bioretention GI MTD that captures and removes pollutants from stormwater including total suspended solids, heavy metals, nutrients, gross solids, trash and debris, and petroleum hydrocarbons through its proprietary Sierra Blend bio-soil media.

N.J.A.C. 7:8-5.5(b) and 5.7(c) allows for the use of manufactured treatment devices for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by NJDEP. NJDEP has certified the use of both the StormFilter System and the Filterra Bioretention System by Contech Engineered Solutions LLC at a TSS removal rate of 80% when designed, operated, and maintained as stipulated by NJDEP in the terms of its certification. The NJDEP has also certified the use of the StormVault BioFiltration with Sierra

Blend by Jensen Water Resources when designed, operated, and maintained as stipulated in its certification letter; however, the proposed configuration of the StormVault as an underground vault with no infiltration does not meet the GI requirements of the certification. This imposes a need for a green infrastructure requirement exemption for the areas to use the StormVault in Site C1. Please refer to Appendix B for the MTDs certification and to Appendix C for the MTDs design, respectively.

2.1.5. Non-Structural Stormwater Management Controls

A Stormwater Pollution Prevention Plan (SWPPP), as required, will be developed prior to operation of the wind port site. The SWPPP will reflect the enhanced drainage, conveyance, and treatment systems for the site area, including routine inspection and maintenance practices. The SWPPP will also address material off-loading and storage practices for any oils (i.e. fuel oil, lubrication oil, etc.).

Section 3 - Stormwater Management System Design

3.1. Storm Drainage Design

The proposed stormwater management system for the wind port Sites G and C1 has been designed to comply with the applicable regulations of N.J.A.C. 7:8, the NJDOT Roadway Drainage Design Manual, and the Township of Lower Alloways Creek Land Development Ordinance Article VI, Section 4.30.B2. The NJDOT drainage regulations state in Table 10.2-C the design recurrence interval for this grade of stormwater management facility and network, which is 25-year storm events. In addition to compliance with the newly implemented green infrastructure rules of N.J.A.C., the design team accounted for the New Jersey extreme precipitation projections recently published by the NJDEP. The stormwater network was designed to account for the 25-year extreme precipitation event to accommodate projected additional flooding due to climate change and increase the facility's resilience.

The wind port site G has been divided into 64 total drainage areas to meet the drainage area limitations, manage the stormwater close to its source, and treat the stormwater locally through green infrastructure measures. The wind port site C1 has been divided into four drainage areas of approximately 2.5 acres each. Please refer to the drawing set included in Appendix E that details the proposed drainage areas of Sites G and C1. Appendix F demonstrates the proposed stormwater management system and all accompanying stormwater conveyance pipes.

Within Site C1, all stormwater runoff from each drainage area shall be intercepted by trench drains that are oriented in the north-south direction and parallel to the wharf in adjacent Parcel A, which will convey the flow into a storm drain network. Diversion structures set in line will direct peak runoff from the NJDEP 1.25-inch, 2-hour water quality storm to the underground storage structures upstream of the underground StormVault MTDs for treatment; larger storm events will bypass the MTD. Because the individual drainage areas are fully impervious, the underground storage shall provide attenuation for the peak storm flows that need to pass through the treatment MTD, which can at its proposed sizing can only handle maximum treatment flow rates of 0.606 cfs. The underground storage is sized based on the contributing area water quality design storm runoff volume. Therefore, the diversion structure provides the initial flow control towards the treatment train, then the outfall of the underground storage incorporates an outlet control structure to allow only up to the maximum treatment flow into the downstream MTD. The StormVault MTD is certified by the NJCAT to achieve the required 80% TSS removal efficiency for water quality treatment. The treated stormwater runoff from the MTDs and the larger storms will be conveyed to the Parcel A outfalls discharging through the wharf into the adjacent Delaware River.

Within Site G, the stormwater runoff from the heavy haul road shall be collected through the Filterra Bioretention systems configured with curb inlets and internal diversion structures. The internal diversion structures will allow the NJDEP water quality design storm (WQDS) flows to enter the bioretention cell and all larger storm events will be diverted downstream. The treated flows from the Filterra and the diverted flows will be conveyed downstream through grassed bioswales provided additional GI treatment prior to discharge to the existing PSEG stormwater pond and to the adjacent wetlands. The stormwater runoff within the western half of Site G that serves as the nacelle laydown area shall be collected through at grade catch basins. These catch basins will convey flow through an underground pipe network to diversion structures where the WQDS flows will be diverted to the pretreatment Stormfilter system housed within Stormpods underground storage structures. Storm events exceeding the 1.25-inch water quality design storm will be diverted downstream and

bypass the pretreatment and underground storage. The pretreatment Stormfilter system will provide the 80% TSS reduction in water quality treatment prior to allowing the water quality flow to pass to another Stormpod underground storage facility where the WQDS volume will be allowed to infiltrate through the bottom of the structures. The Stormfilter pretreatment facility is sized by using HydroCAD and modeling the water quality peak flows. The Stormpod underground chambers shall be positioned such that the open bottom invert is at elevation +8.0, which is two feet above the seasonal high groundwater table elevation of +6.0' in the area. The Stormpod chambers were sized through HydroCAD modeling based on the water quality design storm volume of the contributing drainage area. The capacity to infiltrate this water quality design storm was confirmed by the approved NJDEP infiltration testing procedures which demonstrated infiltration values ranging from 5.5 to 15 inches per hour in this area of the site. Please refer to Appendix H, for the results from the infiltration testing performed on site by Pennoni in June 2022. By applying a factor of safety of two to the lowest infiltration test result of 5.5 inches per hour, the design infiltration rate for the chambers was determined to be 2.75 inches per hour. In order to comply with the Stormwater Management rules stated in N.J.A.C. 7:8-5.2(h) with regards to infiltration, the individual storage structures that facilitate infiltration were evaluated by the Hantush Method to determine all hydraulic impacts on the groundwater table underneath each structure. The results of the Hantush Method groundwater assessment are found in Appendix I, and they show that no groundwater mounding reaches the bottom invert of the infiltration chambers. By infiltrating the water quality storm, this stormwater management system complies with the green infrastructure guidelines. The diverted larger storm events will bypass the infiltration chambers and be conveyed to the discharge point at the existing PSEG drainage channel.

The eastern half of Site G around the perimeter of the nacelle assembly building shall utilize Filterra HC Bioretention systems configured with curb inlets and internal diversion structures. These Filterras will function in the same way as their counterparts along the heavy haul road, but the overflow and the treated stormwater shall be directed to small conveyance networks along the perimeter pavement around the building. The drainage areas were delineated around the assembly building to reach a maximum area of 0.30 acres, which was back-calculated as the maximum impervious area that a Filterra HC can treat as a single unit. As such, the Filterra placement was governed by the peak treatment flows from the independent drainage areas. The Filterra HC Biofiltration is certified by the NJCAT to achieve the required 80% TSS removal efficiency for water quality treatment. These conveyance networks will be sized to accommodate the stormwater runoff captured from the building rooflines and then carry the flows to the four proposed outfalls to the adjacent wetlands and drainage ditch to the north. In the southeast section of Site G, a proposed parking lot will be constructed to serve the nacelle assembly building and office. This proposed parking lot will be designed as porous asphalt to comply with the green infrastructure requirements, and due to poor infiltration in this area of the site, underdrains will be installed. These underdrains will be connected to the storm drain conveyance network that runs under the access road and around the perimeter of the building until discharging to the wetland to the north. Finally, the southernmost section of Site G is dedicated to the electrical substation. The site of the substation is graded such that all stormwater will be collected by a grassed bioswale running from south to north along the adjacent roadway. This bioswale is designed according to the NJ BMP Manual Chapter 9.5 to provide will provide 50% TSS reduction as pretreatment prior to discharging to a catch basin that sends the storm runoff under the access road. The flow then passes through a diversion structure which diverts larger storm events downstream yet allows the WQDS to flow directly to the Filterra HC Bioscape system configured online with a pipe inlet. The treated stormwater and overflow will meet downstream and be discharged to the existing PSEG storm network which is being rerouted through Site G.

Please refer to Appendix A for the full stormwater network XPSWMM modeling results where the stormwater system profiles demonstrate the hydraulic grade line (HGL) results for the model storm return periods. The stormwater system was designed with pipe sizes, materials and slopes that maintain the 25-year HGL below the allowable water elevation, which in this case is below the rim of the inlets and catch basins. This ensures that no flooding takes place during the 25-year extreme storm event, and minimal flooding occurs during larger storms like the 100-year event. Also included within the results are the water elevation versus time plots for the Stormpod infiltration systems, which demonstrate the full water quality storm infiltrating in under twenty-four hours and the water stages over time in the larger storm events.

3.1.1. Hydrologic and Hydraulic Analysis and Approach

The XP-SWMM software was utilized to model the proposed stormwater management network. The XP-SWMM software performs both hydrologic and hydraulic analysis for stormwater drainage systems. XP-SWMM uses the Tuflow calculation engine to run the dynamic wave equation for hydraulic routing. According to the XP-SWMM user guide:

Dynamic Wave routing solves the complete St. Venant flow equations and therefore produces the most accurate results. These equations consist of the continuity and momentum equations for conduits and a flow continuity equation at nodes.

Dynamic wave routing can account for channel storage, backwater, entrance/exit losses, flow reversal, and pressurized flow. Because it couples together the solution for both water levels at nodes and flow in conduits it can be applied to any general network layout, even those containing multiple downstream diversions and loops.

The hydrologic calculations were performed by the unit hydrograph NRCS method. The manufactured treatment devices (MTDs) were designed and sized appropriately using HydroCAD which uses a unit hydrograph for calculating peak runoff and volume storage of the devices.

Runoff volume, drainage collection system pipe sizing, and MTD sizing were determined using XP-SWMM and HydroCAD. The following assumptions were utilized for modeling the system.

1. Point Precipitation Frequency Estimates are sourced from NOAA Atlas 14, Volume 2, Version 3 (Location name: Salem, New Jersey, USA)
    a. 25-year, 24-hour SCS Type III design storm (6.25 inches – based on NOAA).
    b. 25-yr, 24-hour rainfall intensity (7.25 in/hr – based on NOAA).
2. Time of concentration (Tc) = 0.1 hour was utilized as the minimum for the sheet flow within drainage basins. All times of concentration were calculated using the NRCS TR-55 method.
3. For all developed areas, it was assumed 100% impervious area. There were two exceptions to this assumption:
    a. Surrounding the substation and Site G access roadway
    b. Bordering the heavy haul road
4. New Jersey Extreme Precipitation Projection tool was used to model additional extreme precipitation estimates for the 25-year return period (https://njprojectedprecipitationchanges.com/)
    a. 25-year, 24-hour design storm median projection (7.01 inches)

Please refer to Appendix A for full model input parameters and current design results.

Section 4 -Maintenance Procedures and Practices

Section 7:8-5.8 of the NJDEP stormwater management regulations outline requirements necessary to develop a maintenance plan for all proposed stormwater management measures incorporated into the design of a major development. Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure and can include repairs or replacement to the structure, and removal of debris. The maintenance plan shall contain specific preventative maintenance tasks and schedules, as well as cost estimates for sediment, debris, or trash removal. Please refer to Appendix D for manufacturer's detailed maintenance procedures as required by the NJDEP certification of the MTDs.

4.1. Responsibility

The facility manager shall be responsible for ensuring that the stormwater management system will be properly maintained. The facility manager shall ensure that all preventative and corrective maintenance tasks, including routine inspections, and shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the wind port site G1, including a record of all inspections and copies of all maintenance-related work orders. In addition, the person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan as needed.

4.2. Preventative and Corrective Maintenance Measures

Please refer to Appendix D for the approved maintenance manuals provided by the manufacturers. The primary purpose of the StormFilter is to screen and prevent pollutants and debris from discharging into protected waterway and periodically these pollutants must be removed to restore the filer to its full efficiency. Maintenance is recommended on an annual basis, with infrequent occurrences as a result of excessive sediment loading from site erosion or extreme storms. Regulatory requirements or a chemical spill can shift maintenance timing as well. The required frequency of maintenance may be adjusted as additional monitoring information becomes available during the inspection program but, ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual site. While the average maintenance lifecycle of the device is approximately 1-5 years, it is recommended that the site owner develop a database to properly manage inspection and maintenance programs.

The initial step recommended for maintenance is to inspect the StormFilter vault to assess the condition of the filter cartridges. If the submerged cartridges are severely plugged (if pore space between media granules is absent), then the cartridges will need to be replaced. Prior to replacement, however, all cartridges shall be emptied onto the vault floor, and the empty shells returned to the manufacturer. It is recommended that cartridge replacement be done in dry weather.

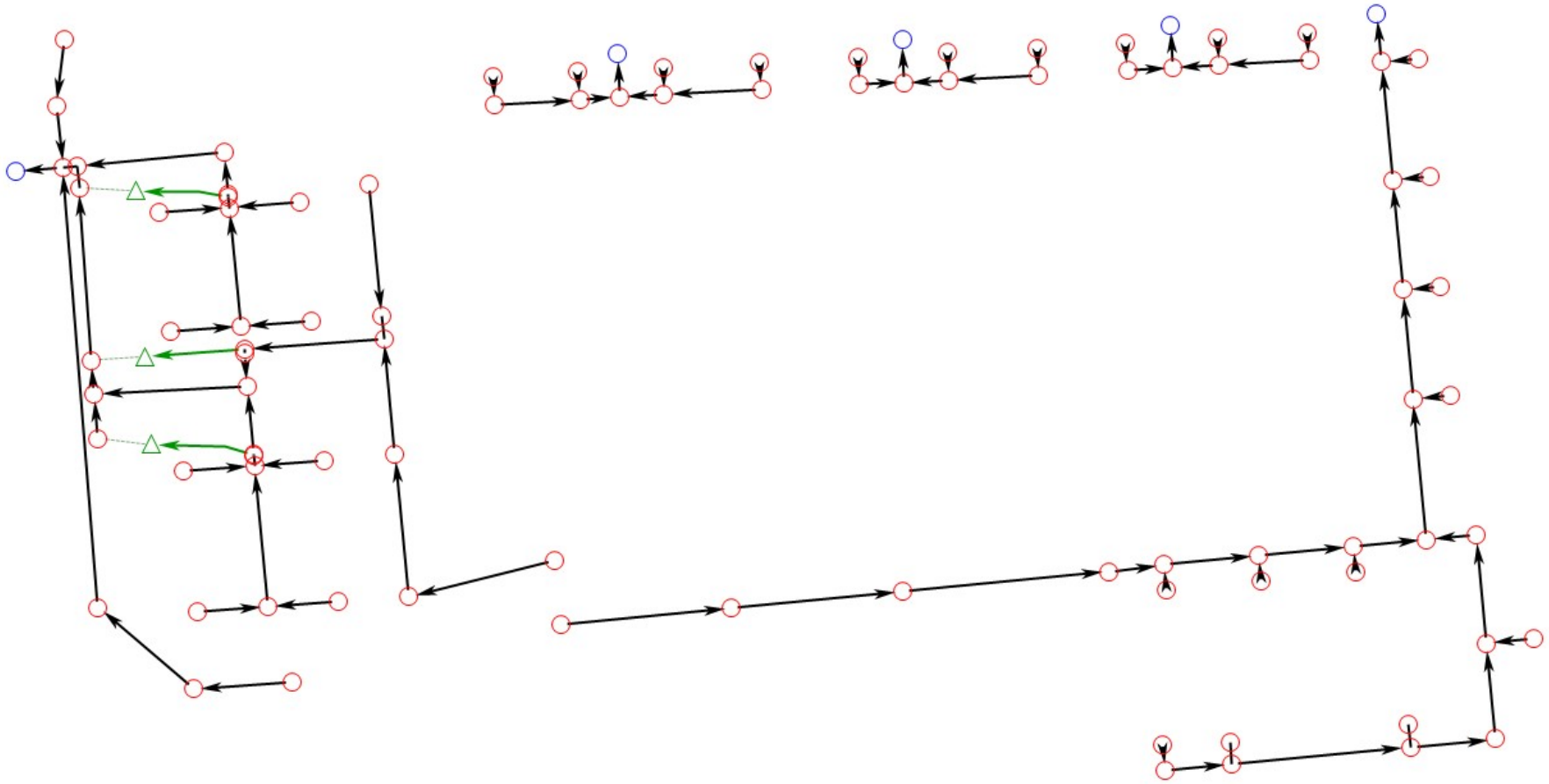
Second, the level of visual sediment loading will need to be assessed. If the level of accumulation within the vault appears excessive (>4" on the vault floor), it is recommended that all accumulated material be removed from the vault and forebay via a vacuum truck. Prior to removal, samples of the accumulated sediment and media should be obtained to determine concentrations of any heavy metals and organic chemicals (such as petroleum products) and coordinate appropriate disposal requirements. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. This typically requires coordination with a local landfill for solid waste disposal. Liquid waste disposal may necessitate one of several options,

including: a municipal vacuum truck decant facility; a local wastewater treatment plant; or on-site treatment and discharge.

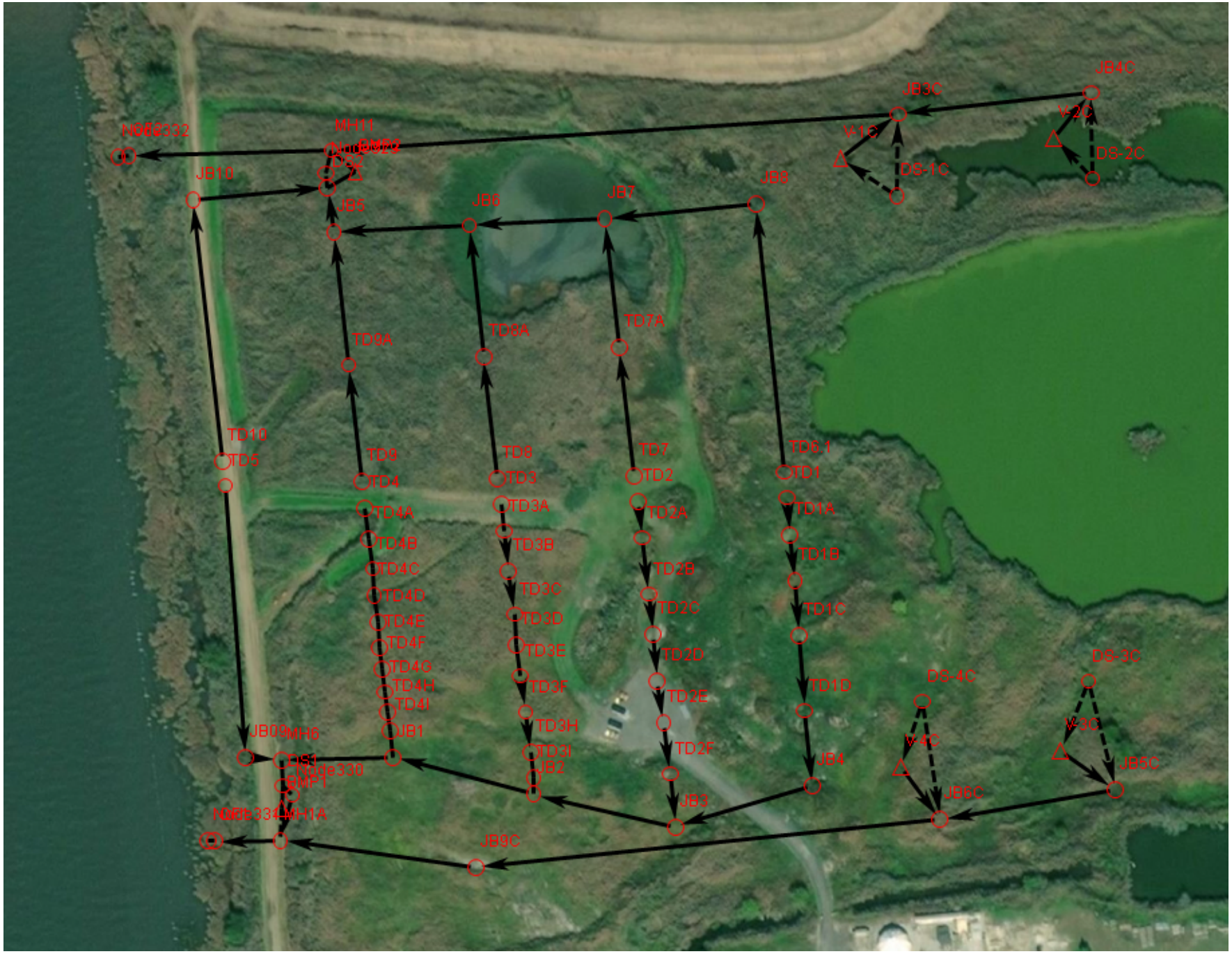
The Filterra HC systems function with internal bypass weirs and a special soil media mix and plants that provide biofiltration of the water quality design storm. With the purchase of the Filterra HC system, Contech includes the activation of the system and a one-year maintenance plan that includes up to two visits. Maintenance is recommended on an annual basis, with infrequent occurrences as a result of excessive sediment loading from site erosion or extreme storms. Regulatory requirements or a chemical spill can shift maintenance timing as well. The required frequency of maintenance may be adjusted as additional monitoring information becomes available during the inspection program but, ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual site. While the average maintenance lifecycle of the device is approximately 1-5 years, it is recommended that the site owner develop a database to properly manage inspection and maintenance programs. The maintenance plan for the Filterra HC was several initial requirements prior to activation of the system. The site landscaping must be fully stabilized in the area, final paving must be completed, and the curb inlet throat opening should measure at least four inches. The routine maintenance visits by Contech include debris removal, pretreatment mulch replacement, and a plant health evaluation. These routine maintenance procedures may be contracted through Contech after the first year or may become the responsibility of the site owner or operator.

Appendix A – XP-SWMM Model Parameters and Output

NEW JERSEY WIND PORT SITE G
XPSWMM MODEL LAYOUT



NEW JERSEY WIND PORT SITE C1
XPSWMM MODEL LAYOUT

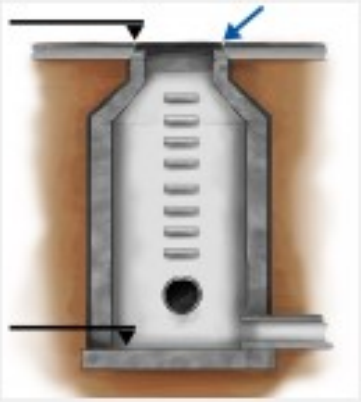


EXAMPLES OF XPSWMM
NODE AND CONDUIT INPUT PARAMETERS

Node Data : Node JB-10

Spill Crest
13.7

Inlet Capacity



Invert Elevation
8.44

Ponding
None Allowed Sealed
Link Spill Crest to 2D Link Invert to 2D

Inflow Data
Constant Inflow
Inflow 0.0
Pollutant Loads

Time Series Inflow
User Inflow
Gauged Inflow
Dry Weather
Use Interface File Flow
100.0 %

2D Inflow Capture
Initial Depth 0.0

Storage Outfall BMP Gauged Data

Conduit Profile : Link PIPE-28

13.7
13.600
D/S
8.25
Diameter
2.
U/S
8.44
8.44
8.25
100
Slope .11 %
Length 165.88
Mannings n .013
Downstream Node Upstream Node

Solve for :
D/S Invert
Slope
U/S Invert
Length
Solve

Design Surface
Natural Design
Other Services

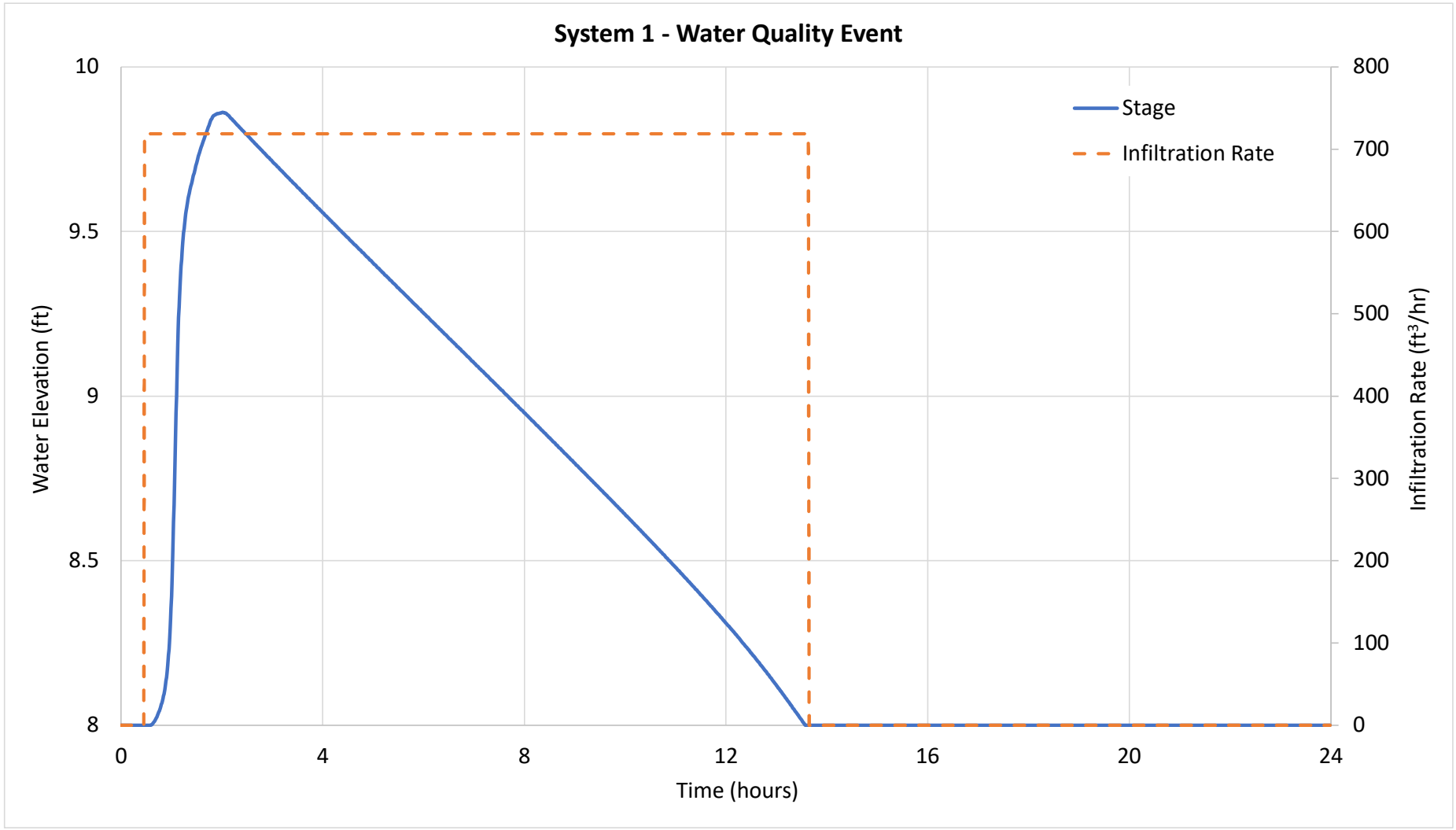
Name	Invert Elevation (ft)	Rim Elevation (ft)
DS-1	8.00	14.10
DS-2	8.00	14.09
DS-3	8.00	14.21
F-1	8.33	13.58
F-10	8.06	13.32
F-11	8.00	13.00
F-12	8.00	13.00
F-13	8.78	13.78
F-14	9.14	14.14
F-15	8.19	13.47
F-16	9.18	14.18
F-17	9.20	14.20
F-18	8.63	13.63
F-19	8.46	11.21
F-2	8.00	13.00
F-20	8.00	10.75
F-3	8.00	14.00
F-4	8.34	13.61
F-5	8.00	13.00
F-6	8.00	13.00
F-7	8.15	13.41
F-8	8.00	13.00
F-9	7.97	13.00
H-2	6.00	10.00
JB-07	7.50	13.80
JB-1	6.87	14.16
JB-10	8.44	13.70
JB-10A	8.25	13.60
JB-11	8.12	14.11
JB-12	8.27	13.50
JB-13	8.27	13.50
JB-14	8.15	13.40
JB-15	8.15	13.40
JB-16	6.31	14.09
JB-16A	7.21	14.08
JB-17	4.16	14.07
JB-18	8.40	13.40
JB-19	8.24	13.50
JB-2	6.72	14.19
JB-20	8.50	13.50
JB-21	8.50	13.50
JB-22	7.85	14.25
JB-23	3.15	14.07
JB-24	3.05	14.11

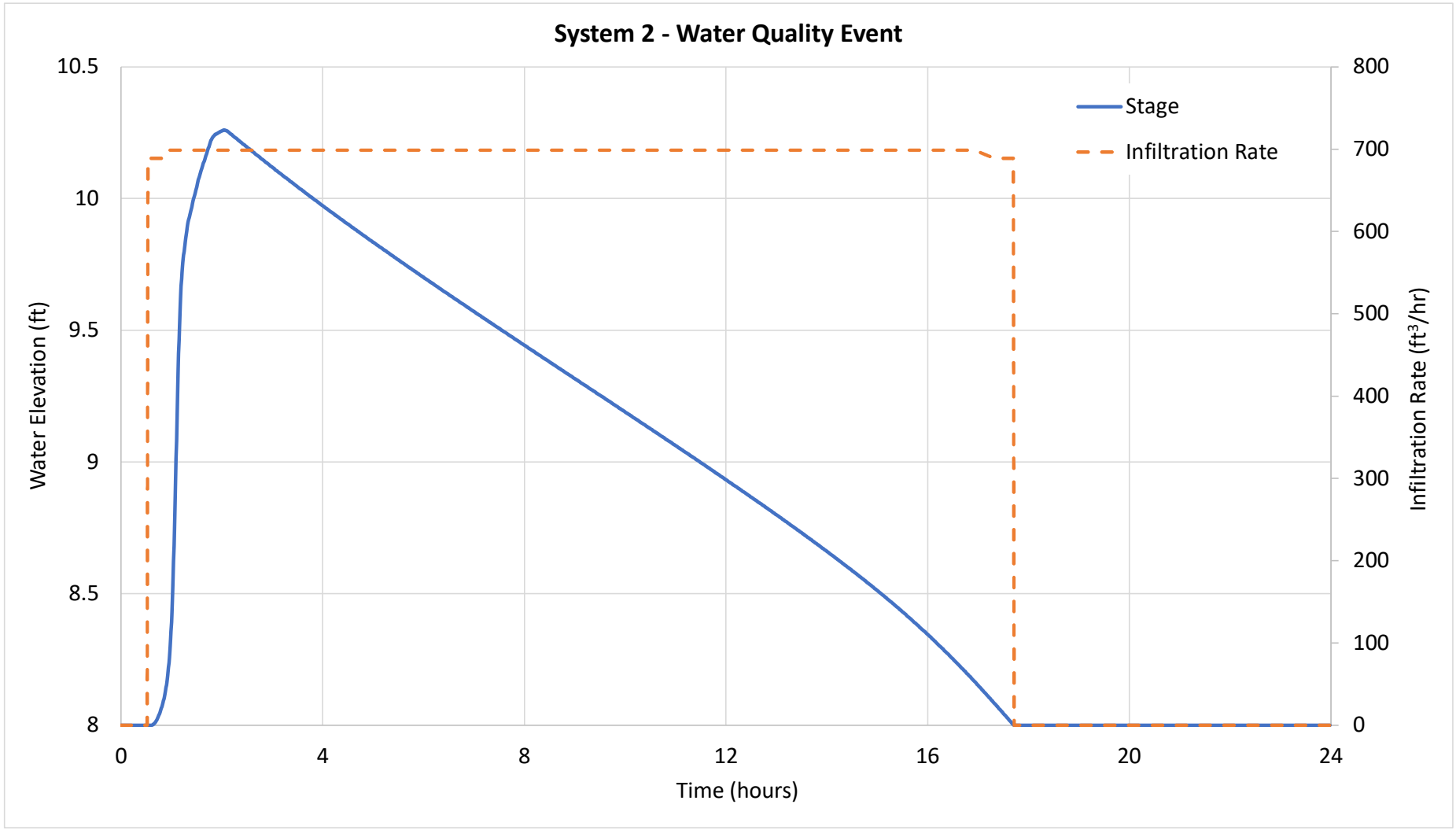
JB-25	0.97	12.11
JB-26	8.21	13.70
JB-27	8.45	13.70
JB-3	6.62	14.07
JB-4	4.66	13.21
JB-4A	4.60	13.95
JB-5	4.39	13.46
JB-6	5.30	11.87
JB-7A	6.77	13.31
JB-8	8.00	13.81
JB-9	8.52	13.81
JB-9A	8.65	13.90
MH-1	8.15	13.95
MH-10	7.88	13.87
MH-11	4.05	13.86
MH-12	4.19	14.16
MH-13	4.31	14.16
MH-14	4.44	14.16
MH-16	6.52	14.15
MH-17	6.31	14.15
MH-18	4.78	13.09
MH-19	5.04	12.72
MH-2	7.66	13.96
MH-20	5.19	11.77
MH-21	5.27	11.96
MH-22	6.73	13.90
MH-22-RN1	8.19	14.10
MH-23	8.03	14.10
MH-23A	5.43	14.09
MH-24	7.99	14.10
MH-25	8.03	14.17
MH-3	7.61	13.97
MH-4	8.16	13.98
MH-5	7.72	14.00
MH-6	7.46	13.95
MH-7	7.97	13.84
MH-8	7.72	13.85
MH-9	7.36	13.86
MH-W1	4.21	10.28
MH-W2	3.63	10.73
MH-W3	2.91	10.83
MH-W4	5.26	13.62
O-1	6.62	9.50
O-2	6.47	9.34
O-3	6.37	9.26
O-4	4.00	9.00
O-6	0.71	6.83

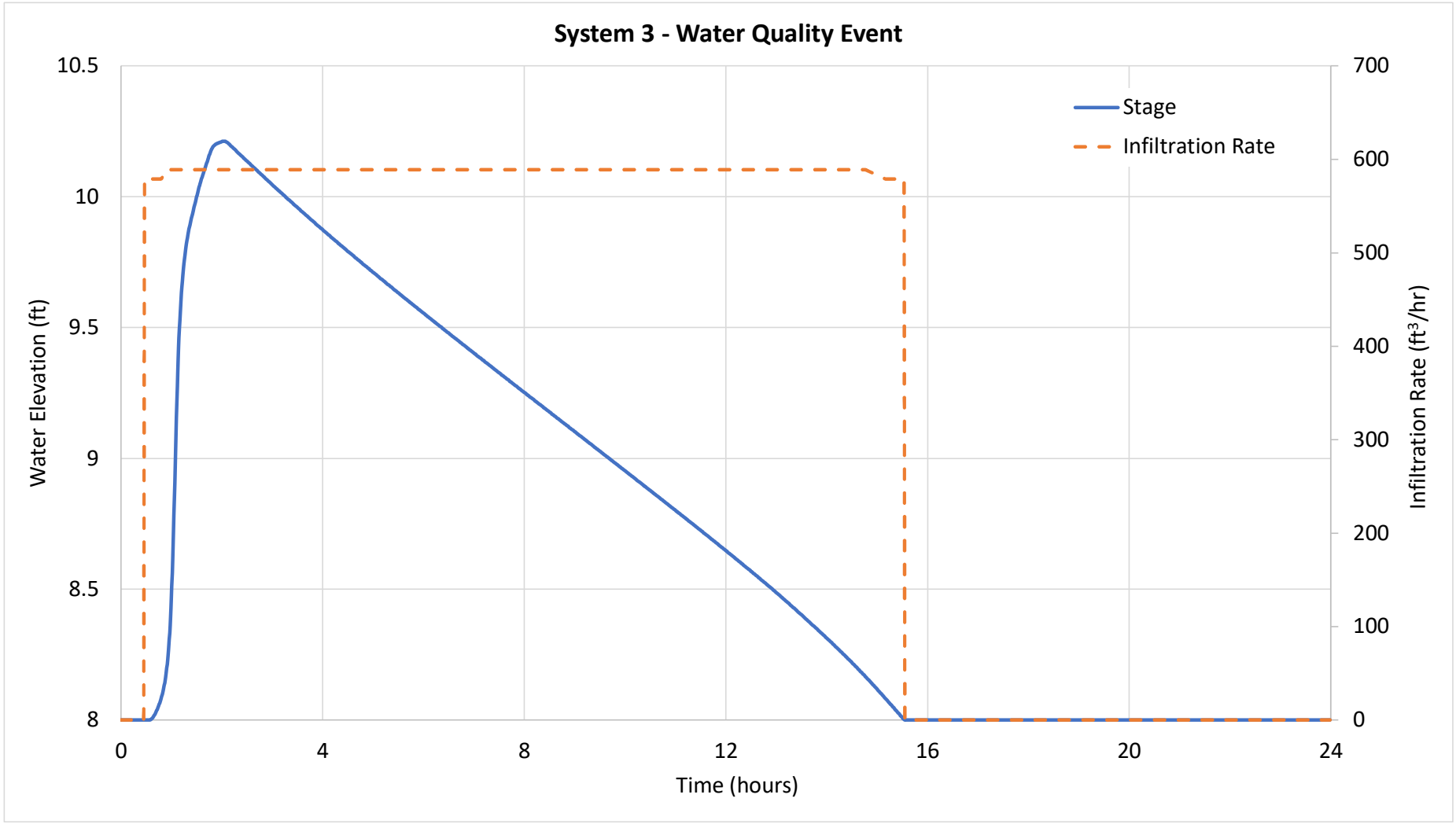
SYS1	8.00	14.00
SYS2	8.00	14.00
SYS4	8.00	13.80

Name	Upstream Node Name	Downstream Node Name	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Length (ft)	Diameter (ft)	Roughness	Conduit Slope (%)
CO-28	JB-4A	MH-14	4.61	4.44	165.9	5	0.013	0.10
CO-36	F-14	MH-14	9.14	8.90	47.0	2	0.013	0.51
CO-38	F-17	MH-17	9.20	9.05	30.0	2	0.013	0.50
CO-41	MH-20	MH-19	5.20	5.04	159.0	3.5	0.013	0.10
CO-47	F-19	MH-19	8.46	8.31	34.0	2	0.013	0.44
CO-5	F-3	MH-3	8.00	7.82	36.0	2	0.013	0.50
PIPE-1	JB-13	MH-22-RN1	8.27	8.19	82.0	2	0.013	0.10
PIPE-10	JB-23	JB-24	3.17	3.05	24.4	3.5	0.013	0.49
PIPE-11	WEIR-DS-1	JB-16	7.01	6.64	73.0	3.5	0.013	0.51
PIPE-110	WEIR-DS-2	JB-16	6.51	6.31	39.0	3.5	0.013	0.51
PIPE-112	JB-26	JB-11	8.21	8.17	36.0	2	0.013	0.11
PIPE-115	JB-16	MH-23A	6.32	5.43	177.6	3.5	0.013	0.50
PIPE-116	JB-16A	MH-23A	7.21	6.81	40.0	3.5	0.013	1.00
PIPE-117	MH-23A	JB-17	5.45	5.25	39.5	3.5	0.013	0.51
PIPE-126	JB-7A	MH-22	6.89	6.73	65.1	2	0.013	0.25
PIPE-13	JB-17	JB-23	4.16	3.15	201.8	3.5	0.013	0.50
PIPE-17	JB-12	MH-22-RN1	8.27	8.19	82.1	2	0.013	0.10
PIPE-18	JB-15	MH-23	8.15	8.05	81.8	2	0.013	0.12
PIPE-19	JB-14	MH-23	8.15	8.05	82.2	2	0.013	0.12
PIPE-2	MH-22-RN1	MH-23	8.19	8.03	164.0	2	0.013	0.10
PIPE-20	JB-19	MH-24	8.24	8.17	81.9	2	0.013	0.09
PIPE-21	MH-24	MH-25	8.17	8.03	138.5	2	0.013	0.10
PIPE-22	JB-18	MH-24	8.40	7.99	82.1	2	0.013	0.50
PIPE-23	JB-21	MH-25	8.50	8.09	82.3	2	0.013	0.50
PIPE-24	JB-20	MH-25	8.50	8.09	82.1	2	0.013	0.50
PIPE-25	JB-8	JB-07	8.00	7.50	200.0	2	0.013	0.25
PIPE-27	JB-9A	JB-10	8.65	8.44	174.2	2	0.013	0.12
PIPE-28	JB-10	JB-10A	8.44	8.25	165.9	2	0.013	0.12
PIPE-29	JB-9	JB-8	8.54	8.04	199.7	2	0.013	0.25
PIPE-3	MH-23	DS-1	8.04	8.00	12.4	2.5	0.013	0.32
PIPE-32	JB-11	DS-2	8.17	8.00	162.5	2	0.013	0.11
PIPE-33	JB-10A	JB-11	8.25	8.12	128.0	2	0.013	0.10
PIPE-34	JB-27	JB-26	8.45	8.21	199.0	2	0.013	0.12
PIPE-4	MH-25	DS-3	8.04	8.00	12.3	2	0.013	0.33
PIPE-40	MH-1	MH-2	8.16	7.66	100.5	2	0.013	0.50
PIPE-41	MH-2	JB-1	7.67	7.44	45.5	2	0.013	0.51
PIPE-42	JB-1	O-1	6.87	6.62	49.7	2.5	0.013	0.50
PIPE-43	MH-3	JB-1	7.62	7.36	51.7	2	0.013	0.50
PIPE-44	F-1	MH-1	8.33	8.15	36.0	2	0.013	0.50
PIPE-45	F-2	MH-2	8.00	7.82	36.0	2	0.013	0.50
PIPE-47	MH-5	JB-2	7.72	7.45	53.0	2	0.013	0.51
PIPE-48	JB-2	O-2	6.72	6.47	50.1	2.5	0.013	0.50
PIPE-49	MH-7	MH-6	7.98	7.46	104.2	2	0.013	0.50
PIPE-5	WEIR-DS-3	JB-22	8.01	7.85	52.0	2	0.013	0.31
PIPE-50	MH-6	JB-2	7.47	7.21	53.2	2	0.013	0.49
PIPE-51	F-5	MH-5	8.00	7.82	32.0	2	0.013	0.56
PIPE-52	F-6	MH-6	8.00	7.82	32.0	2	0.013	0.56
PIPE-53	F-7	MH-7	8.15	7.97	36.0	2	0.013	0.50
PIPE-54	MH-10	MH-9	7.89	7.36	105.5	2	0.013	0.50
PIPE-55	MH-9	JB-3	7.38	7.11	53.6	2	0.013	0.50
PIPE-56	JB-3	O-3	6.62	6.37	49.9	2.5	0.013	0.50
PIPE-57	MH-8	JB-3	7.72	7.46	52.3	2	0.013	0.50
PIPE-58	F-10	MH-10	8.06	7.88	36.0	2	0.013	0.50
PIPE-59	F-9	MH-9	7.98	7.82	31.5	2	0.013	0.51
PIPE-6	JB-22	JB-24	7.86	7.34	171.3	2	0.013	0.30
PIPE-60	F-8	MH-8	8.00	7.82	36.0	2	0.013	0.50
PIPE-61	MH-14	MH-13	4.44	4.31	127.7	5	0.013	0.10
PIPE-62	MH-13	MH-12	4.32	4.19	127.7	5	0.013	0.10
PIPE-63	MH-12	MH-11	4.19	4.05	138.3	5	0.013	0.10
PIPE-64	MH-11	O-4	4.06	4.00	55.7	5	0.013	0.11
PIPE-65	F-11	MH-11	8.00	7.76	47.0	2	0.013	0.51
PIPE-66	F-12	MH-12	8.00	7.76	47.0	2	0.013	0.51
PIPE-67	F-13	MH-13	8.78	8.54	47.0	2	0.013	0.51

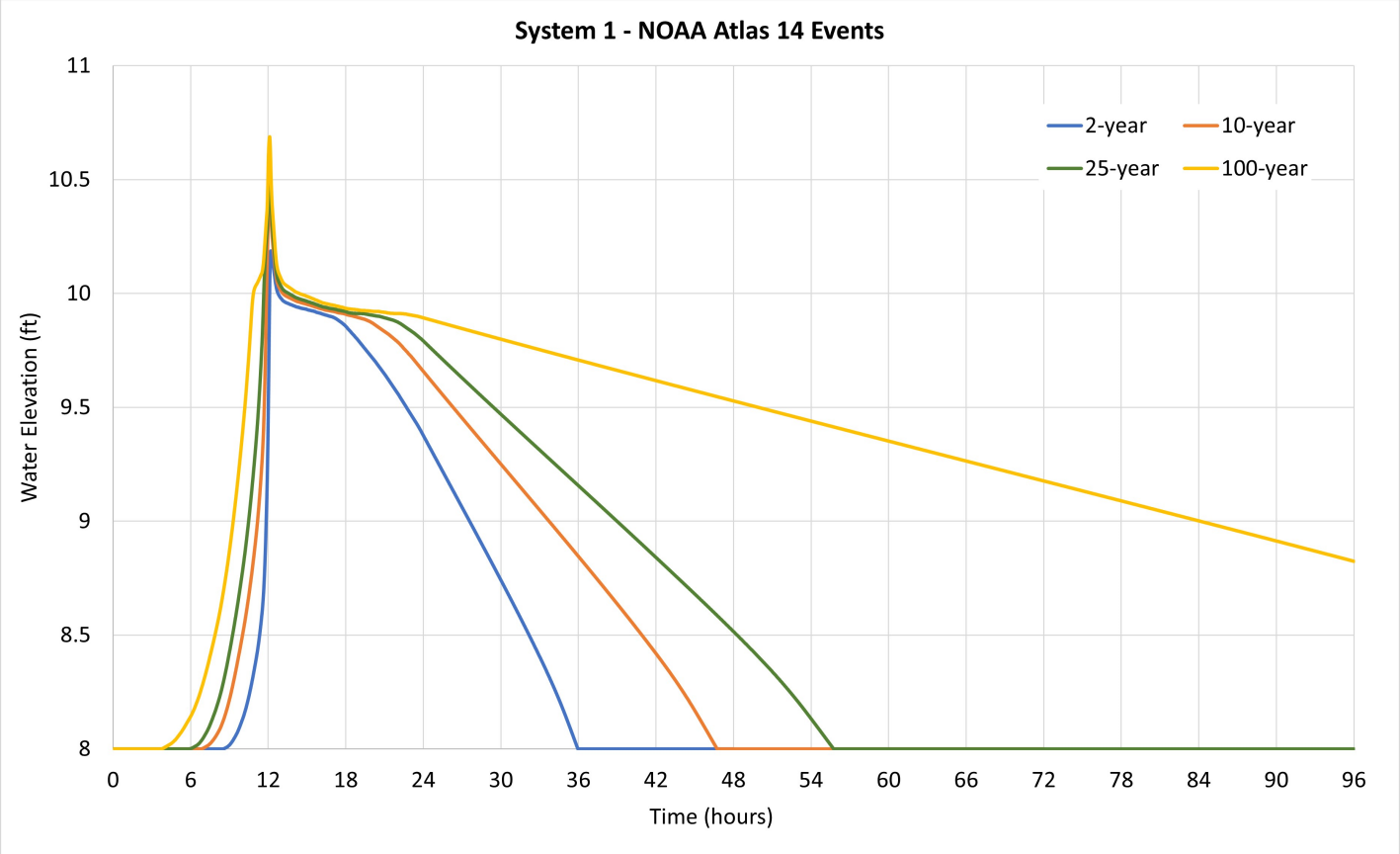
PIPE-69	MH-W1	MH-W2	4.21	3.63	115.5	2.5	0.013	0.50
PIPE-7	JB-24	JB-25	3.06	2.97	17.4	3.5	0.013	0.52
PIPE-70	MH-W2	MH-W3	3.64	2.91	146.0	2.5	0.013	0.50
PIPE-71	MH-W3	JB-25	2.92	0.97	513.7	3	0.013	0.38
PIPE-72	H-2	MH-W4	6.00	5.26	74.3	4	0.013	1.00
PIPE-73	MH-W4	JB-25	5.26	4.47	72.1	4	0.013	1.10
PIPE-74	F-4	MH-4	8.34	8.16	36.0	2	0.013	0.50
PIPE-75	MH-4	MH-3	8.17	7.61	112.5	2	0.013	0.50
PIPE-76	F-15	MH-22	8.19	8.02	34.0	2	0.013	0.50
PIPE-77	MH-22	MH-16	6.73	6.52	102.0	3	0.013	0.21
PIPE-78	MH-16	MH-17	6.53	6.31	109.7	3	0.013	0.20
PIPE-79	F-16	MH-16	9.18	9.03	29.9	2	0.013	0.50
PIPE-7-RN1	JB-25	O-6	0.98	0.71	55.5	5.5	0.013	0.49
PIPE-81	F-20	MH-20	8.00	7.85	34.0	2	0.013	0.44
PIPE-83	MH-19	JB-5	5.04	4.89	148.0	4	0.013	0.10
PIPE-84	JB-5	MH-18	4.89	4.78	111.4	4	0.013	0.10
PIPE-86	MH-18	JB-4	4.78	4.66	126.1	4	0.013	0.10
PIPE-87	MH-17	JB-4A	6.31	6.14	86.0	3	0.013	0.20
PIPE-89	F-18	MH-18	8.63	8.33	60.0	2	0.013	0.50
PIPE-90	JB-6	MH-21	5.30	5.27	34.0	3	0.013	0.09
PIPE-91	MH-21	MH-20	5.27	5.19	78.4	3	0.013	0.10
PIPE-94	JB-07	JB-7A	7.51	6.89	241.6	2	0.013	0.26
PIPE-96	JB-4	JB-4A	4.66	4.60	57.5	4.5	0.013	0.10
SYS1-IN	DS-3	SYS1	8.00	8.00	107.5	2	0.013	0.00
SYS2-IN	DS-1	SYS2	8.00	8.00	120.8	3.5	0.013	0.00
SYS4-IN	DS-2	SYS4	8.00	8.00	116.2	3.5	0.013	0.00

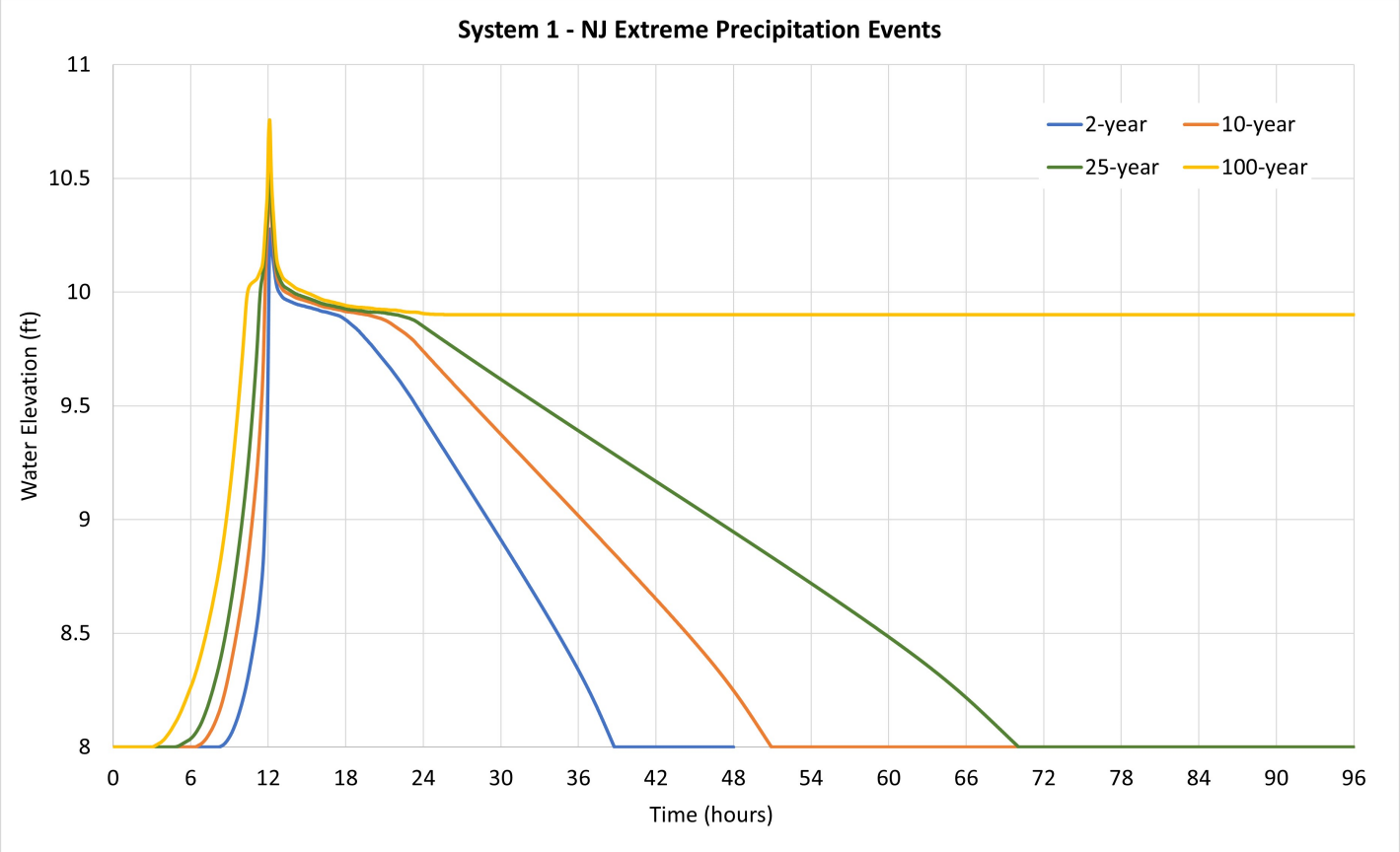

System 1 - Water Quality Event
Water Elevation (ft)
Infiltration Rate (ft³/hr)
Time (hours)
Stage
Infiltration Rate
10
9.5
9
8.5
8
800
700
600
500
400
300
200
100
0
0
4
8
12
16
20
24

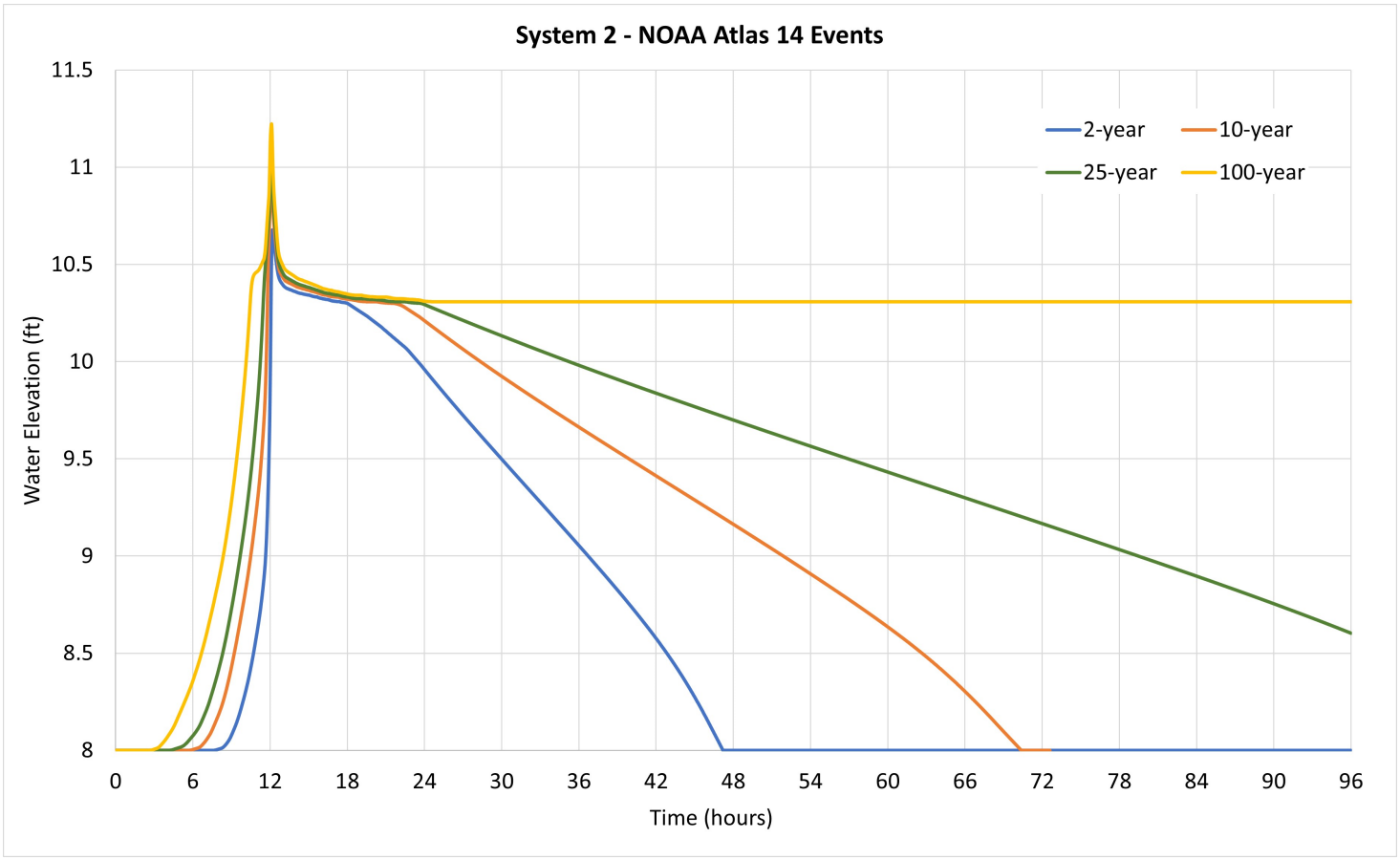

System 2 - Water Quality Event
Water Elevation (ft)
10.5
10
9.5
9
8.5
8
Infiltration Rate (ft³/hr)
800
700
600
500
400
300
200
100
0
0
4
8
12
16
20
24
Time (hours)
Stage
Infiltration Rate

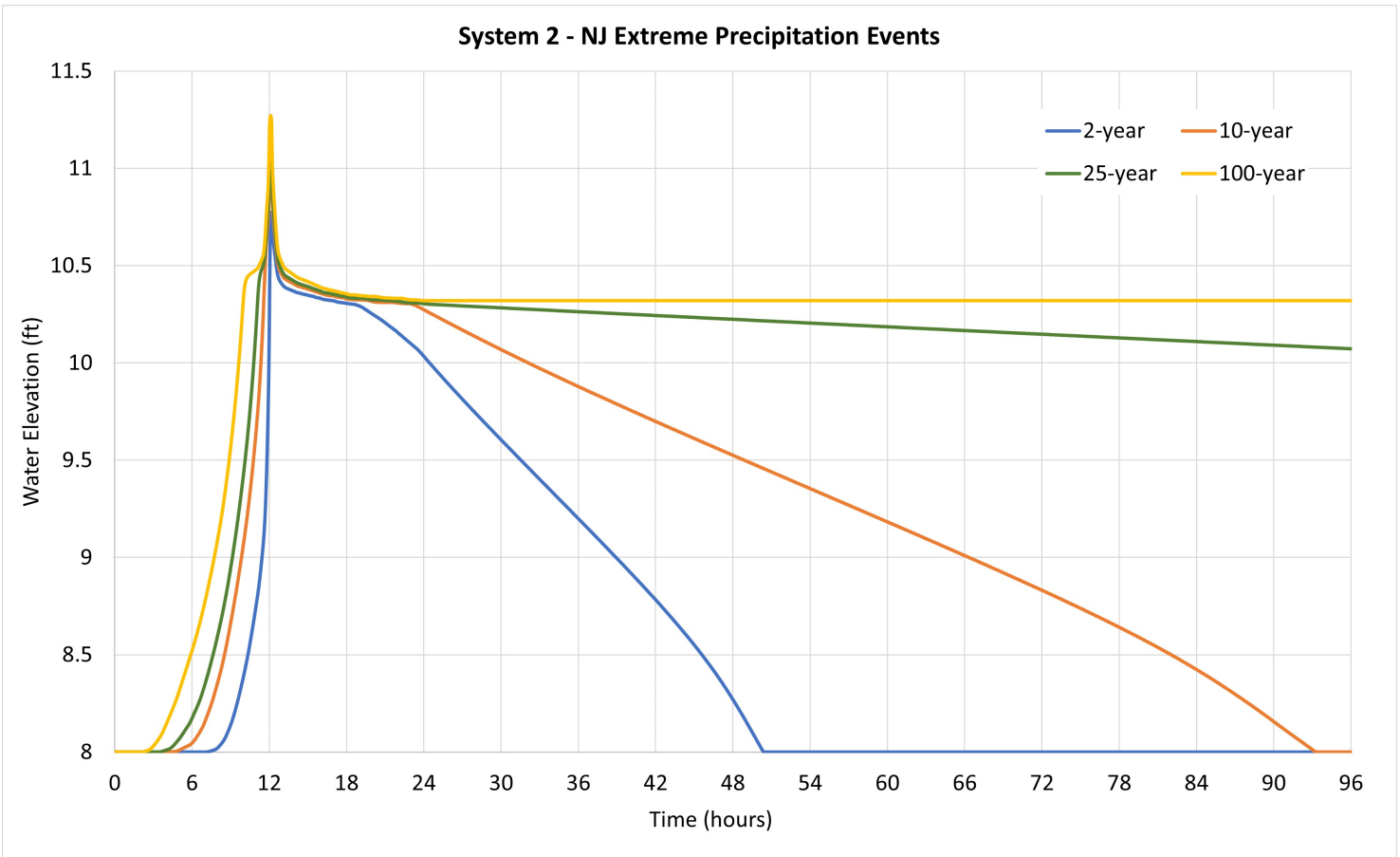

System 3 - Water Quality Event
Water Elevation (ft)
10.5
10
9.5
9
8.5
8
Infiltration Rate (ft³/hr)
700
600
500
400
300
200
100
0
0
4
8
12
16
20
24
Time (hours)
Stage
Infiltration Rate

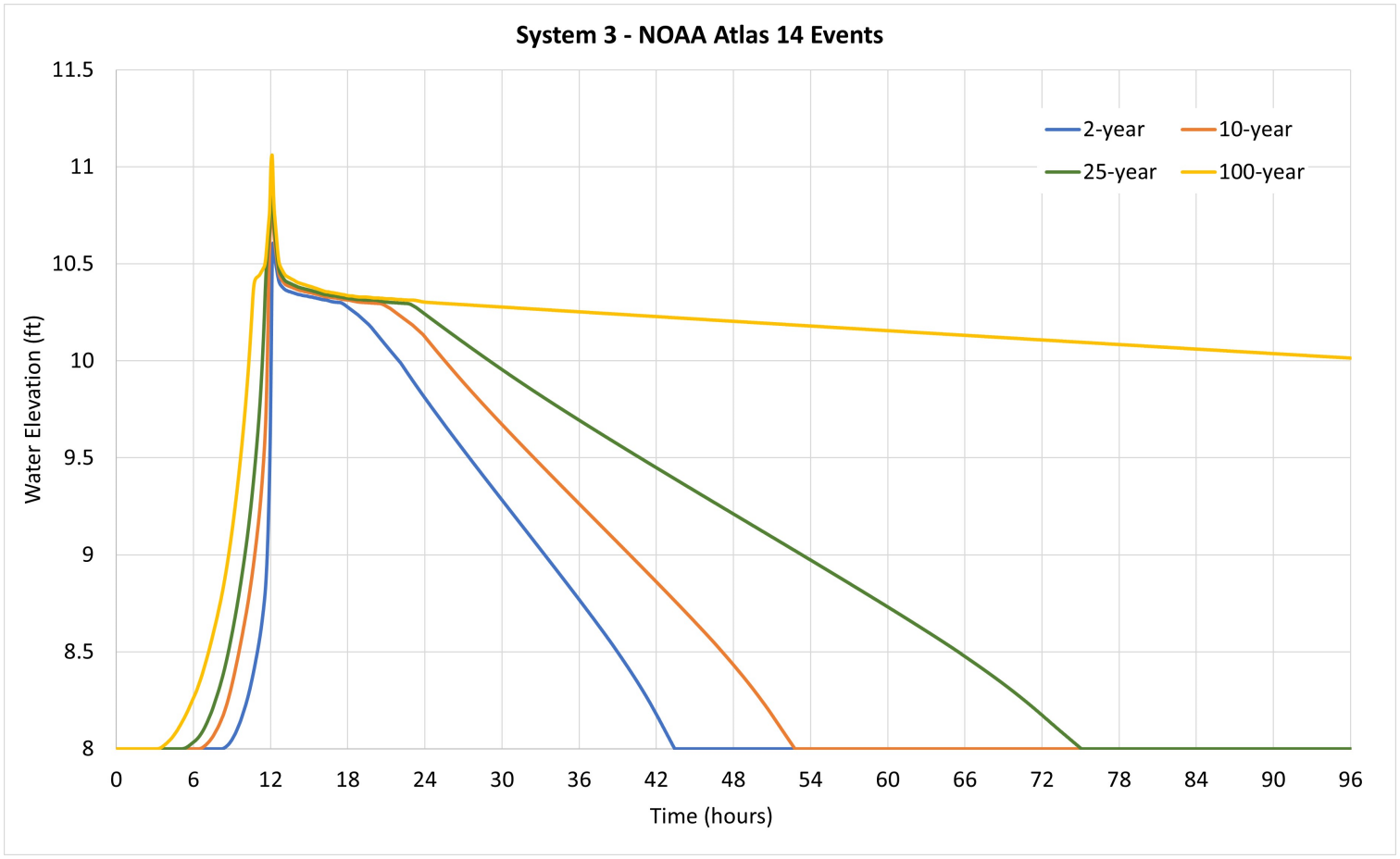
XPSWMM WATER SURFACE ELEVATION RESULTS FOR UNDERGROUND STORAGE SYSTEMS- PARCEL G

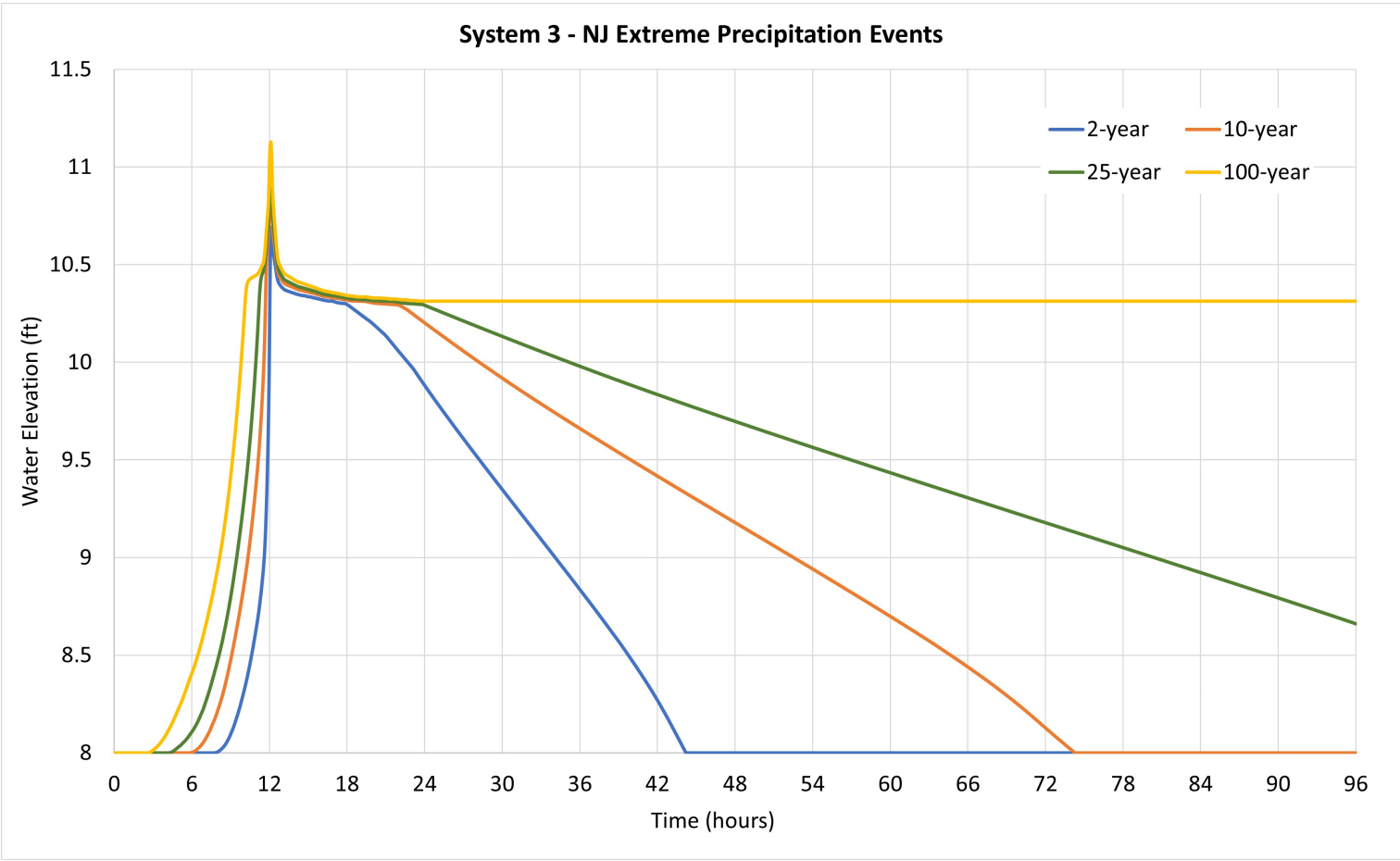





System 2 - NOAA Atlas 14 Events
Water Elevation (ft)
11.5
11
10.5
10
9.5
9
8.5
8
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
Time (hours)
2-year
10-year
25-year
100-year

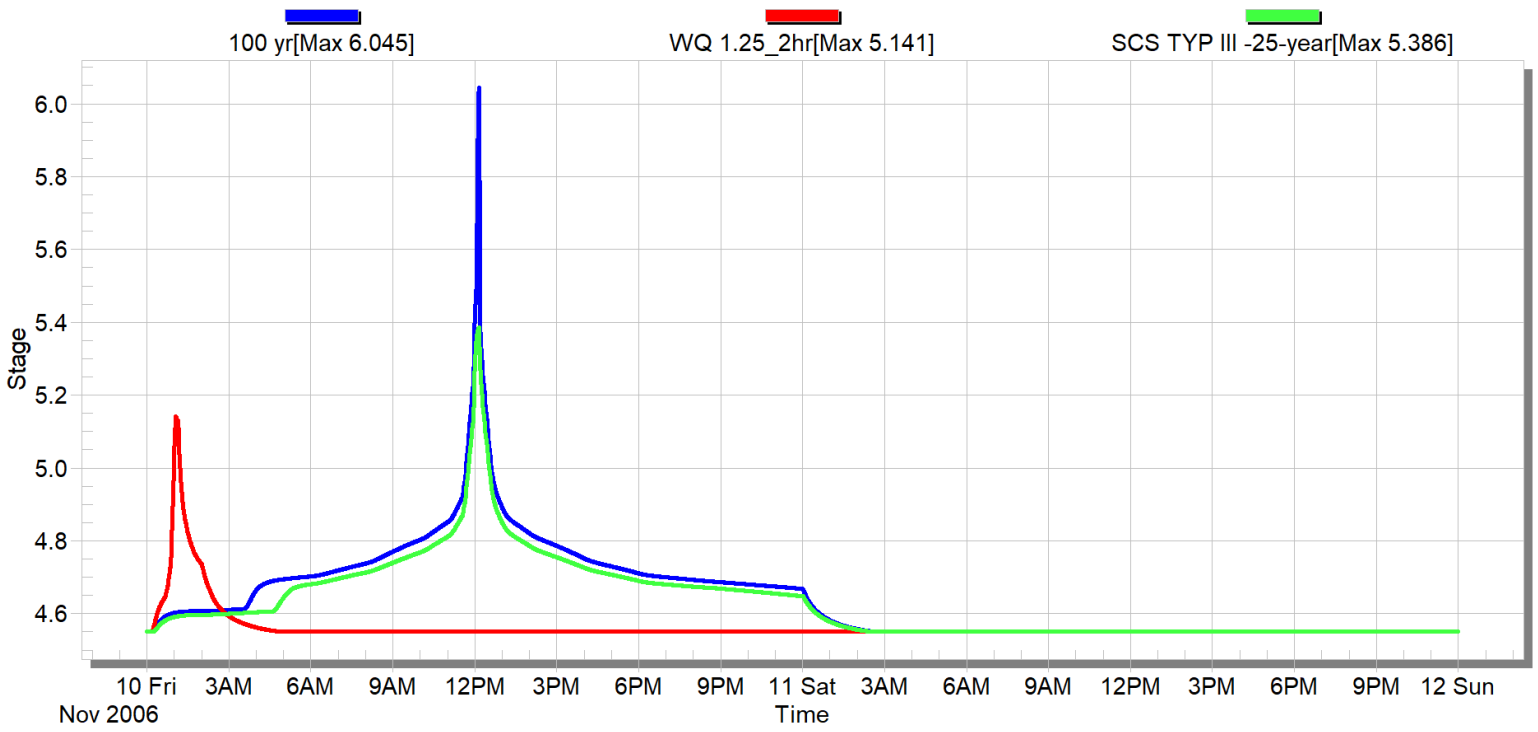

System 2 - NJ Extreme Precipitation Events
Water Elevation (ft)
11.5
11
10.5
10
9.5
9
8.5
8
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
Time (hours)
2-year
10-year
25-year
100-year


System 3 - NOAA Atlas 14 Events
11.5
11
10.5
10
9.5
9
8.5
8
Water Elevation (ft)
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
Time (hours)
2-year
10-year
25-year
100-year

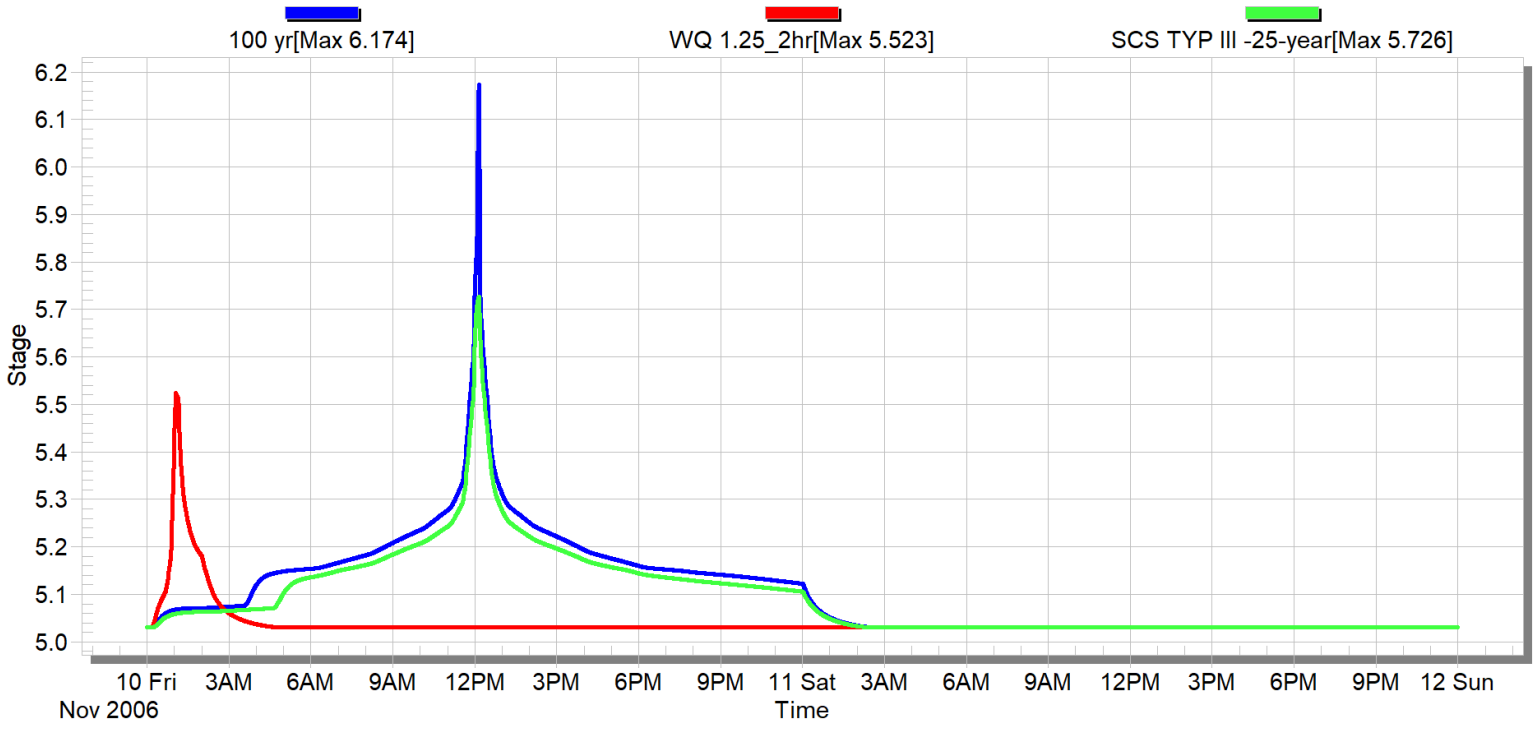

System 3 - NJ Extreme Precipitation Events
11.5
11
10.5
10
9.5
9
8.5
8
Water Elevation (ft)
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
Time (hours)
2-year
10-year
25-year
100-year

XPSWMM WATER SURFACE ELEVATION RESULTS FOR UNDERGROUND STORAGE SYSTEMS- PARCEL C

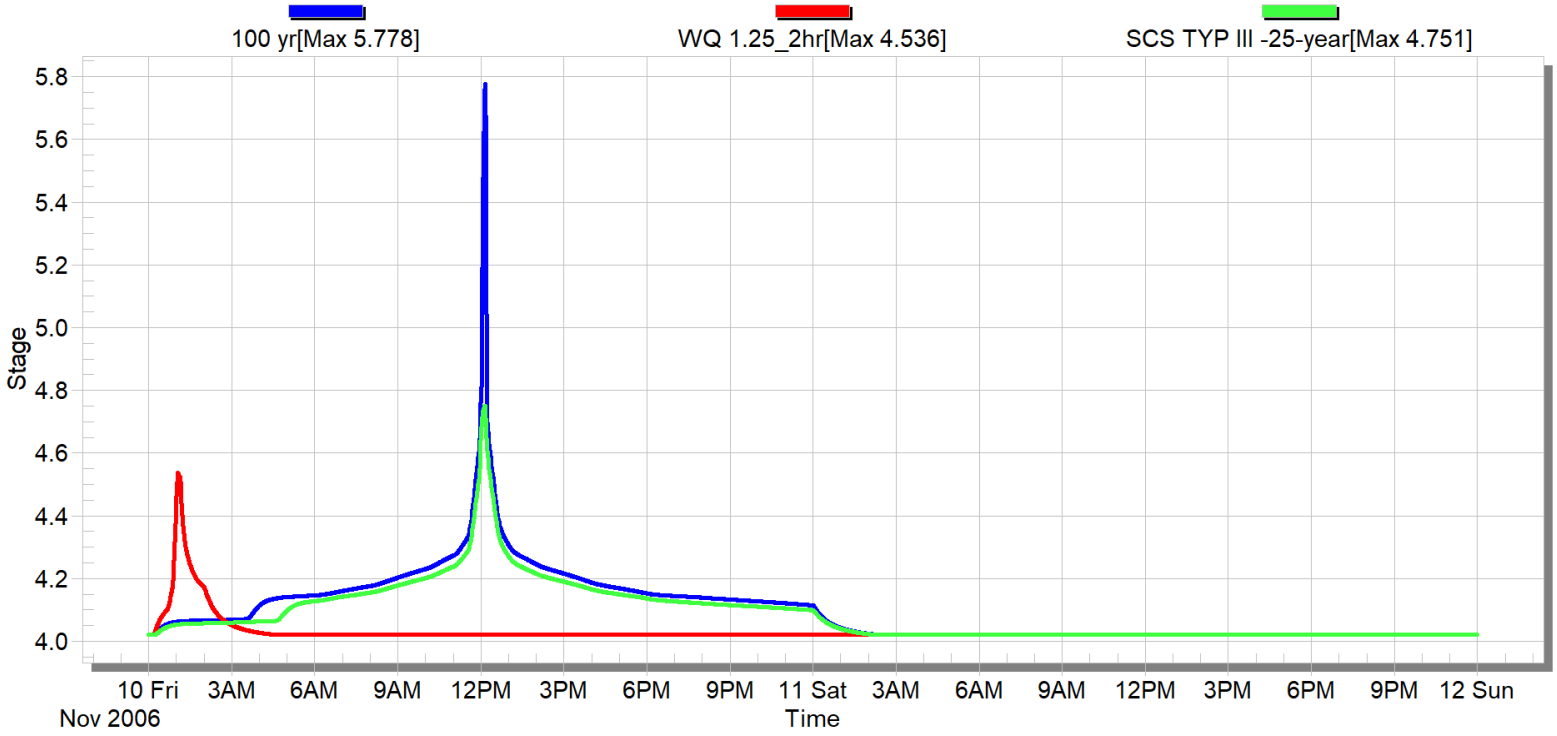
Node - V1C



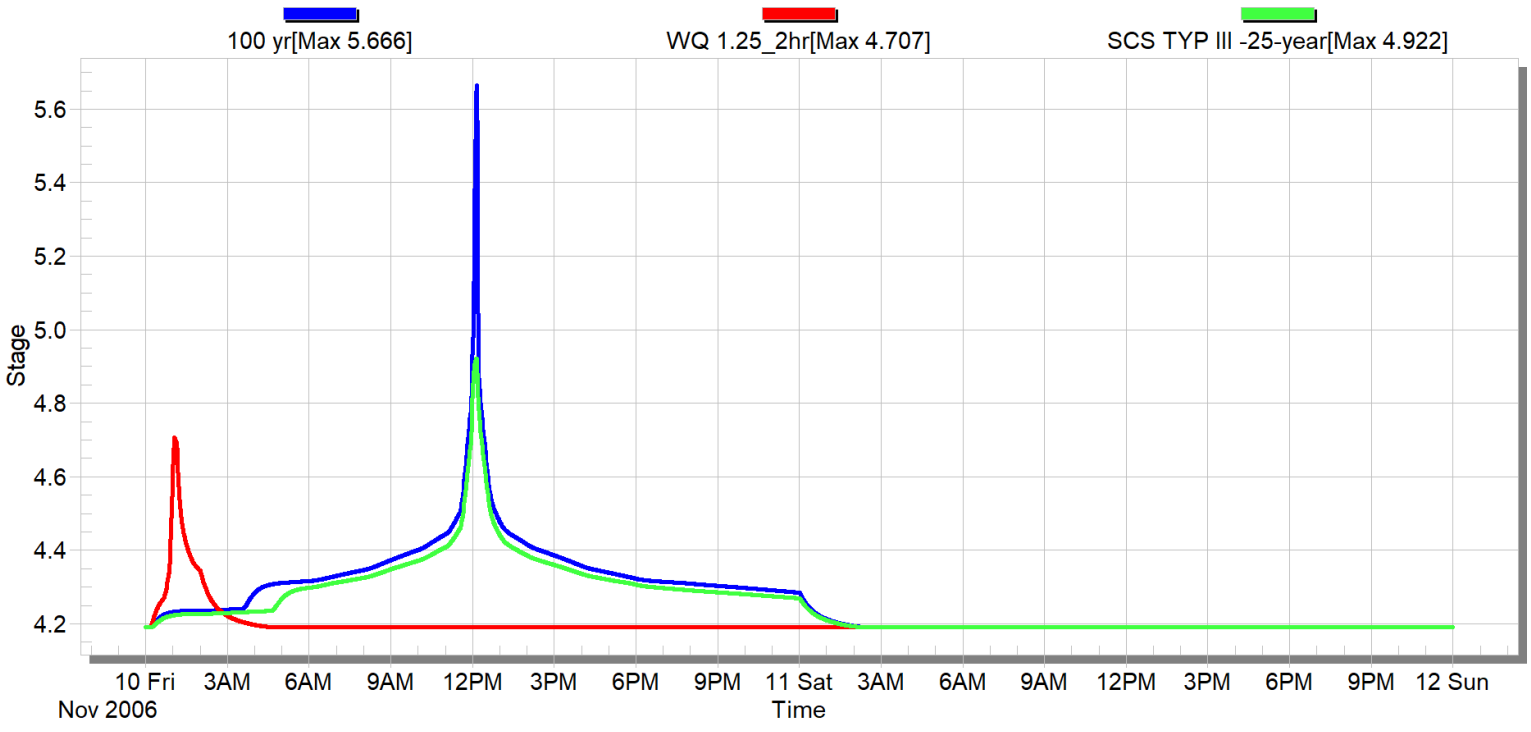
Node - V2C



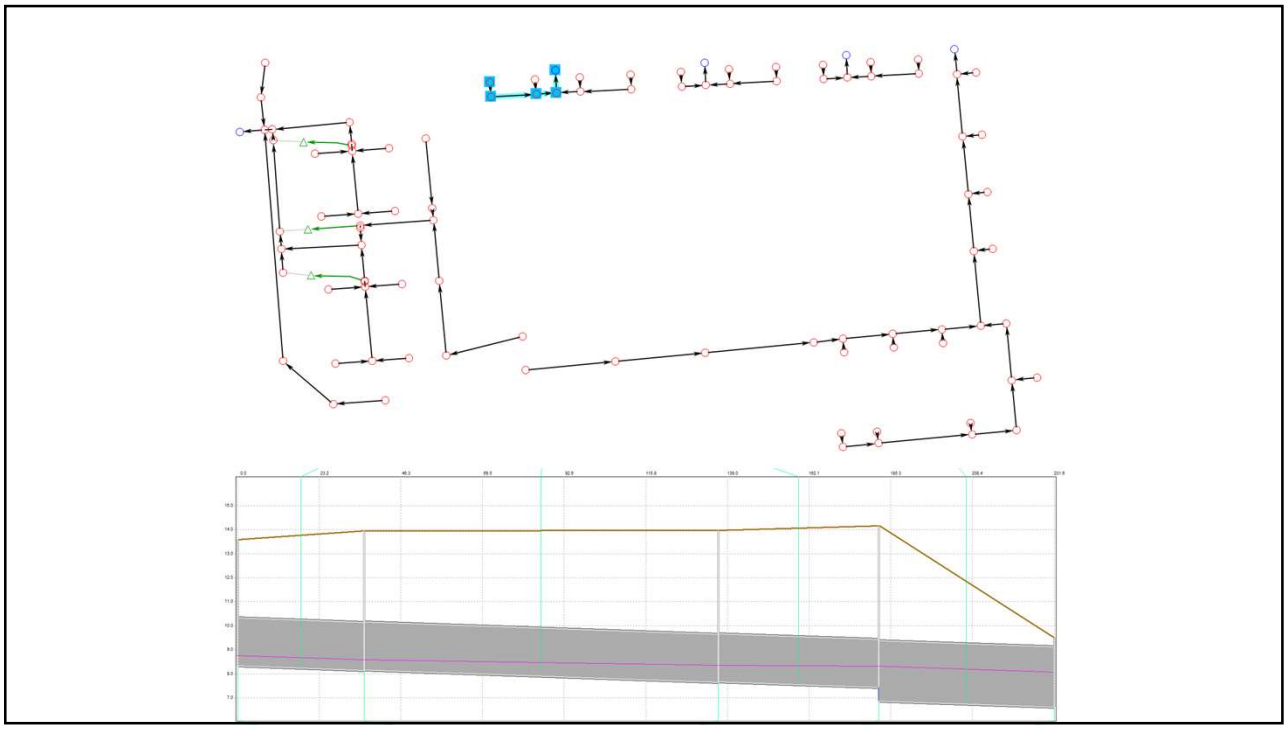
Node - V3C



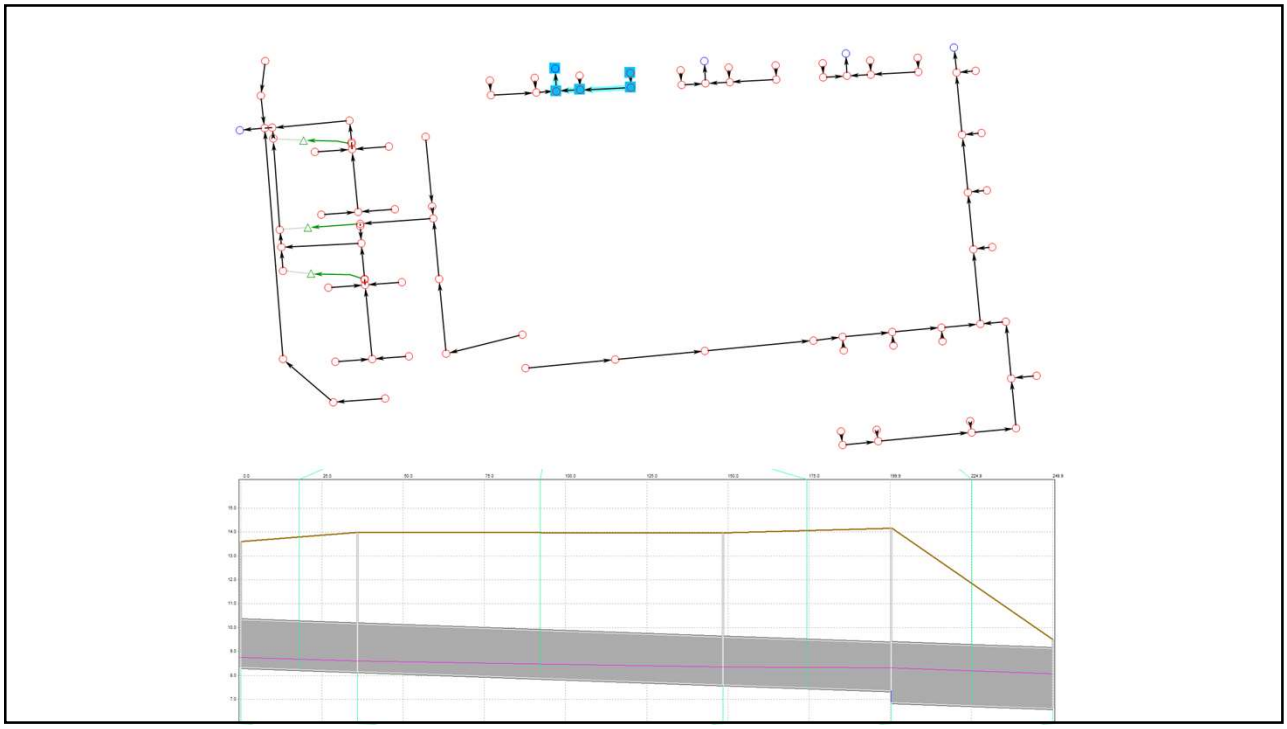
Node - V4C



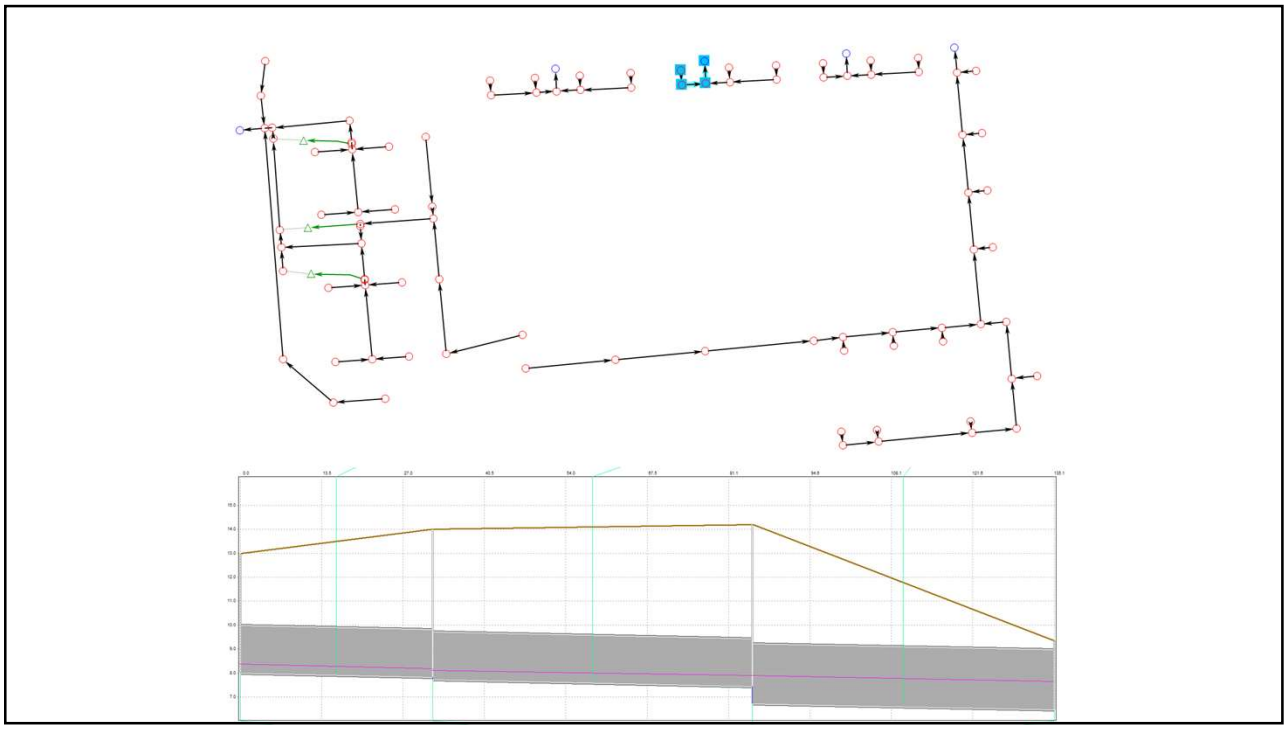
XPSWMM STORM DRAIN PROFILES FOR 25-YEAR STORM FOR PARCEL G



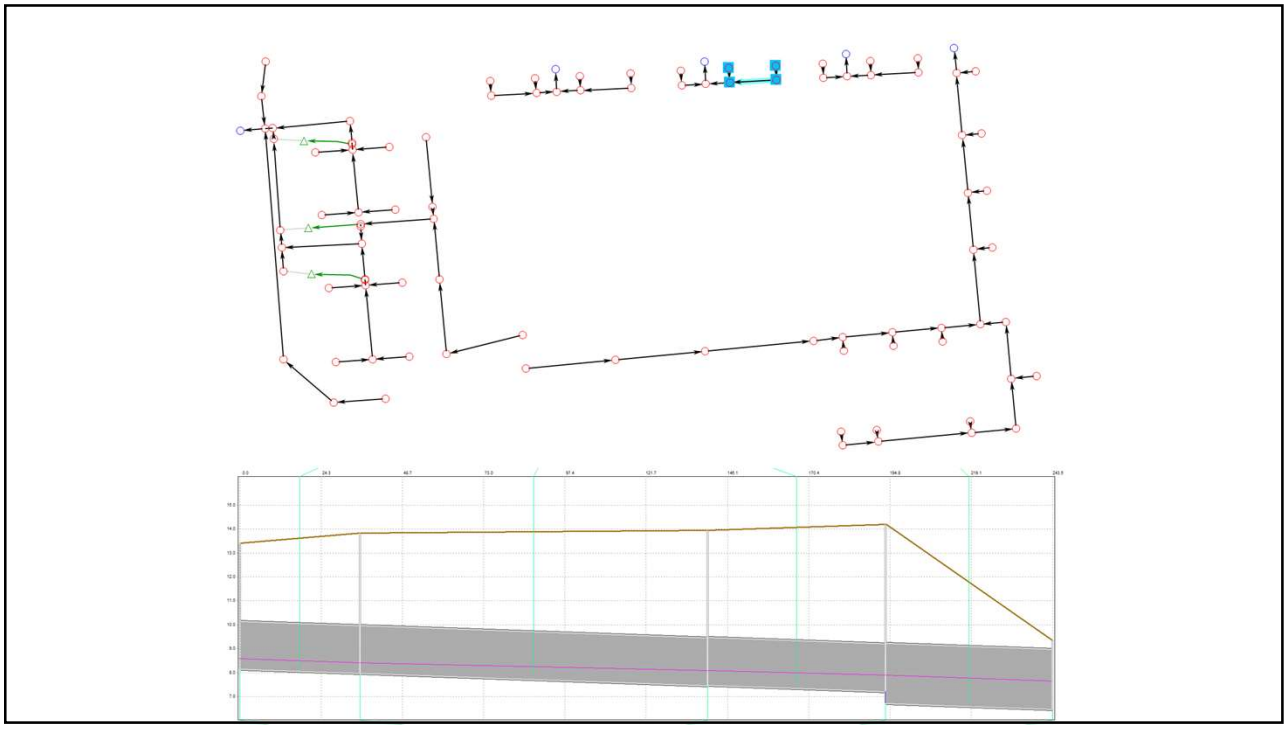
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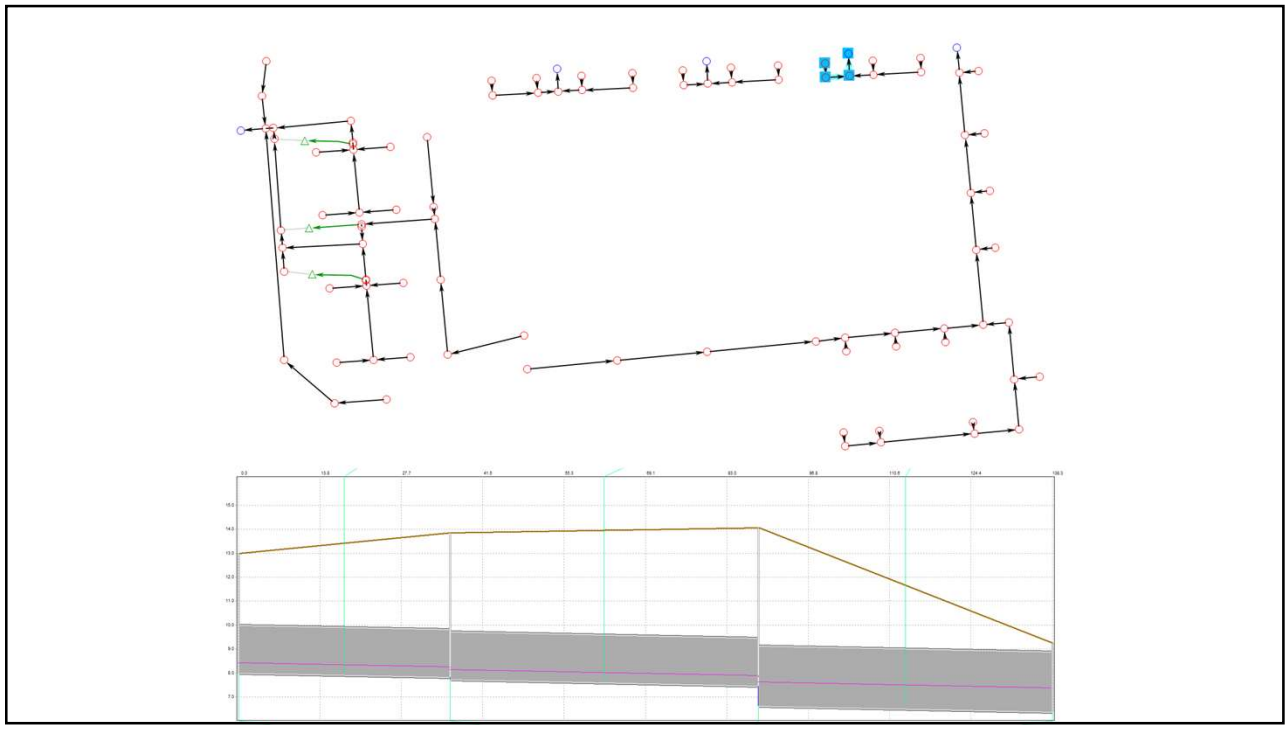
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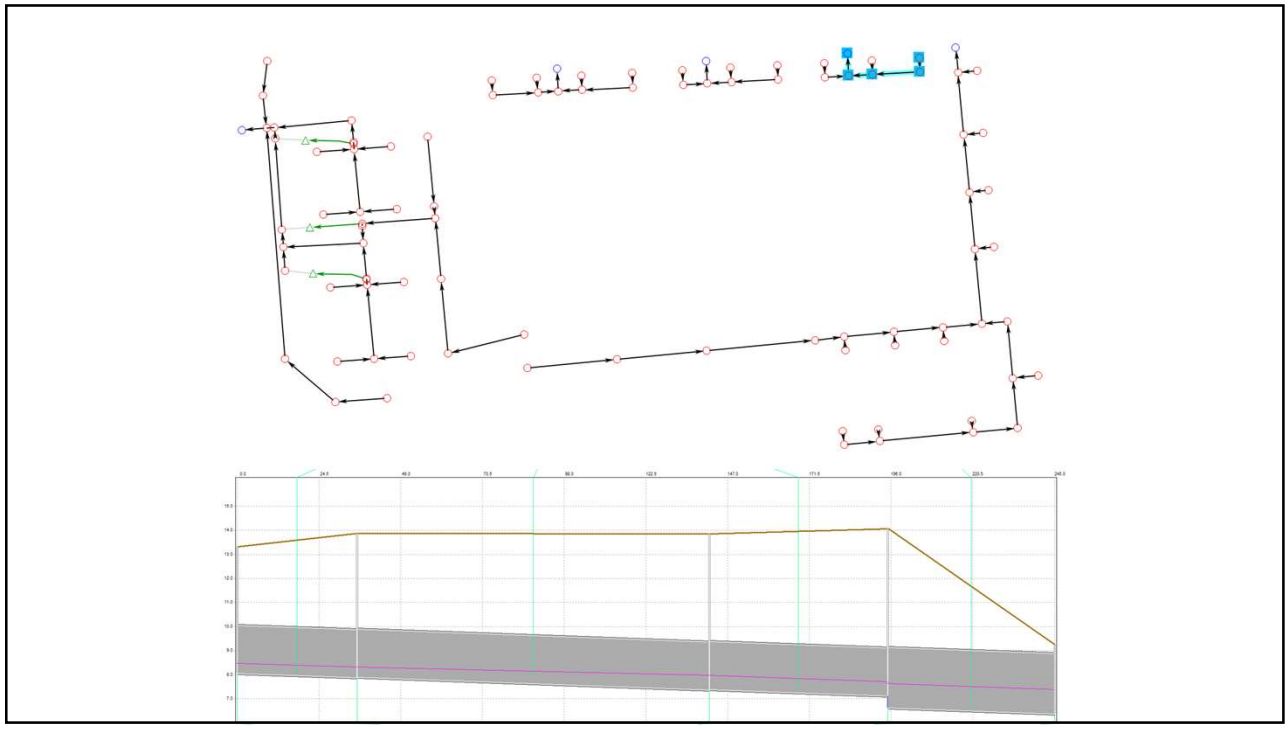
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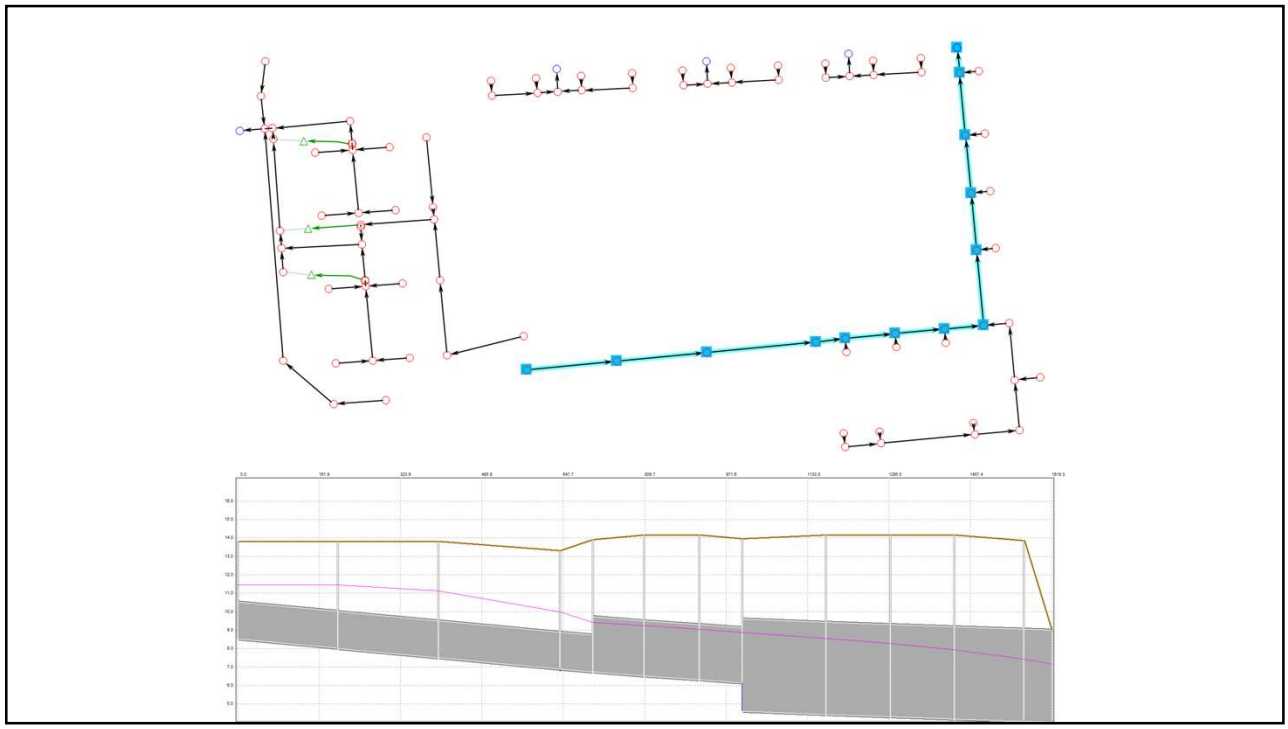
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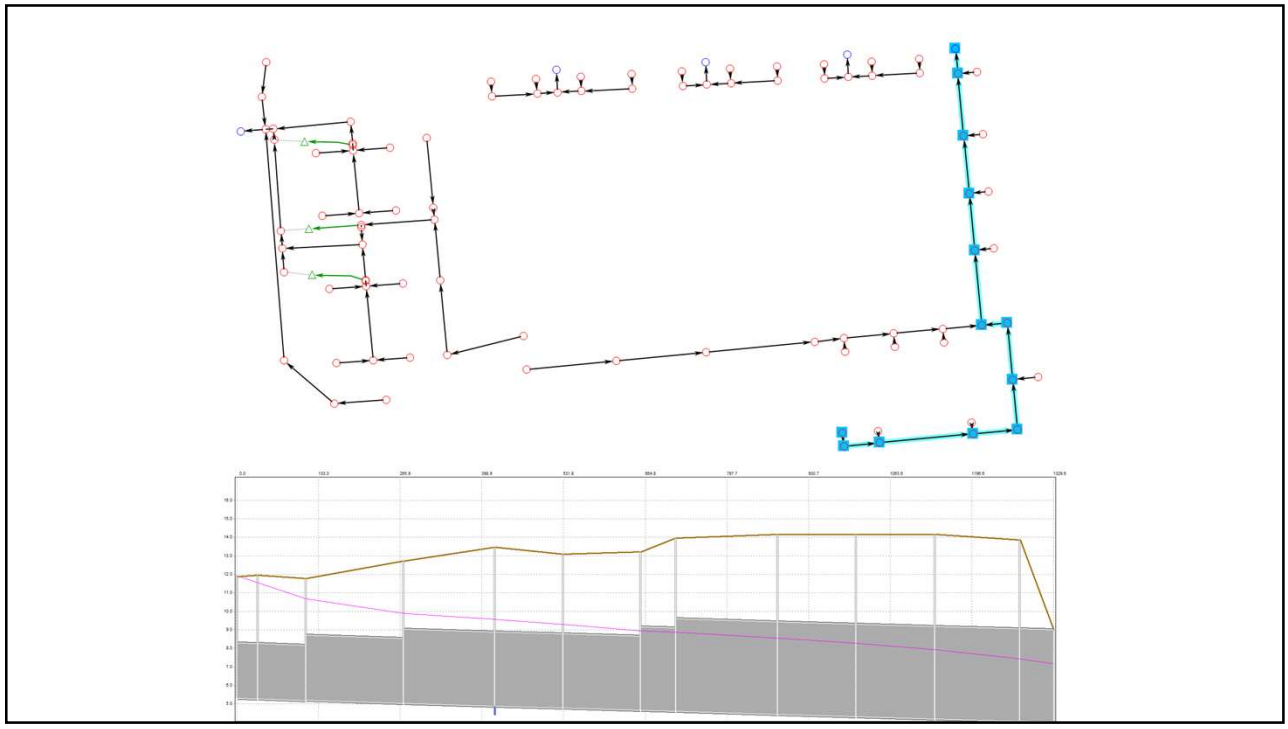
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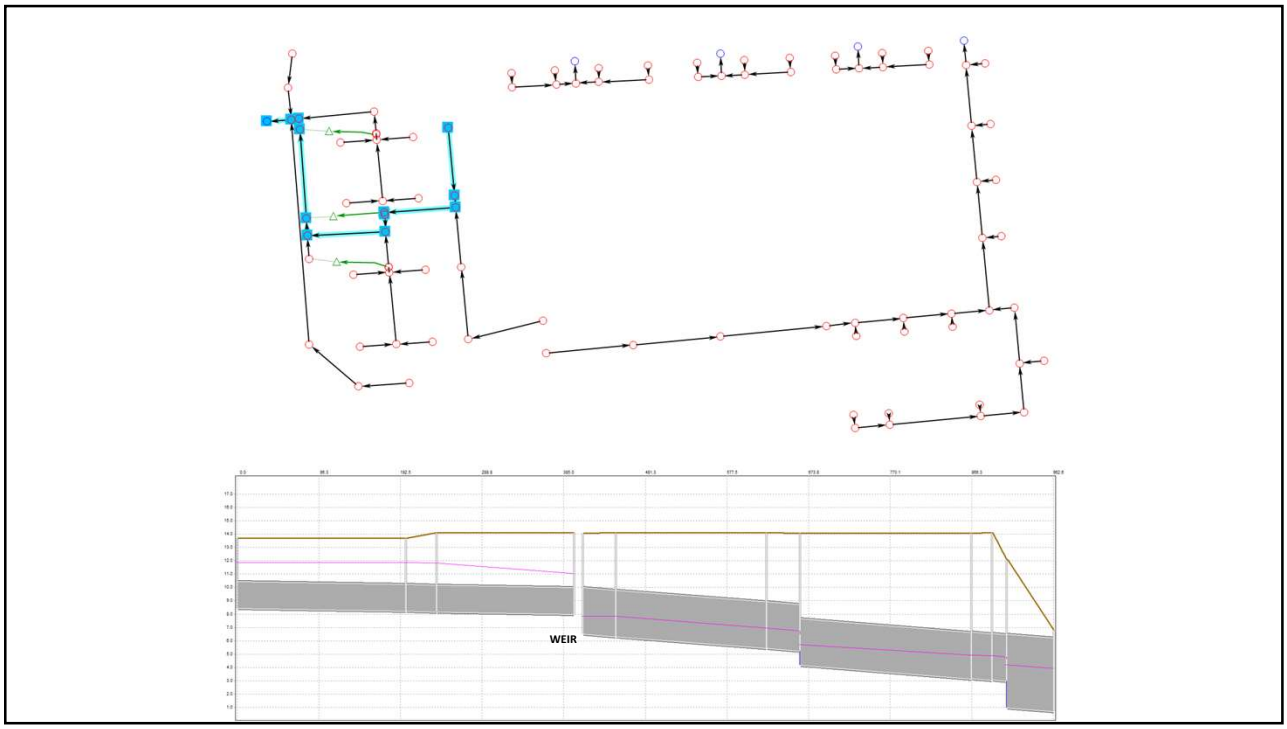
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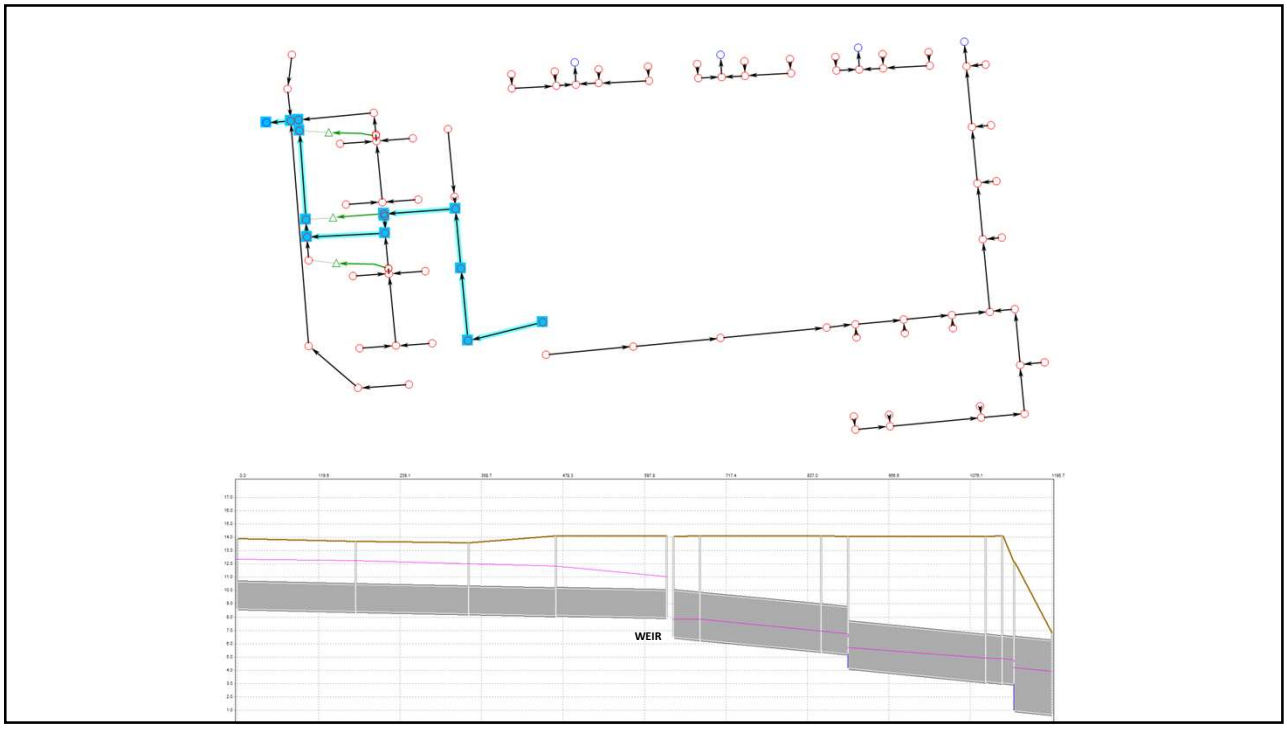
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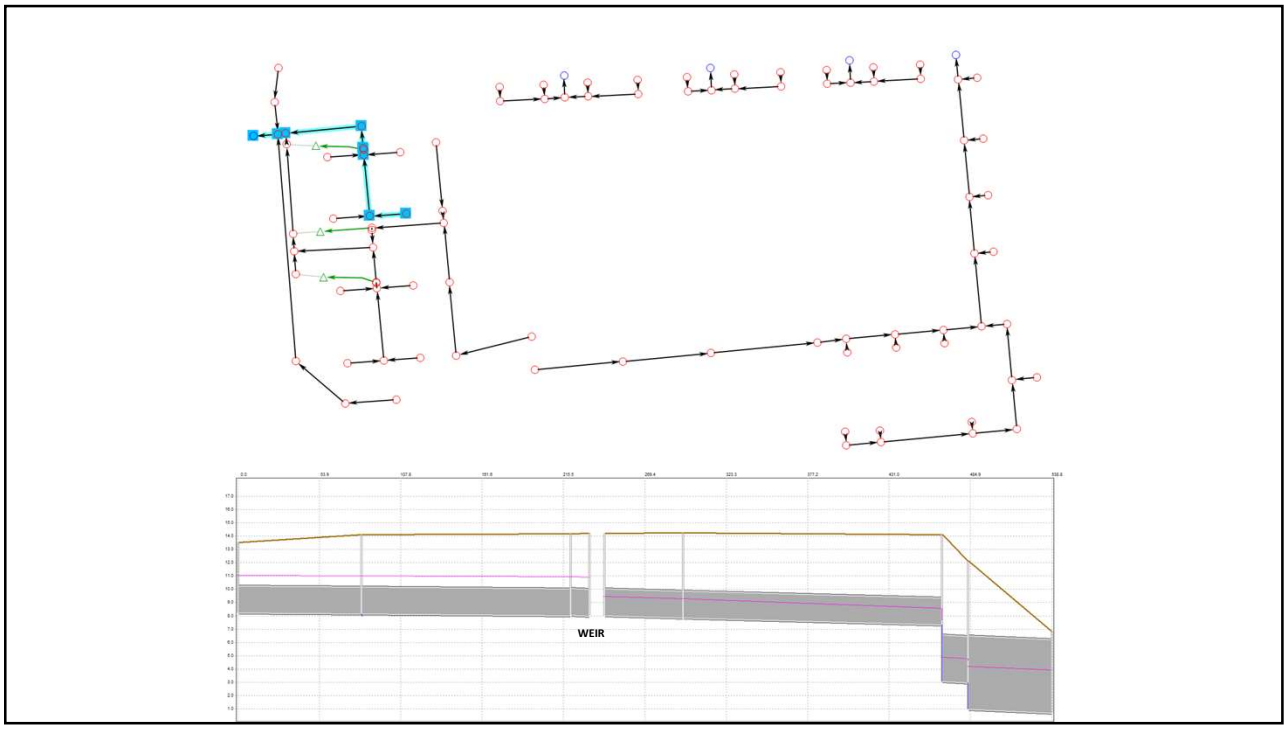
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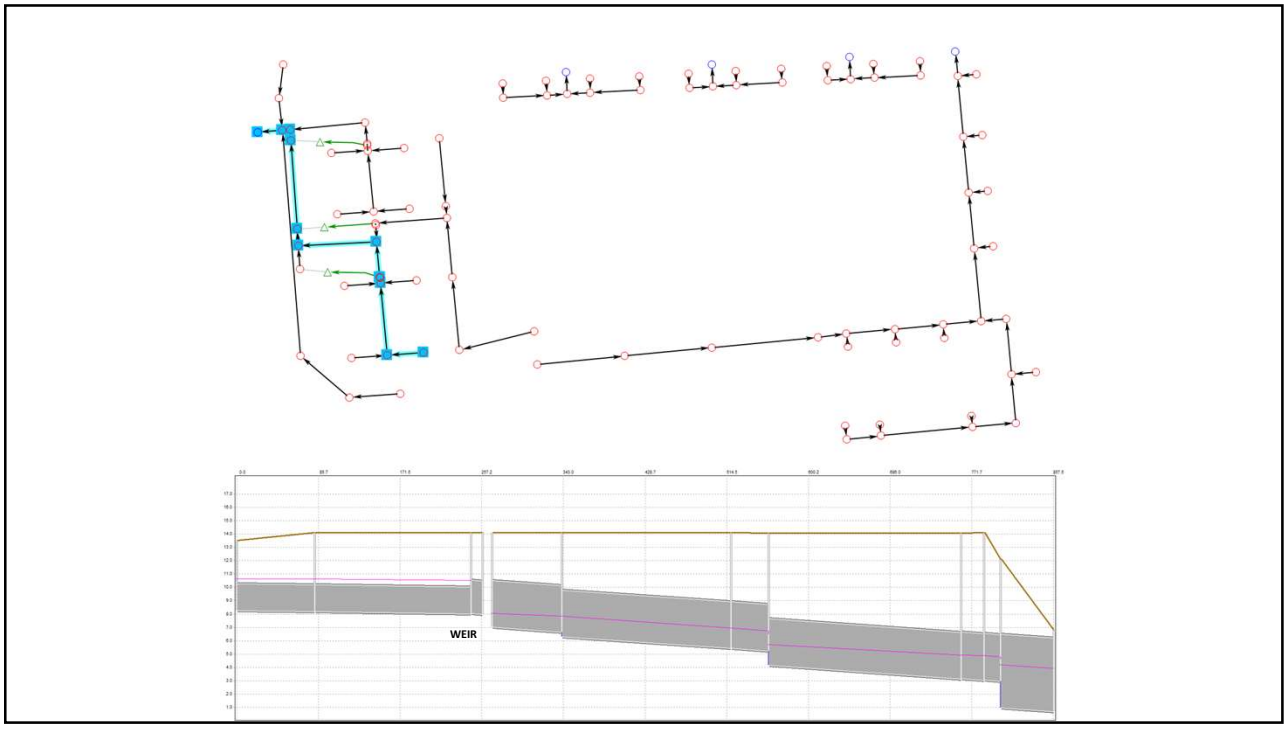
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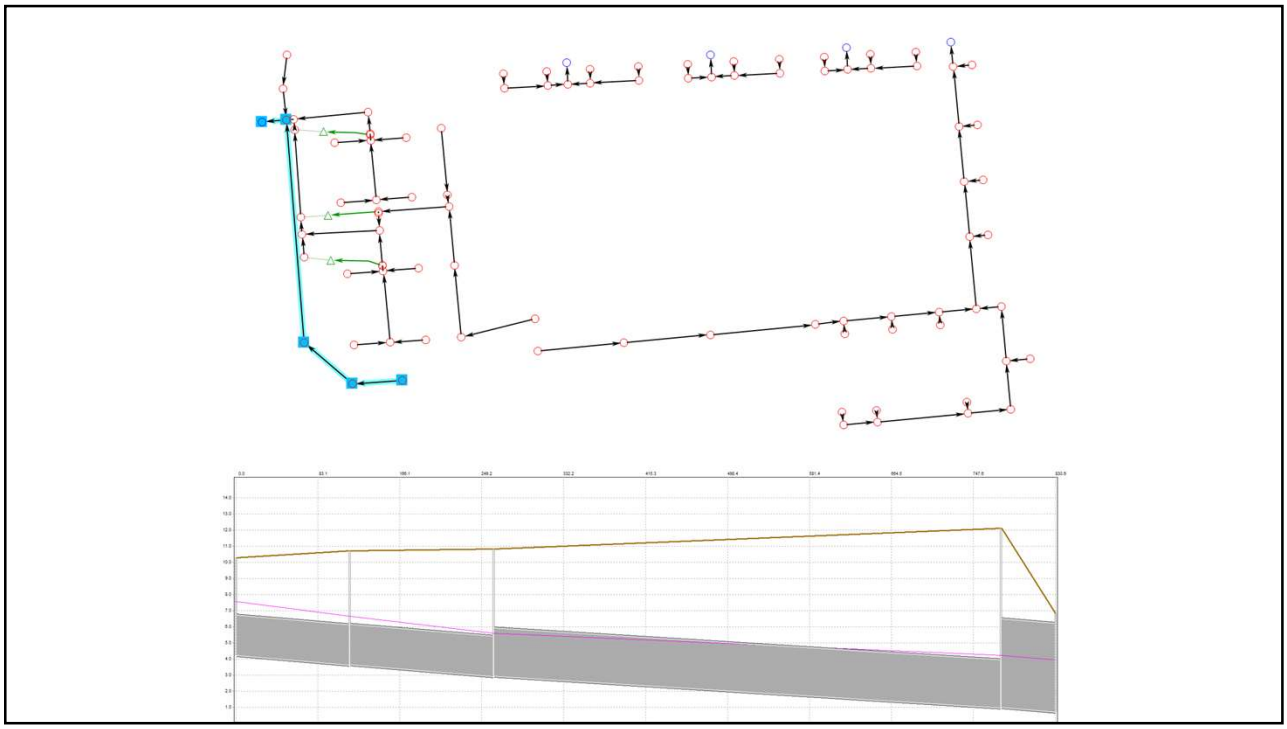
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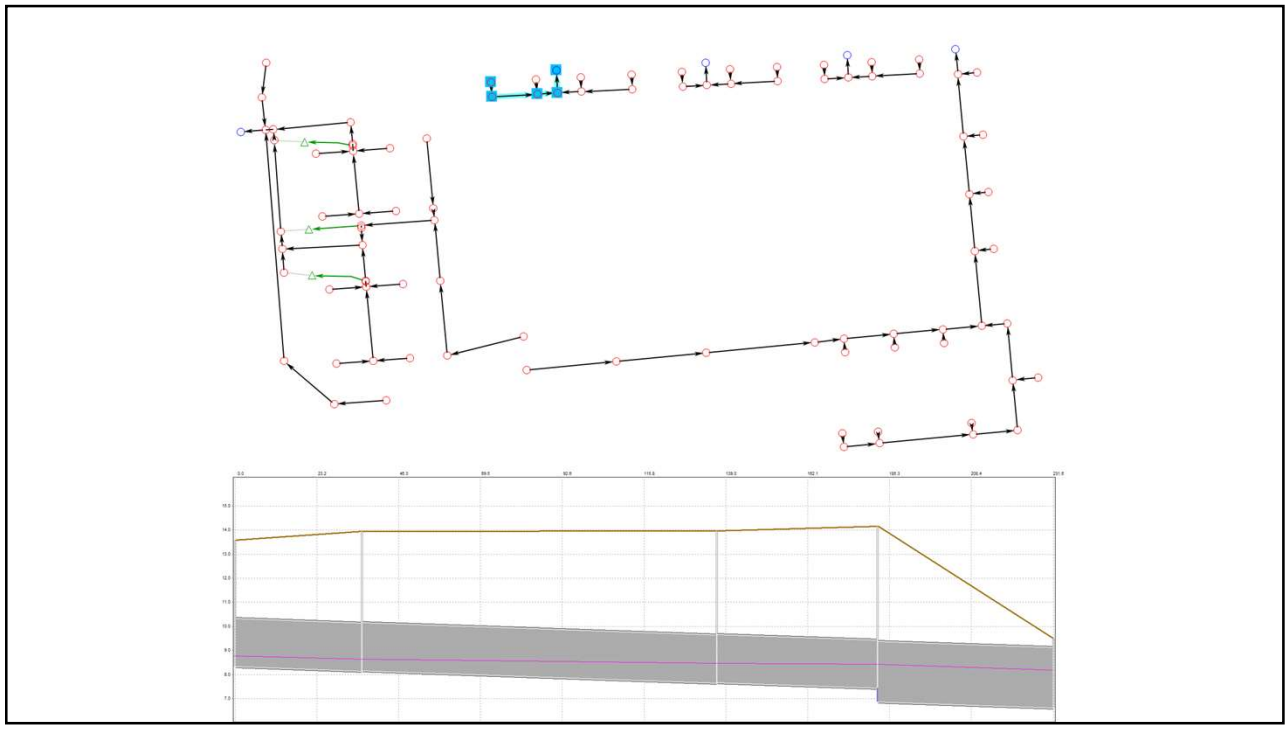


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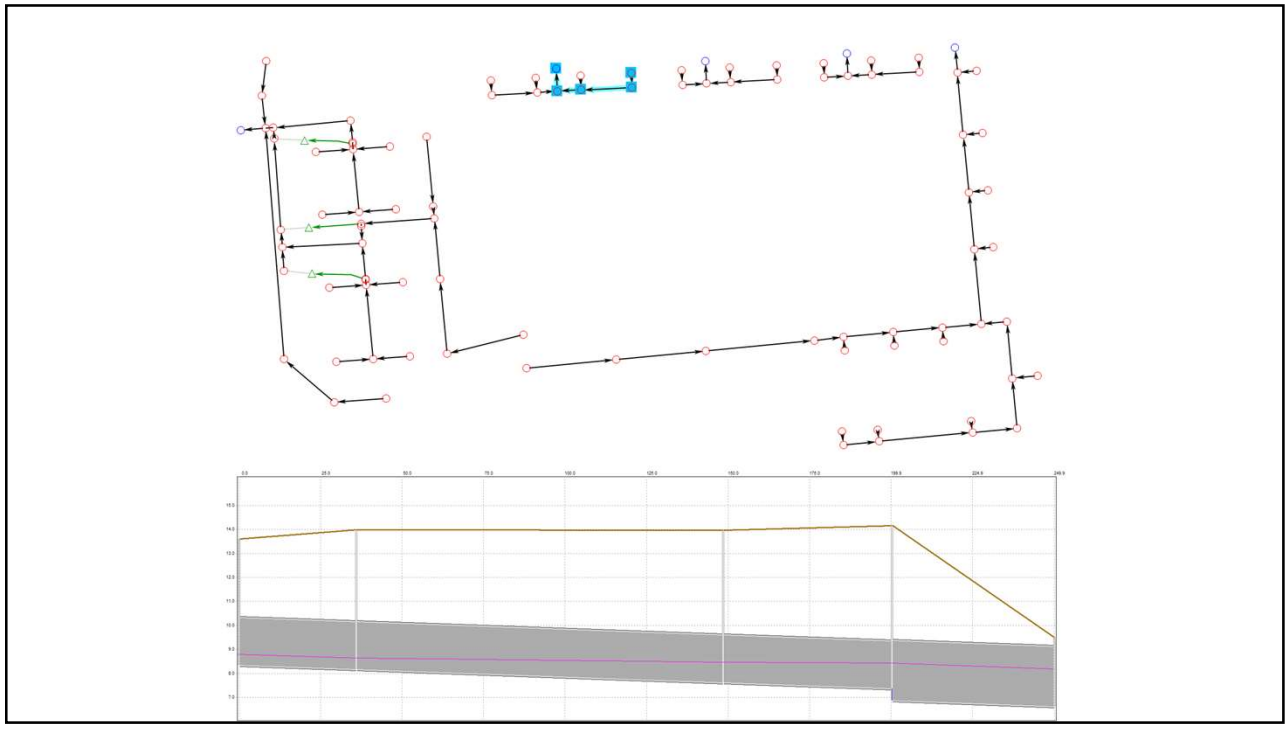


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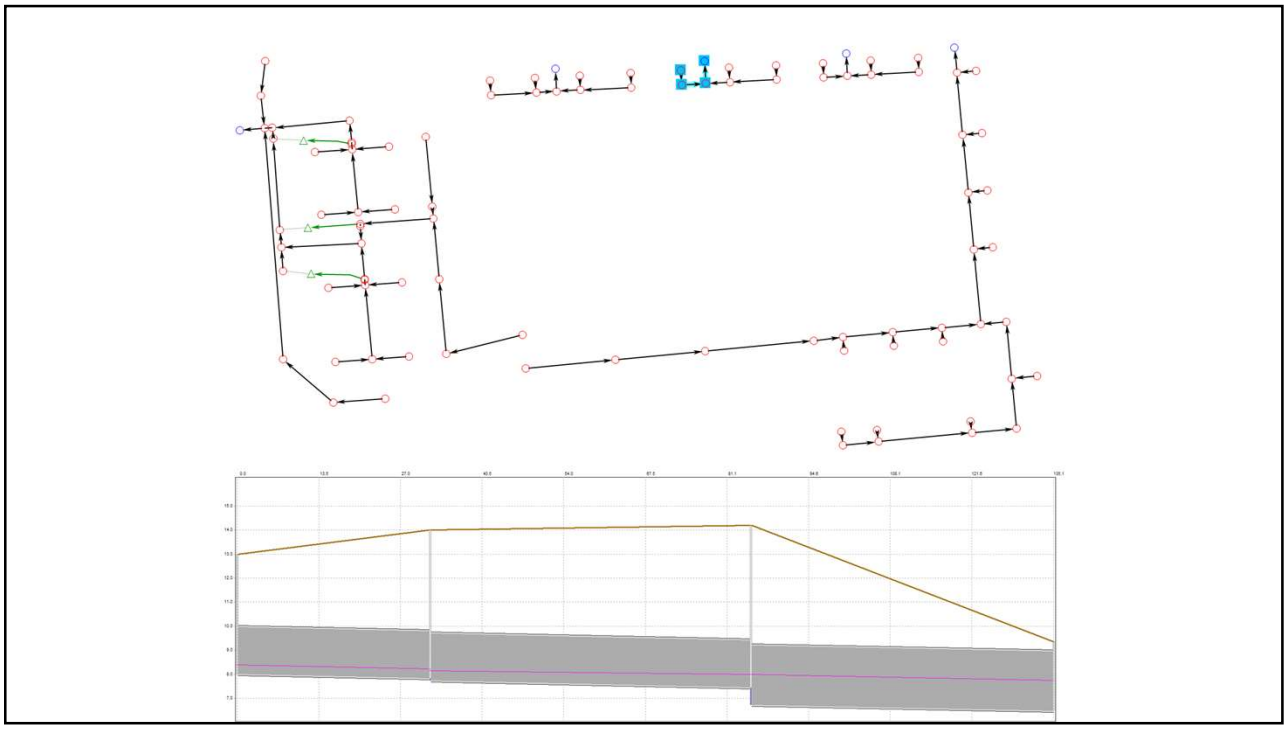
XPSWMM STORM DRAIN PROFILES FOR EXTREME 25-YEAR STORM PROJECTION FOR PARCEL G



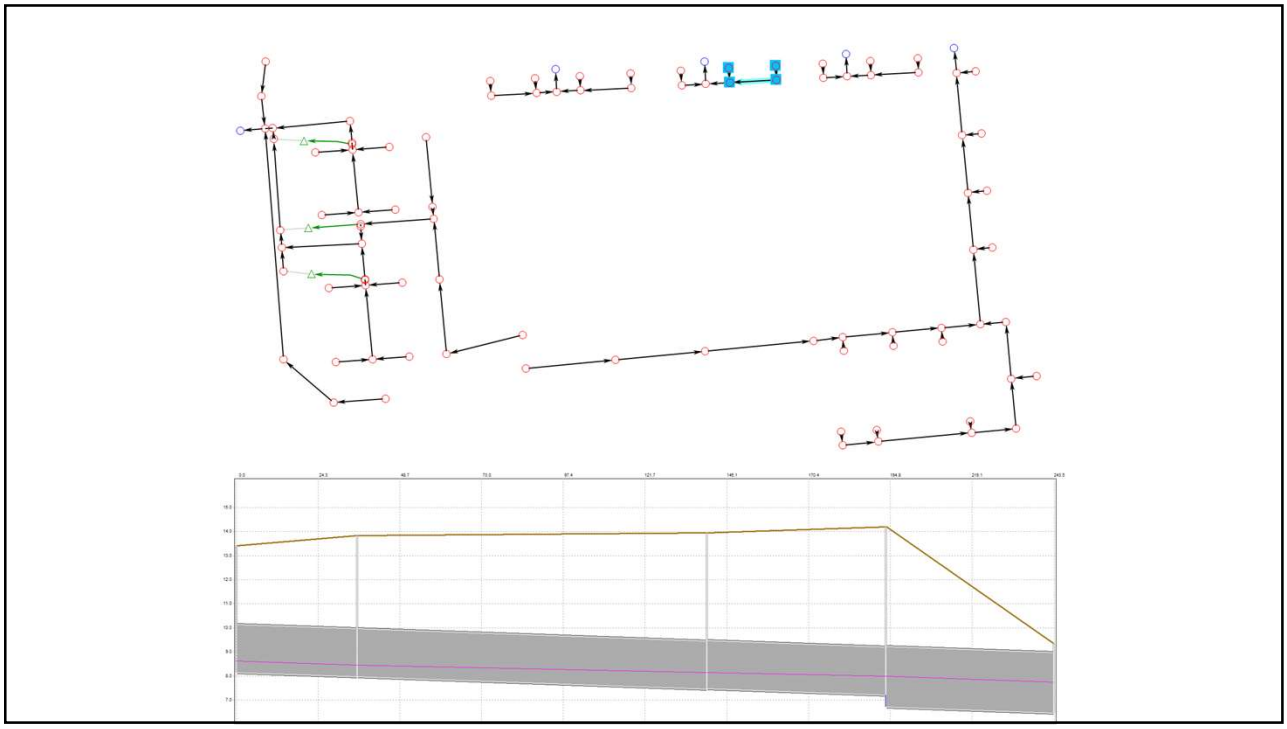
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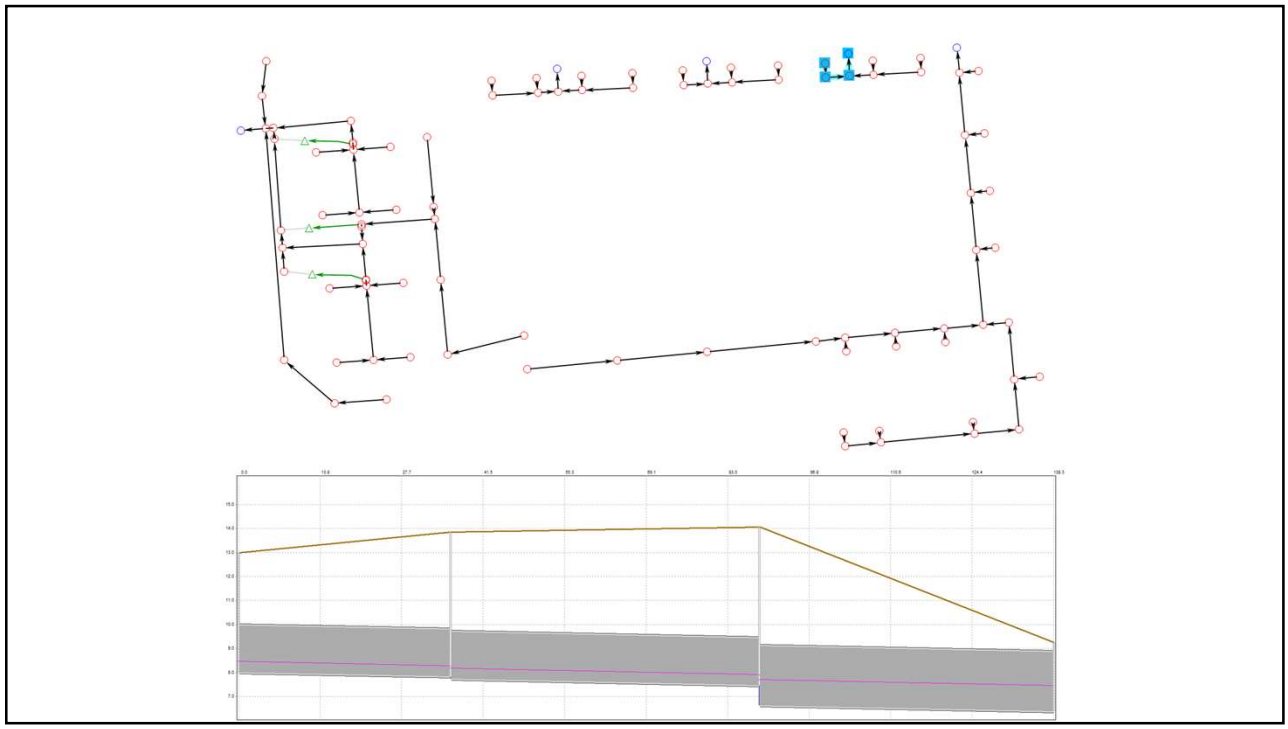
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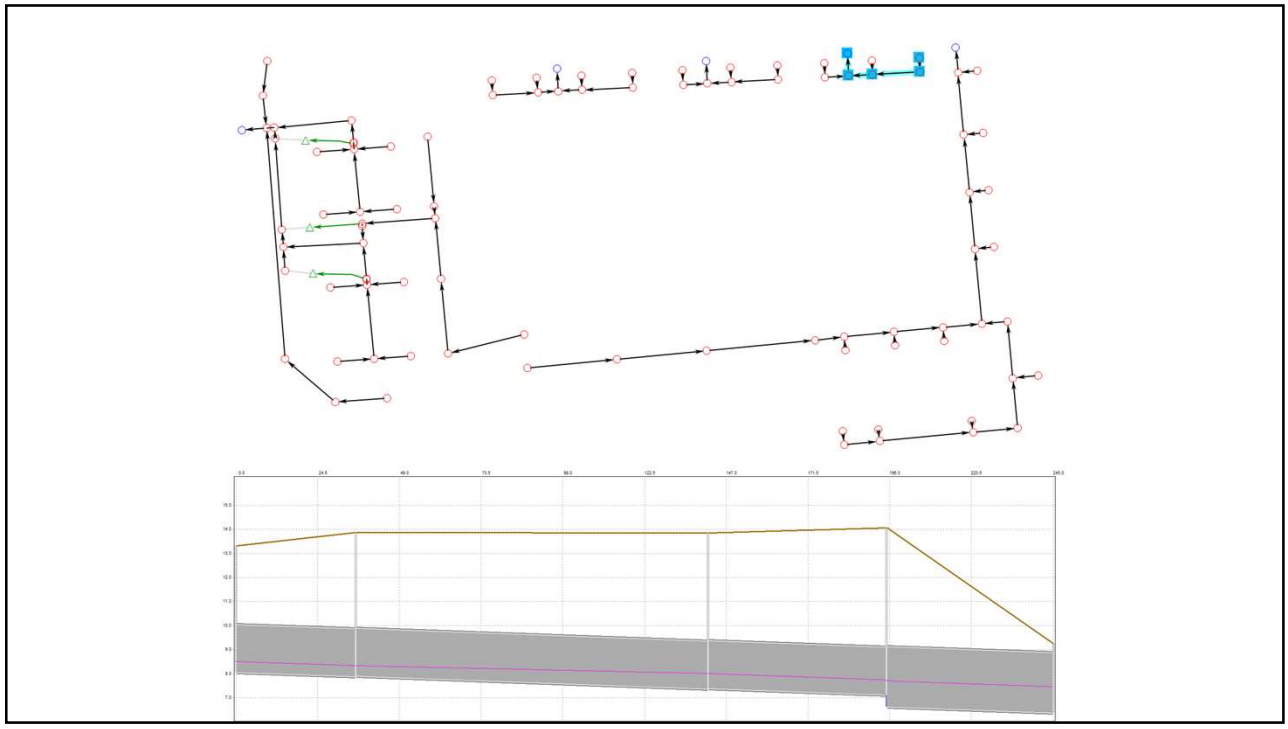
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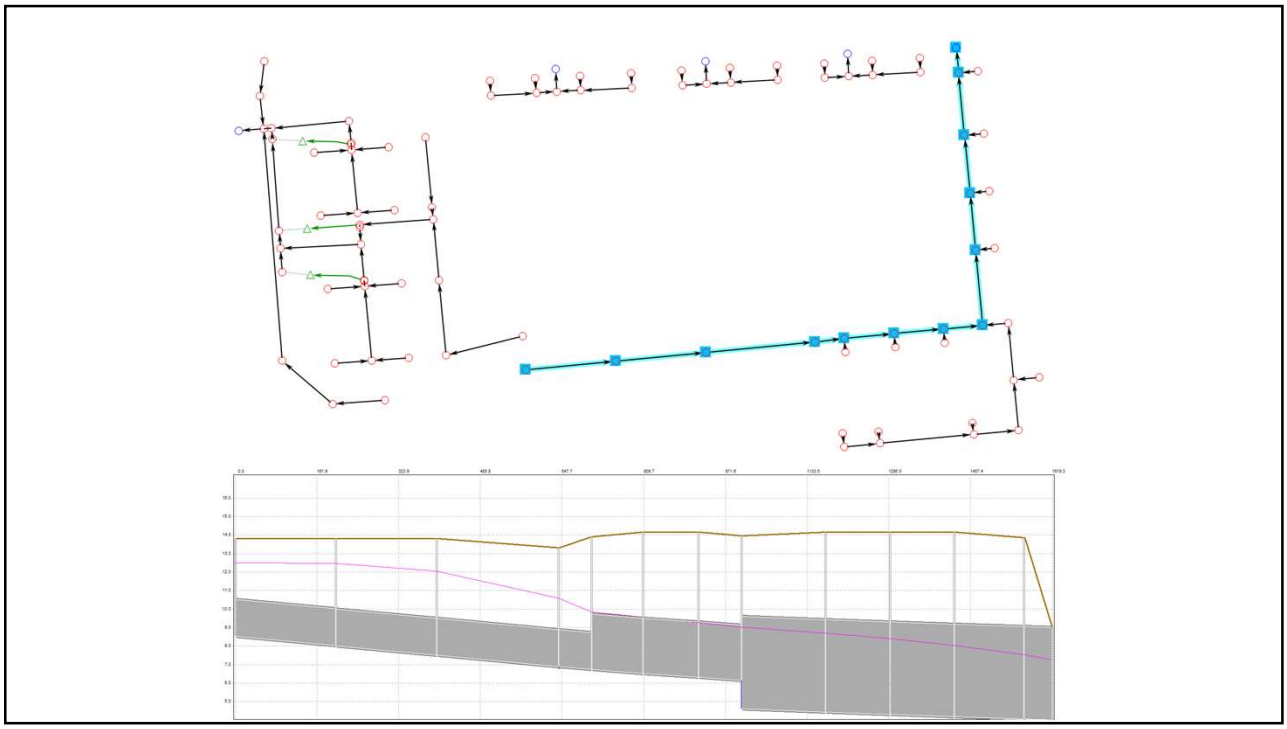
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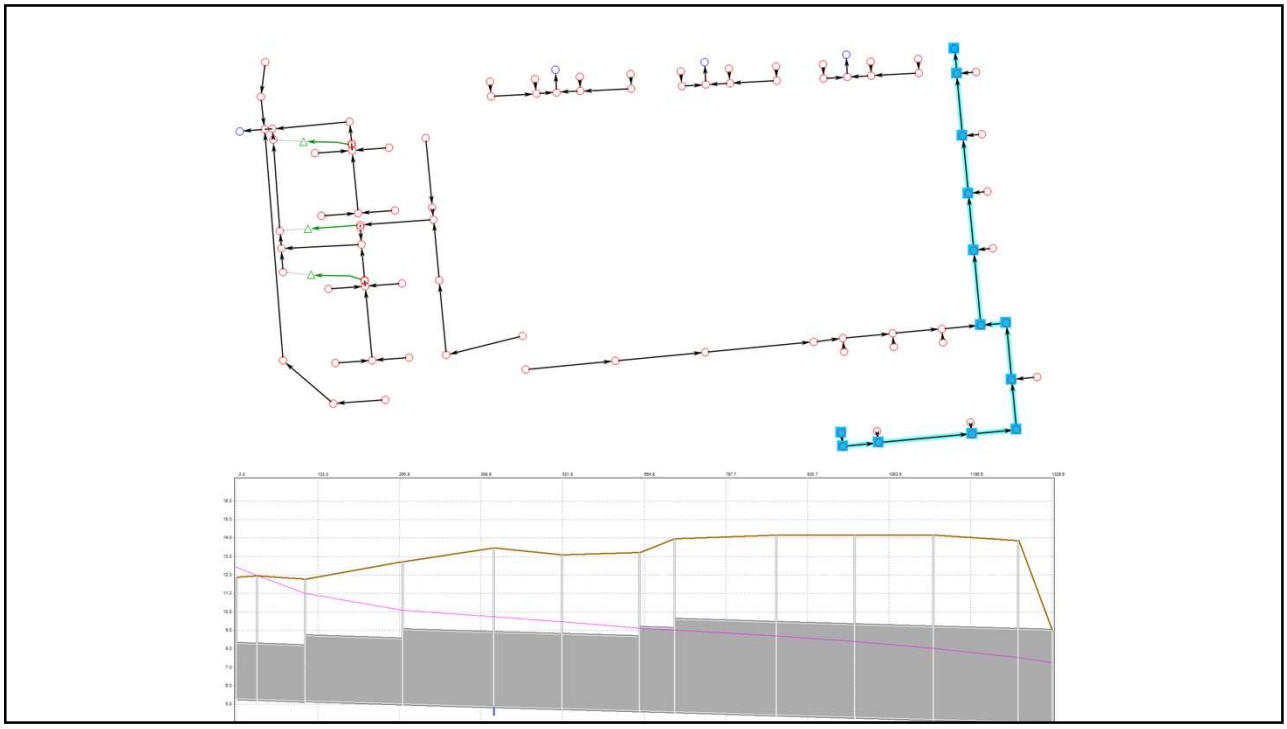
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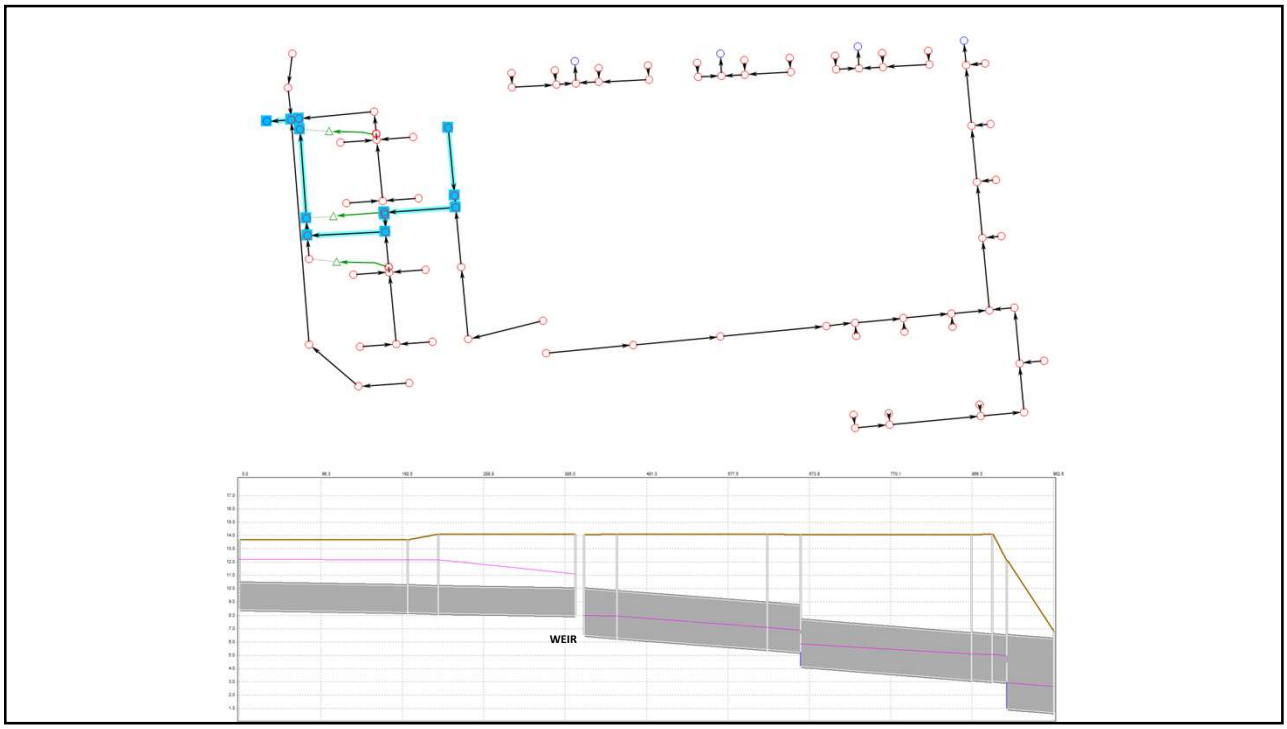
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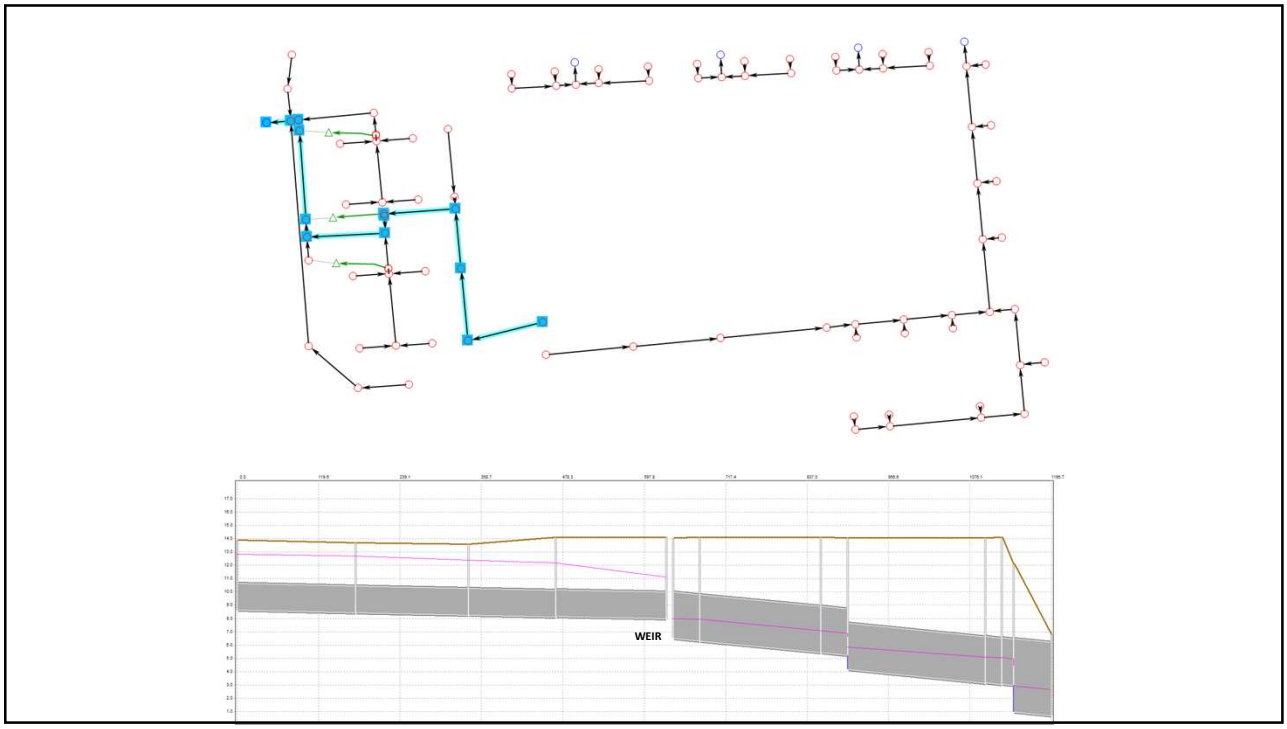
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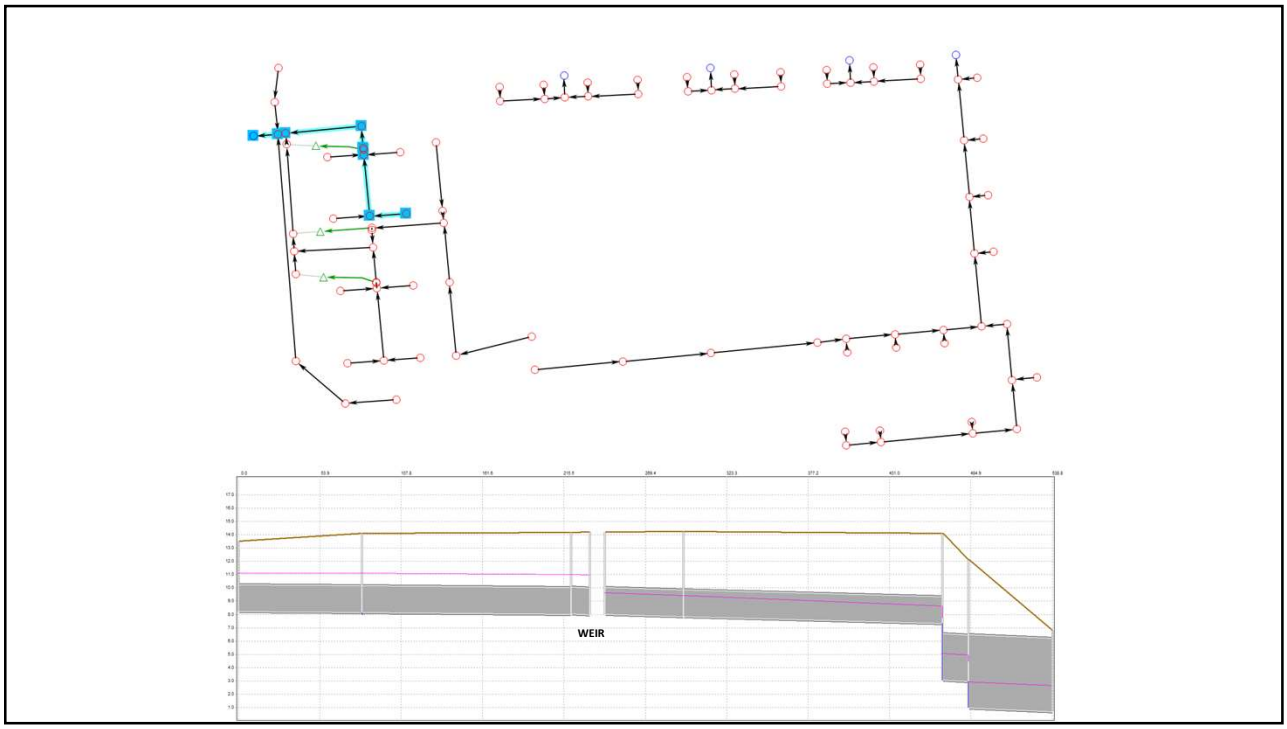
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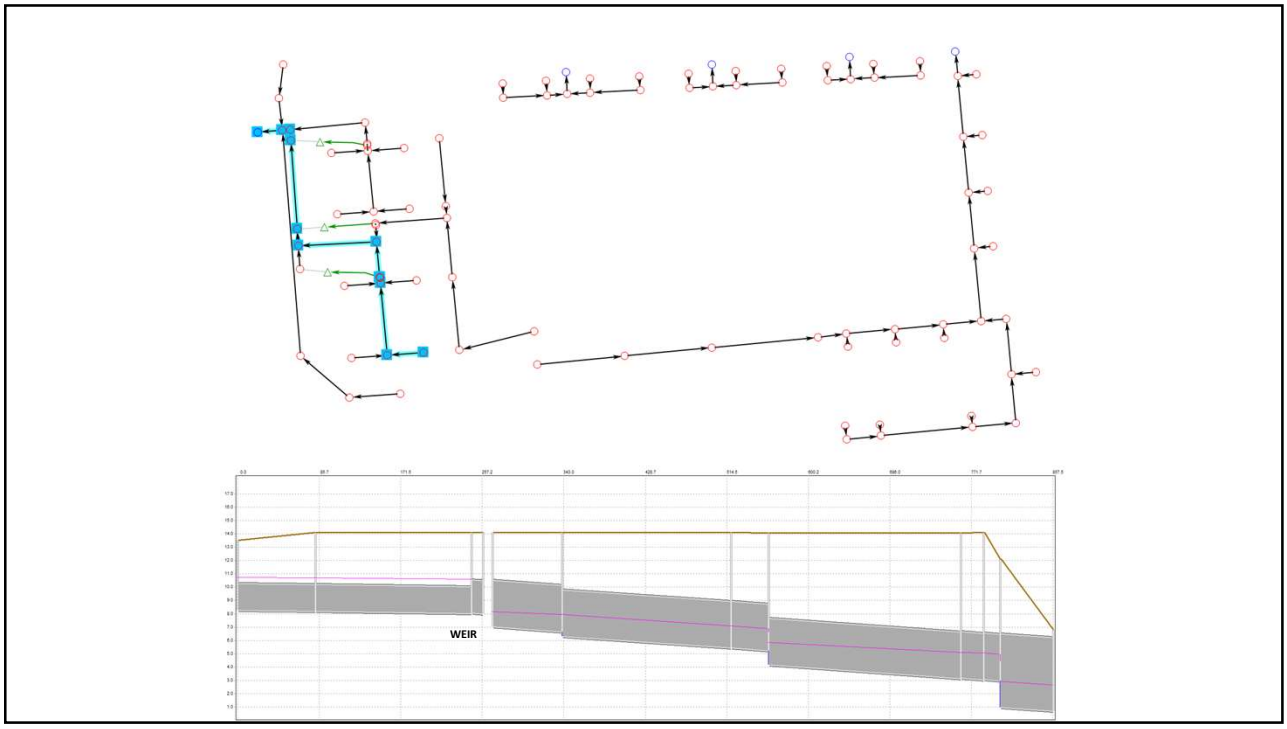
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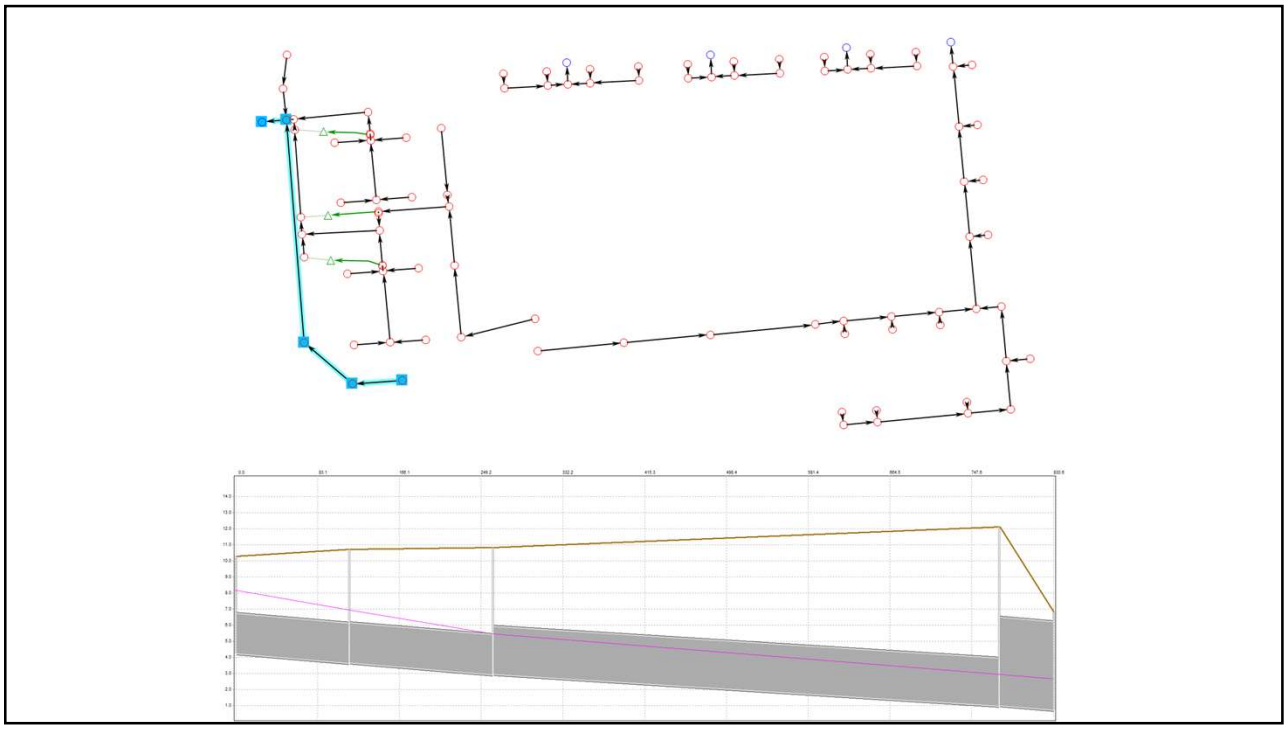
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11



12



13

Appendix B – NJDEP/NJCAT MTD Certification Letters

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER QUALITY
Bureau of Stormwater Permitting
401 East State Street
P.O. Box 420 Mail Code 401-02B
Trenton, NJ 08625-0420
Tel. (609) 633-7021 • Fax (609) 777-0432
www.nj.gov/dep/dwq/bnpc_home.htm

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Acting Commissioner

February 12, 2021

Derek M. Berg
Director – Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Lab Certification
Filterra® HC Bioretention System
Off-line Installation Approved

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the Filterra® HC Bioretention System (Filterra® HC.)

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated January 2021) for this device is published online at http://www.njcat.org/uploads/newDocs/NJCATFilterraTechnologyVerificationReportFinal._.pdf.

The NJDEP certifies the use of the Filterra® HC stormwater treatment unit by Contech Engineered Solutions LLC at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 3.12 gpm/ft^2 of effective filtration treatment area.

2. The Filterra® HC stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Filterra® HC. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.conteches.com/Portals/0/Documents/Maintenance%20Guides/Filterra%20HC%20OM%20Packet.pdf for any changes to the maintenance requirements.

6. For an MTD to be considered "green infrastructure" (GI) in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) treat stormwater runoff through infiltration into subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil; or (3) store stormwater runoff for reuse.

   The Filterra® HC filters stormwater runoff through an engineered biofiltration soil media and, thus, meets the definition of GI. Filterra® HC can be configured with or without a precast vault. Installations that will not include a precast vault will additionally need to comply the NJDEP Stormwater BMP Manual conditions regarding separation from the seasonal high water table and, if infiltration is proposed as an outlet, minimum vertical saturated hydraulic conductivity of the subsoil. Installations without a precast vault that do not rely on infiltration are required to maintain at least a one-foot separation from the seasonal high water table measured from the lowest point of the system. Installations without a precast vault that utilize infiltration are required to have the most hydraulically restrictive soil layer below the MTD meet the minimum tested vertical saturated hydraulic conductivity of one inch per hour and have at least two feet of separation from the seasonal high water table measured from the lowest point of the system.

7. Sizing Requirement:

   The example below demonstrates the sizing procedure for the Filterra® HC:

   Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using the Filterra® HC. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

   The selection of the appropriate model of Filterra® HC is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

   Inflow Drainage Area Evaluation:

   The drainage area to the Filterra® HC in this example is 0.25 acres. Included in Table 1 below, all of the Filterra® HC models are designed with a maximum allowable drainage area greater than 0.25 acres. Specifically, the Filterra® HC with a 4'x4' media bay and a maximum allowable drainage area of 0.40 acres would be the smallest model able to treat runoff without exceeding the maximum allowable drainage area.

   Maximum Treatment Flow Rate (MTFR) Evaluation:

   The site runoff (Q) was based on the following:
   time of concentration = 10 minutes
   i = 3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
   c = 0.99 (runoff coefficient for impervious)
   $Q = ciA = 0.99 \times 3.2 \times 0.25 = 0.79$ cfs

   Given the site runoff is 0.79 cfs and based on the MTFR's listed in Table 1 below, the Filterra® HC with a 16'x8' media bay and an MTFR of 0.889 cfs would be the smallest model that could be used to treat the impervious area without exceeding the MTFR. If using more than one unit for treating runoff, the units should be configured such that the flowrate to each unit does not exceed the design MTFR for each unit and ensuring the entire 0.25 acre area is treated.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below:

Table 1. Filterra® HC MTFRs and Maximum Allowable Drainage Areas

	Available Filterra® Media Bay Sizes (feet)	Effective Filtration Treatment Area (ft^2)	Treatment Flow Rate (cfs)	Maximum Allowable Drainage Area (ac)
Standard Configuration Filterra and Filterra Biosape Vaults	4x4	16	0.111	0.40
	4x6 or 6x4	24	0.167	0.60
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	0.245	0.89
	6x6	36	0.250	0.91
	6x8 or 8x6	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	6x12 or 12x6	72	0.500	1.81
	7x13 or 13x7	91	0.632	2.29
	14x8	112	0.778	2.82
	16x8	128	0.889	3.22
	18x8	144	1.000	3.62
	20x8	160	1.111	4.03
	22x8	176	1.222	4.43
Peak Diversion Filterra Vaults	4x4	16	0.111	0.40
	4.5x5.83 (Nominal 4x6)	26.24	0.182	0.66
	6x4	24	0.167	0.60
	6x6	36	0.250	0.91
	6x8	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	7x10	70	0.486	1.76
	8x10.5	84	0.583	2.11
	8x12.5	100	0.694	2.52
	Custom and/or Filterra Bioscape	Media Area in ft^2	0.00694 * (Media Area in ft^2)	0.0252 * (Media Area in ft^2)

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact me at (609) 633-7021.

Sincerely,



Gabriel Mahon, Chief
Bureau of Stormwater Permitting

Attachment: Maintenance Plan
cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP – Water & Land Management
Nancy Kempel, NJDEP– BSTP
Keith Stampfel, NJDEP – DLRP
Dennis Contois, NJDEP – DLRP

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
Mail Code 401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

December 14, 2016

Derek M. Berg
Director - Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Laboratory Certification
Stormwater Management StormFilter® (StormFilter) by Contech Engineered Solutions LLC
Off-line Installation

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the StormFilter System.

This project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the afore-mentioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the StormFilter System by Contech Engineered Solutions LLC at a TSS removal rate of 80%, when designed, operated and maintained in accordance with the information provided in the Verification Appendix and subject to the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 2.12 gpm/sf of effective filtration treatment area.

2. The StormFilter System shall be installed using the same configuration as the unit tested by NJCAT, and sized in accordance with the criteria specified in item 6 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter), to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the StormFilter, which is attached to this document. However, it is recommended to review the maintenance website at http://www.conteches.com/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=2813&PortalId=0&DownloadMethod=attachment for any changes to the maintenance requirements.

6. Sizing Requirements:

   The example below demonstrates the sizing procedure for a StormFilter System.

   Example: A 0.25 acre impervious site is to be treated to 80% TSS removal using a StormFilter System. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

   The calculation of the minimum number of cartridges for use in the StormFilter System is based upon both the MTFR and the maximum inflow drainage area. It is necessary to calculate the required cartridges using both methods and to rely on the method that results in the highest minimum number of cartridges determined by the two methods.

   Inflow Drainage Area Evaluation:

   The drainage area to the StormFilter System in this example is 0.25 acres. Based upon the information in Table 1 below, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the maximum drainage area:

1. Five (5) 12” cartridges,
2. Three (3) 18” cartridges, or
3. Two (2) 27” cartridges

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was determined based on the following:

time of concentration = 10 minutes
i=3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
c=0.99 (runoff coefficient for impervious)
Q=ciA=0.99x3.2x0.25=0.79 cfs=0.79x448.83 gpm=354.58 gpm

Based on a flow rate of 354.58 gpm, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the MTFR:

1. Thirty-six (36) 12” cartridges,
2. Twenty-four (24) 18” cartridges, or
3. Sixteen (16) 27” cartridges

The MTFR Evaluation results will be used since that method results in the higher minimum number of cartridges determined by the two methods.

The sizing table corresponding to the available system models are noted below:

TABLE 1 STORMFILTER CARTRIDGE HEIGHTS AND NEW JERSEY TREATMENT CAPACITIES

StormFilter Cartridge Heights and New Jersey Treatment Capacities				
StormFilter Cartridge Height	**Filtration Surface Area (sq.ft)**	**MTFR[1] (GPM)**	**Mass Capture Capacity (lbs)**	**Maximum Allowable Inflow Area[2] (acres)**
Low Drop (12")	4.71	10	36.3	0.061
18"	7.07	15	54.5	0.09
27"	10.61	22.5	81.8	0.136

Notes:

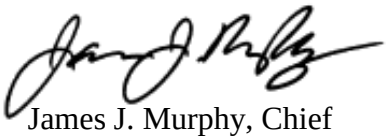
1. *MTFR calculated based on 4.72x10-3 cfs/sf (2.12 gpm/sf) of effective filtration treatment area.*
2. *Based upon the equation found in the NJDEP Filter Protocol Maximum Inflow Drainage Area (acres) = weight of TSS before 10% loss in MTFR (lbs)/600 lbs/acre of drainage area annually.*

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of

indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Shashi Nayak of my office at (609) 633-7021.

Sincerely,



James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP - BNPC

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
PHILIP D. MURPHY
Governor
SHEILA Y. OLIVER
Lt. Governor
DIVISION OF WATERSHED PROTECTION AND RESTORATION
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SHAWN M. LATOURETTE
Commissioner

June 23, 2021

Walter Stein, P.E.
Jensen Water Resources
521 Dunn Circle
Sparks, NV 89431

Re: MTD Lab Certification
StormVault BioFiltration with Sierra Blend
Online Installation

TSS Removal Rate 80%

Dear Mr. Stein:

This revised certification letter supersedes the Department's prior certification dated May 5, 2020. This revision was completed as a result of a change to the company name (formerly Jensen Stormwater Systems), and the development of an updated maintenance manual. No other modifications were made to this certification.

The Stormwater Management rules under N.J.A.C. 7:8-5.2(f) and 5.2(j) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Jensen Water Resources (Jensen) has requested a Laboratory Certification for the StormVault Biofiltration with Sierra Blend ("SVBF") system.

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated April 2020) for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the StormVault Biofiltration with Sierra Blend stormwater treatment unit by Jensen at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 2 gpm/ft^2 of effective filtration treatment area.

2. The SVBF stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 11.3 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the SVBF. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.jensenprecast.com/water-resources/product/biofiltration-systems/ for any changes to the maintenance requirements.

6. For an MTD to be considered "green infrastructure" in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) infiltrate into the subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil. The SVBF can be configured in two different manners, either as an open top planter box for shrubs, other smaller plants, or as a grated tree box; or it can be configured as an underground treatment vault fed by a subsurface inlet pipe. Any configuration that uses a bio-filtration media and can be configured "above ground" and incorporate a tree box, planter box, or shrubs, etc., would meet the GI definition. Any MTD with bio-filtration media that would be placed "below ground" as a vault without any vegetation can be considered GI (for NJ purposes) only if the device infiltrates the entire Water Quality Design Storm into the subsoil. Further, the below ground device (vault) would need to meet the NJDEP Stormwater BMP Manual conditions of having the soil below the MTD meet the minimum tested infiltration rate of one inch per hour, have at least two feet of separation from the seasonal high water table, and infiltrate into the subsoil.

7. Sizing Requirement:

   The example below demonstrates the sizing procedure for the SVBF:

   Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using an SVBF. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

   The selection of the appropriate model of SVBF is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the SVBF in this example is 0.25 acres. Based upon the information in Table 1 below, all of the SVBF models would be able to treat runoff without exceeding the maximum allowable drainage area.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:

time of concentration = 10 minutes
i = 3.2 in/hr (page 21, Fig. 5-10 of Chapter 5 of the NJ Stormwater BMP Manual)
c = 0.99 (runoff coefficient for impervious)
Q = ciA = 0.99 x 3.2 x 0.25 = 0.79 cfs (354.58 gpm)
(Note: 1 cfs = 448.83 gpm)

Given the site runoff is 0.79 cfs and based on Table 1 below, the minimum size unit to be used to treat the runoff without exceeding the MTFR is the Model SVBF 10 x 20.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below:

Table 1. StormVault BioFiltration with Sierra Blend (SVBF) Model MTFRs and Maximum Allowable Drainage Area.

Configuration	Dimensions (ft)	Media Surface Area (ft^2)	MTFR (cfs)[1]	Maximum Allowable Drainage Area (acres)
SVBF Unit	3 x 5	15.00	0.07	0.28
	4 x 4	16.00	0.07	0.30
	4 x 6.5	26.00	0.12	0.48
	4.5 x 8.5	38.25	0.17	0.71
	5 x 5	25.00	0.11	0.48
	5 x 10.5	52.50	0.23	0.97
	6 x 6	36.00	0.16	0.67
	6 x 8	48.00	0.21	0.89
	6 x 12	72.00	0.32	1.33
	6 x 15	90.00	0.40	1.67
	8 x 8	64.00	0.29	1.19
	8 x 10	80.00	0.36	1.48
	8 x 16	128.00	0.57	2.37
	10 x 20	200.00	0.89	3.70

Table 1. StormVault BioFiltration with Sierra Blend (SVBF) Model MTFRs and Maximum Allowable Drainage Area (continued)

Configuration	Dimensions (ft)	Media Surface Area (ft^2)	MTFR (cfs)[1]	Maximum Allowable Drainage Area (acres)
SVBF with Internal Bypass	3 x 5	14.91	0.07	0.28
	4 x 4	15.91	0.07	0.29
	4 x 6.5	25.91	0.12	0.48
	4.5 x 8.5	38.16	0.17	0.71
	5 x 5	24.91	0.11	0.46
	5 x 10.5	52.41	0.23	0.97
	6 x 6	35.80	0.16	0.66
	6 x 8	47.80	0.21	0.89
	6 x 12	71.80	0.32	1.33
	6 x 15	89.80	0.40	1.66
	8 x 8	63.80	0.28	1.18
	8 x 10	79.80	0.36	1.48
	8 x 16	127.80	0.57	2.37
	10 x 20	199.80	0.89	3.70

1. Calculated based on 2.0 gpm/ft^2 (0.004 cfs/ft^2) of effective filtration treatment area.

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Anthony Robalik of my office at anthony.robalik@dep.nj.gov.

Sincerely,



Gabriel Mahon, Chief
Bureau of NJPDES Stormwater Permitting & Water Quality Management
Division of Watershed Protection and Restoration
New Jersey Department of Environmental Protection

Attachment: Maintenance Plan

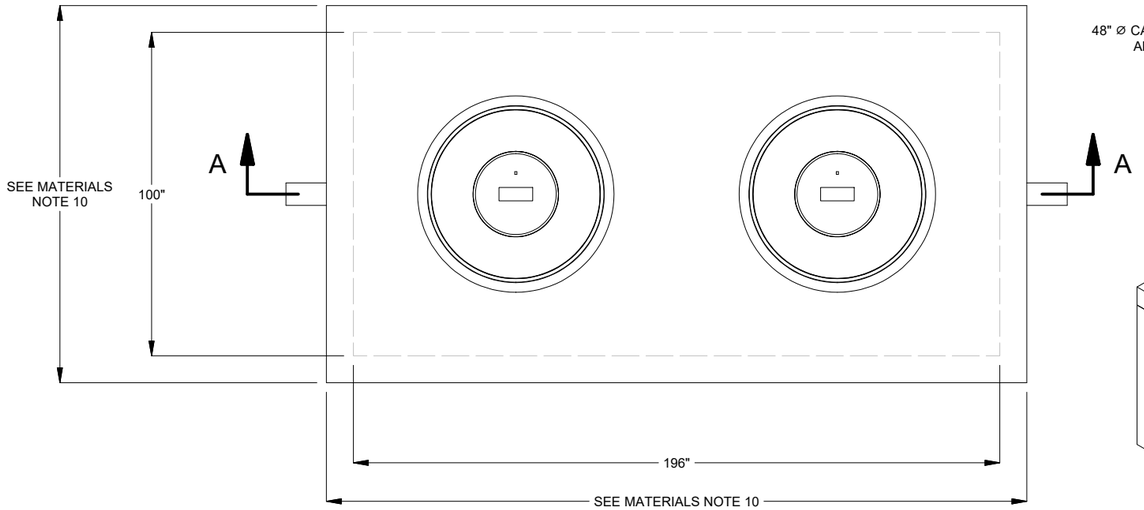
cc: Richard Magee, NJCAT

Appendix C – MTD HydroCAD Analysis and Drawings

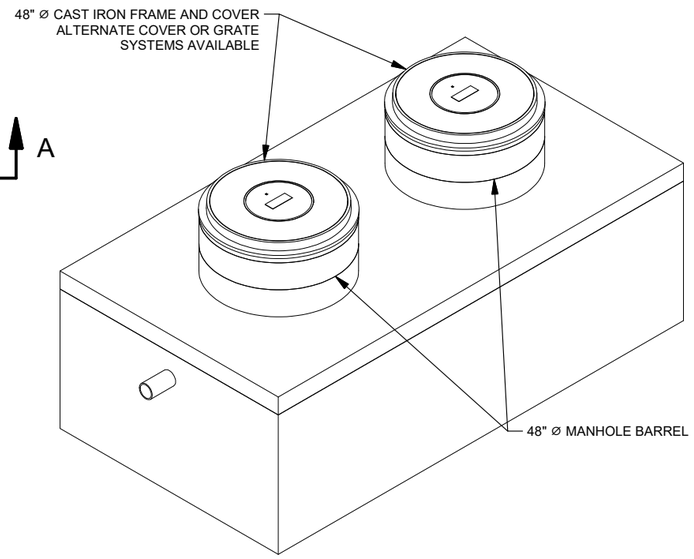
STORMVAULT BIOFILTRATION (SVBF)

CONFIGURATION: UNDERGROUND VAULT (-UV)

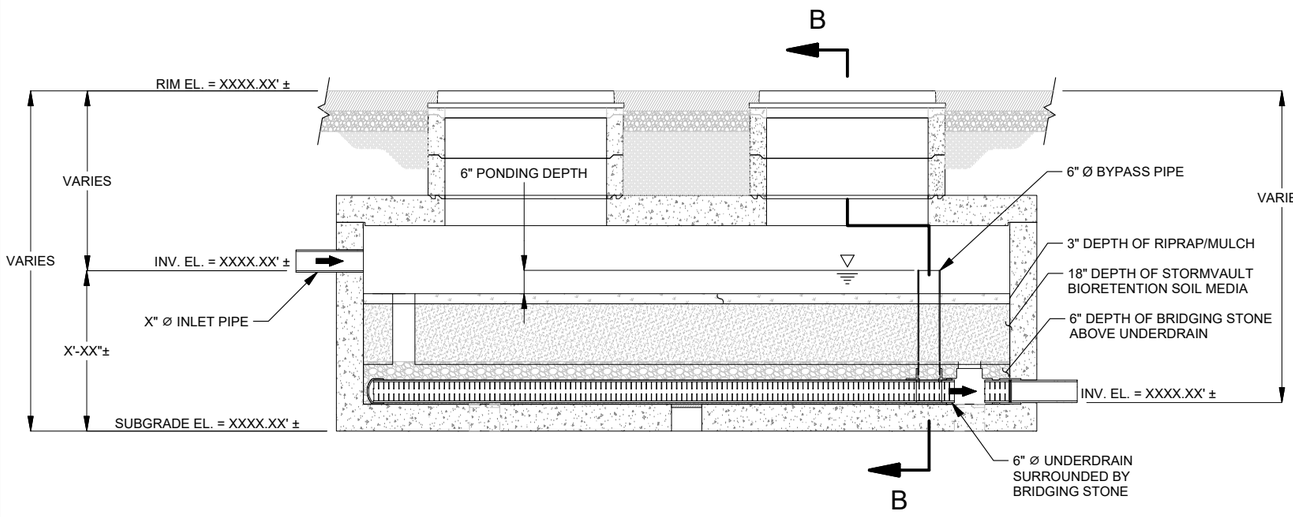
MODEL: SVBF-UV 8'4" X 16'4"



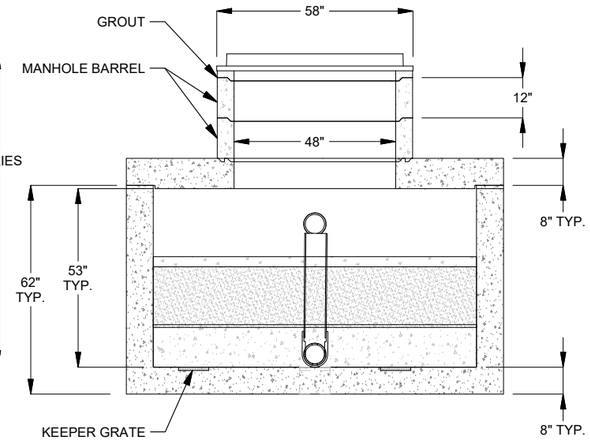
PLAN VIEW



ISOMETRIC VIEW



SECTION A-A



SECTION B-B

HYDRAULICS

WATER QUALITY DESIGN STORM (WQDS)	≤ 0.606-CFS
STORM DRAIN DESIGN CONVEYANCE FLOW	XX.X-CFS
RETURN REQUENCY / PERIOD OF PEAK DESIGN CONVEYANCE FLOW	XX-YRS

TREATMENT

BIO SOILS FILTRATION MEDIA	JENSEN'S *SIERRA BLEND* *
MODEL SVBF-UV 8'4"X16'4" MAXIMUM TREATMENT FLOW RATE (MTFR)	0.606-CFS
	272-GPM
BIO SOIL MEDIA UNITIZED TREATMENT FLUX RATE *HYDRAULIC SURFACE LOADING RATE (HSLR)*	193-(IN/HR)/FT^2
	2-GPM/FT^2

*THIS STORMVAULT BIOFILTRATION UNIT PROVIDES A MAXIMUM TREATMENT FLOW RATE (MTFR) EQUAL TO OR GREATER THAN THE PEAK FLOW FROM THE WATER QUALITY DESIGN STORM (WQDS) LISTED IN THE HYDRAULICS TABLE ABOVE.

1. THIS PROPRIETARY MANUFACTURED TREATMENT DEVICE (MTD), IS A CERTIFIED GREEN INFRASTRUCTURE (GI), BEST MANAGEMENT PRACTICE (BMP), BY THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION (NJDEP).
2. THIS GI CERTIFIED MTD ACHIEVES 80% TSS REMOVAL EFFICIENCY ON A PARTICLE SIZE DISTRIBUTION (PSD), HAVING A $d_{50} \leq$ 48-MICRONS (µm). THIS PERFORMANCE HAS BEEN VERIFIED BY THE NEW JERSEY CORPORATION FOR ADVANCED TECHNOLOGY (NJCAT).
3. SIZING OF THIS SVBF IS BASED ON THE VERIFIED HYDRAULIC SURFACE LOADING RATE (HSLR), OF 2-GPM/FT^2 OF THE ENGINEERED "SIERRA BLEND" BIO SOIL MEDIA (BSM).
4. CAPTURED WATER QUALITY CONSTITUENTS:
   - TOTAL SUSPENDED SOLIDS (TSS)
   - PHOSPHORUS
   - TOTAL AND DISSOLVED COPPER
   - TOTAL AND DISSOLVED ZINC
   - OIL & GREASE
   - FECAL COLIFORM

DESIGN PARAMETERS

1. VEGETATION, FOUNDATION, SUBGRADE, AND BACKFILL TO BE DESIGNED BY OTHERS.
2. ***SVBF*** CAN READILY BE RECONFIGURED AS AN OPEN TOP SWALE SYSTEM TO RECEIVE SURFACE FLOW FROM ALL SIDES.
3. ***SVBF*** MAY BE DEPLOYED WITH UNFINISHED TOP OF WALLS TO BE POURED IN FIELD ALLOWING FOR CONSTRUCTION OF CONTINUOUS STREETSCAPE AND LANDSCAPE FEATURES.
4. INLETS THROUGH CURB CAN BE LOCATED ON ANY SIDE OF THE BOX AND THEIR DIMENSIONS VARY PER DESIGN.
5. GROUNDWATER ELEVATION IS ASSUMED TO BE BELOW THE BOTTOM OF PRECAST STRUCTURE. CONTACT JENSEN WATER RESOURCES FOR HIGH GROUNDWATER CONDITIONS.
6. STANDARD CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE READILY AVAILABLE. CONTACT JENSEN WATER RESOURCES FOR CUSTOM DESIGNS.
7. FOR COMPLETE DESIGN AND PRODUCT INFORMATION, CONTACT JENSEN WATER RESOURCES.

CONSTRUCTION & INSTALLATION NOTES

1. CONTRACTOR TO VERIFY ALL DIMENSIONS AND ELEVATIONS IN FIELD PRIOR TO INSTALLATION.
2. THE CONNECTION BETWEEN THE INTERNAL DRAIN PIPING OF THE ***SVBF*** SHALL BE WATERTIGHT.
3. CONTRACTOR MAY GROUT ALL PIPE PENETRATIONS IN PRECAST CONCRETE OPENINGS IN FIELD AS NECESSARY.
4. CONTRACTOR TO PROVIDE FIELD POUR OF CURB TO THE ELEVATIONS SHOWN ON THE SITE DRAWINGS AS NECESSARY.

MATERIALS

1. ALL DIMENSIONS ARE IN DECIMAL INCHES.
2. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH F'c = 4,000-psi AT 28-DAYS.
3. THE PORTLAND CEMENT USED IN THE PRECAST SECTION SHALL MEET THE REQUIREMENTS OF TYPE II/V HIGH SULFATE RESISTANT CEMENT IN ACCORDANCE WITH ASTM CLASS M C-150.
4. VAULT SECTIONS DESIGNED AND MANUFACTURED IN ACCORDANCE WITH ASTM C857 & C858
5. ALL PRECAST CONCRETE COMPONENTS TO BE MANUFACTURED IN A NPCA CERTIFIED PLANT.
6. IF REQUIRED, JENSEN WILL FURNISH VAULT WITH FLUID-APPLIED WATERPROOFING COATING AROUND ENTIRE INSIDE SURFACE OF ***SVBF***.
7. BRIDGING STONE SHALL BE 3/8" WASHED PEA GRAVEL OR 1/2" CLEAN ROUND ROCK.
8. ALL PVC PIPE SHALL CONFORM TO ASTM D 3034 (SDR-35) PIPE.
9. JENSEN WATER RESOURCES TO PROVIDE ALL MATERIALS AS SHOWN, UNLESS OTHERWISE NOTED.
10. ALL CONCRETE COMPONENT THICKNESSES, DIMENSIONS, AND JOINT ORIENTATIONS MAY VARY ACROSS JENSEN PRECAST'S MANUFACTURING FACILITIES.

SVBF-UV 8X16 NJCAT.idw

DISCLAIMERS, INCLUDING BUT NOT LIMITED TO:
1.) All elevations have been provided by others, and have not been verified by Jensen Precast. Contractor to verify all dimensions and elevations in field prior to installation.
2.) These layout drawings are intended to show overall system design only. All concrete component thicknesses, dimensions, and joint orientations may vary across Jensen Precast's manufacturing facilities. Contractor to confirm all thicknesses, dimensions, and joint orientations prior to installation.
3.) System design criteria has been provided to Jensen Precast. Others are responsible for verification that system meets intended application.
4.) Foundation, subgrade, and backfill to be designed by others.

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JENSEN WATER RESOURCES
521 DUNN CIRCLE, SPARKS, NV 89431
www.jensenwaterresources.com
(855) 468-5600

MODEL:
STORMVAULT BIOFILTRATION
UNDERGROUND VAULT
MODEL: SVBF-UV 8'4"X16'4"

PROJECT:
PROJECT NAME
CITY, STATE

REV:

PART NUMBER:	SVBF-UV 8'4"X16'4"	DRAWN BY:	T. Schmaling
CREATED:	6/4/2021	MODIFIED:	6/4/2021

SHEET:
1 OF 1

Oldcastle Infrastructure™
A CRH COMPANY

STORMCAPTURE®

Design Summary



PROJECT INFORMATION

PROJECT NAME: New Jersey Wind Port C1

PROJECT CITY: 30th Street Train Station

PROJECT STATE: Pennsylvania

COMPANY: Moffatt & Nichol

SITE TYPE: Industrial

SYSTEM DESIGN

System Type:
| Detention

Module Construction Type:
| Clamshell

Storage Volume Required (cf):
| 9800

Configured Storage Volume (cf):
| 10431

System Internal Height (ft):
| 6

Nominal Module Capacity (cf):
| 630

Required Number of Modules:
| 15

Module Designation:
| SC2 3-3

SITE DESIGN

System Invert Elevation (ft):
| 4.55

Top of Module Elevation (ft):
| 11.13

Maximum Rim Elevation (ft):
| 12.21

Depth of Cover (ft):
| 1.08

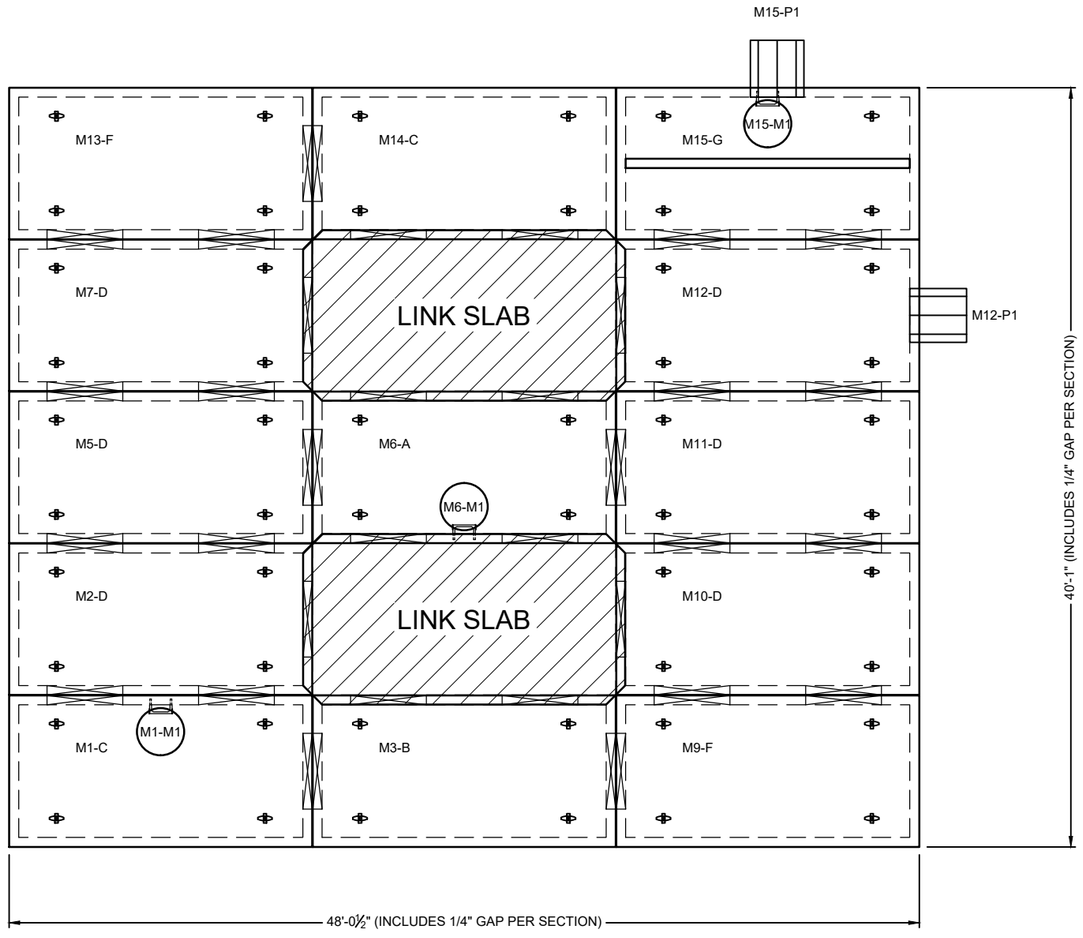
Minimum Inlet Elevation (ft):
| 6.62

Maximum Inlet Elevation (ft):
| 6.62

Minimum Outlet Elevation (ft):
| 4.55

Maximum Outlet Elevation (ft):
| 4.55

Notes and Exceptions:
1. Additional design changes may be required for loading conditions over HS-20.
2. Additional design changes may be required for groundwater elevation above system invert.



PLAN VIEW
SCALE: 1/8" = 1'-0"

MODULE NOTES

TYPE	QUANTITY	HEIGHT
A	1	6.00'
B	1	6.00'
C	2	6.00'
D	6	6.00'
F	2	6.00'
G	1	6.00'
LINK SLAB	2	-
TOTAL	15	
VOLUME	10,431	CUBIC FEET

PIPE SCHEDULE

PIPE	SIZE	INVERT
M12-P1	24" RCP	6.62'
M15-P1	24" RCP	4.55'

MANHOLE SCHEDULE

MANHOLE	TYPE	RIM
M1-M1	30" DIA. F&C Steps	12.21'
M15-M1	30" DIA. F&C Steps	12.21'
M6-M1	30" DIA. F&C Steps	12.21'

DESIGN NOTES

1. LIVE LOADING CRITERIA:
   - A. AASHTO HS-20-44 DESIGN TRUCK (WITH IMPACT AT 0.50FT MINIMUM COVER)
   - B. LATERAL LIVE LOAD SURCHARGE: 80 PSF (TO 8.00FT DEPTH)
   - C. NO LATERAL SURCHARGE(S) FROM ANY ADJACENT BUILDINGS, WALLS, FOUNDATIONS, OR ANY ADDITIONAL SITE ELEMENTS.
2. SOIL LOADING CRITERIA:
   - A. SOIL COVER DEPTH: 0.50FT (MIN.) - 5.00FT (MAX.)
   - B. SOIL UNIT WEIGHT: 120 PCF
   - C. ASSUMED WATER TABLE ELEVATION: BELOW BOTTOM OF PRECAST
   - D. REQUIRED ALLOWABLE BEARING PRESSURE: 2,500 PSF
   - E. EQUIVALENT LATERAL FLUID PRESSURE, ACTIVE: 45 PCF (DRAINED)
   - F. EQUIVALENT LATERAL FLUID PRESSURE, AT-REST: 60 PCF (DRAINED)
   - G. EQUIVALENT LATERAL FLUID PRESSURE, PASSIVE: 150 PCF (DRAINED)
   - H. ASSUMED COEFFICIENT OF FRICTION: 0.40
   - I. SEISMIC LATERAL EARTH PRESSURES: NOT APPLICABLE
3. STORMCAPTURE MODULE TYPE: DETENTION (WATERTIGHT).
4. CONCRETE (NORMALWEIGHT):
   - A. MIN. 28-DAY COMPRESSIVE STRENGTH: 6,000 PSI
   - B. CEMENT: ASTM C150
5. STEEL REINFORCEMENT: ASTM A615 / A706 (GRADE 60), ASTM A1064 (GRADE 80)
6. REFERENCE STANDARDS: ASTM C913 & C890, ACI 318-14

Detention/ Infiltration

REV	DESCRIPTION	DATE
	-	-

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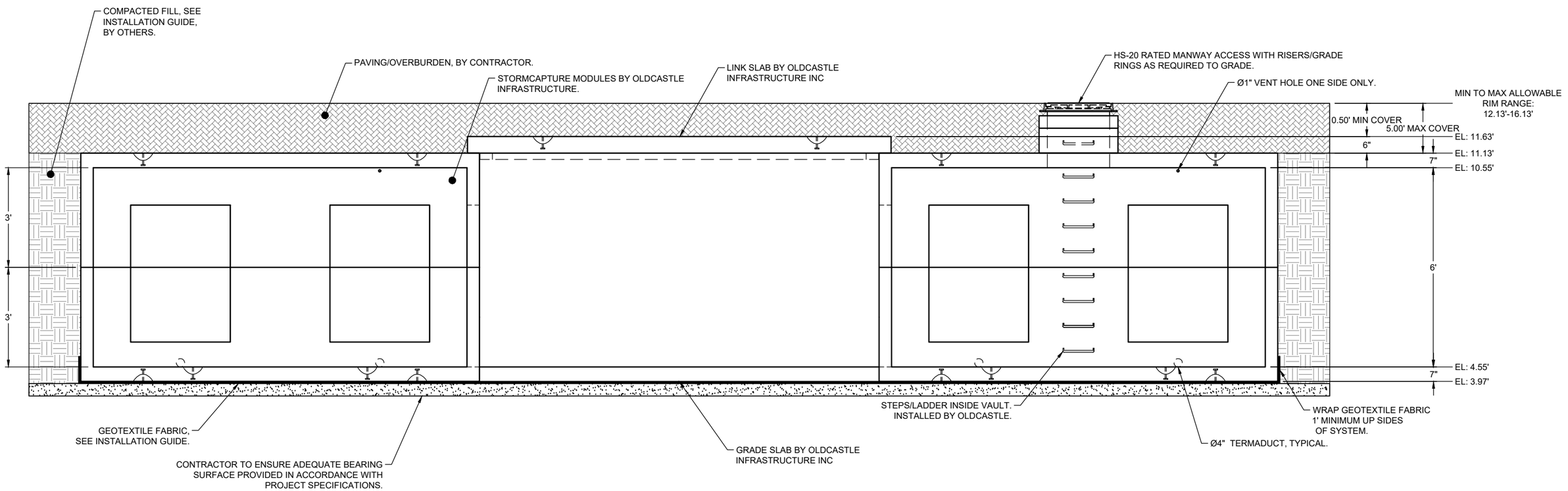
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STORMCAPTURE ® DETENTION SYSTEM					SYSTEM ID: 1	PLAN-N
CUSTOMER: Moffatt & Nichol						JOB NUMBER: -
JOB NAME: New Jersey Wind Port C1						
DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER	
10/30/2022	-	-	-	-	-	
DRAWING NAME: SC2 3-3					SHEET: 1 OF 3	

REVIEWING NOTES

1. THIS SYSTEM HAS BEEN DESIGNED PER THE DESIGN PARAMETERS SPECIFIED IN THE DESIGN NOTES. REVIEWING ENGINEER SHALL VERIFY THAT THESE PARAMETERS MEET OR EXCEED PROJECT SPECIFIC REQUIREMENTS. IF SITE CONDITIONS DIFFER FROM NOTED DESIGN PARAMETERS, REVIEWING ENGINEER SHALL NOTIFY OLDCASTLE FOR POTENTIAL REDESIGN AND/OR PRICING ADJUSTMENTS.
2. REVIEWING ENGINEER SHALL VERIFY ALL PIPE PENETRATION LOCATIONS, SIZES, AND INVERTS.
3. REVIEWING ENGINEER SHALL VERIFY ALL MANWAY ACCESS LOCATIONS AND RIM ELEVATIONS.
4. THIS SYSTEM IS DESIGNED FOR A GROUNDWATER TABLE ELEVATION PER DESIGN NOTE 2C. REVIEWING ENGINEER SHALL VERIFY THAT THE DESIGN GROUNDWATER ELEVATION MEETS OR EXCEEDS SITE CONDITION REQUIREMENTS. NOTIFY OLDCASTLE IF SITE CONDITIONS VARY FROM WHAT HAS BEEN SPECIFIED FOR POTENTIAL SYSTEM DESIGN CHANGES AND/OR PRICING ADJUSTMENTS.
5. STORMCAPTURE MODULES ARE NOT WATERTIGHT. IF A WATERTIGHT SOLUTION IS REQUIRED, CONTACT OLDCASTLE FOR RECOMMENDATIONS. THE WATERTIGHT APPLICATION TO BE PROVIDED AND IMPLEMENTED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT THE SELECTED WATERTIGHT SOLUTION PERFORMS AS SPECIFIED BY THE MANUFACTURER.
6. DESIGN OF THE STORMCAPTURE PRECAST MODULE SYSTEM ASSUMES NO ADJACENT BUILDING(S), WALL(S), OR STRUCTURAL FOUNDATION(S) WITHIN A 1:1 INFLUENCE LINE FROM THE BOTTOM EDGE OF ANY SYSTEM MODULE. ANY SITE ELEMENTS BEYOND THIS ZONE OF INFLUENCE ARE ASSUMED TO HAVE NO IMPACT ON THE SYSTEM AND EXERT ZERO LATERAL SURCHARGE ONTO THE MODULES. THE CONTRACTOR SHALL VERIFY THAT ANY ADJACENT BUILDING(S), WALL(S), OR STRUCTURAL FOUNDATION(S) DO NOT LIE WITHIN THIS INFLUENCE ZONE OR DO NOT SURCHARGE THE PRECAST MODULES.
7. WRITTEN APPROVAL OF SUBMITTAL DRAWINGS ALONG WITH SIGNED PURCHASE ORDER REQUIRED FOR BEGINNING OF PRODUCT FABRICATION. ANY SYSTEM MODIFICATION POST-APPROVAL MAY RESULT IN CHANGE ORDER(S) AND/OR POTENTIAL DELIVERY DELAYS.
8. ALL SAND FILTER MEDIA, DRAIN ROCK AGGREGATE, PIPE, AND FITTINGS PROVIDED BY CONTRACTOR.



TYPICAL ELEVATION

NTS

NOTE:
TERMADUCT INSERTS TO BE KNOCKED OUT AT SPECIFIED LOCATIONS ONLY (BY OTHERS).

Detention/
Infiltration

REV	DESCRIPTION	DATE
	-	-

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STORMCAPTURE ® DETENTION SYSTEM	SYSTEM ID: 1	
CUSTOMER: Moffatt & Nichol		
JOB NAME: New Jersey Wind Port C1		JOB NUMBER: -

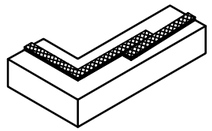
DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
10/30/2022	-	-	-	-	-

DRAWING NAME	SHEET
SC2 3-3	2 OF 3

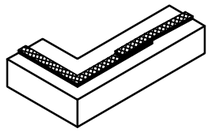
INSTALLATION NOTES

1. UNDERGROUND PRECAST CONCRETE SYSTEM INSTALLATION SHALL BE PER ASTM C891, “STANDARD PRACTICE FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES” AND PER OLDCASTLE.
2. MODULE SUBBASE OR SUBGRADE SHALL BE LEVEL/SCREEDED AND COMPACTED ADEQUATELY FOR REQUIRED BEARING CAPACITY PER DESIGN NOTE 2D. CONTRACTOR AND/OR INSTALLING SUB-CONTRACTOR SHALL VERIFY THAT SOIL BEARING CONDITIONS MEET OR EXCEED DESIGN REQUIRED MINIMUMS PRIOR TO PLACEMENT AND INSTALLATION OF MODULES.
3. ANY CONSTRUCTION EQUIPMENT EXCEEDING NOTED DESIGN LOADING IS NOT PERMITTED OVER OR ADJACENT TO ANY MODULE WITHOUT FORMAL REVIEW AND WRITTEN APPROVAL BY OLDCASTLE ENGINEERING, ELSE PRODUCT WARRANTY MAY BE VOIDED. ANY DESIGN CONSTRAINT EXCEEDING THE DESIGN PARAMETERS NOTED ABOVE MAY REQUIRE CUSTOM STRUCTURAL DESIGN, SUBGRADE REVISIONS, AND/OR PRICING ADJUSTMENTS.
4. HEAVY VIBRATORY COMPACTION EQUIPMENT SHALL NOT BE OPERATED WITHIN 10 FEET OF MODULE EXTERIOR.
5. MINIMUM OF 0.50FT OF SOIL COVER REQUIRED FOR CONSTRUCTION EQUIPMENT OPERATION ON TOP OF SYSTEM. IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND INSTALLING SUB-CONSTRACTOR TO ENSURE THAT NO MODULES ARE DAMAGED DURING CONSTRUCTION.
6. UNLESS NOTED OTHERWISE, ALL PIPE SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR MAY MODIFY AT RISK ANY OLDCASTLE PRODUCT(S) IN THE FIELD OR AFTER DELIVERY WITHOUT FORMAL REVIEW AND WRITTEN APPROVAL BY OLDCASTLE ENGINEERING. THE CONTRACTOR SHALL BE RESPOSIBLE FOR VERIFYING THAT ANY PRODUCT MODIFICATIONS DO NOT INVALIDATE THE PRODUCT WARRANTY.
8. MODULE PLACEMENT FIELD TOLERANCES SHALL NOT EXCEED 3/4" BETWEEN ADJACENT MODULES. IF MODULE GAP EXCEEDS 3/4", CONTRACTOR SHALL MAKE NECESSARY ADJUSTMENTS AND RESET MODULE(S) TO BRING WITHIN NOTED TOLERANCES.
9. CONTRACTOR IS RESPONSIBLE FOR PRODUCTS ONCE DELIVERED TO THE SITE. OLDCASTLE IS NOT RESPONSIBLE FOR OFFLOADING PRODUCTS, MAINTENANCE, AND INSTALLATION OF PRODUCTS ONCE THEY ARRIVE TO THE SITE.
10. CONTRACTOR SHALL INSTALL SYSTEM PER PROJECT WATERPROOFING AND SOILTIGHTNESS REQUIREMENTS. WATERPROOFING AND SOILTIGHTNESS INSTALLATION IS NOT BY OLDCASTLE AND OLDCASTLE WILL PROVIDE NO GUARANTEE FOR THIS COMPONENT OF SYSTEM INSTALLATION.

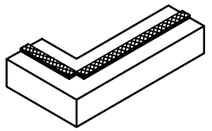
KEYWAYS MUST BE FREE OF DIRT, ROCKS, AND WATER. ROCKS AND DIRT PREVENT THE VAULT SECTIONS FROM SEATING AND SEALING PROPERLY. REMOVE ALL PROTECTIVE PAPER FROM RUBBER SEALANT MATERIAL. SPLICE RUBBER SEALANT MATERIAL WITH A "SIDE BY SIDE" JOINT, AWAY FROM CORNERS. CORNER SPLICING WILL NOT SEAL PROPERLY.



CORRECT - INSTALL RUBBER SEALANT MATERIAL AT THE OUTER EDGE OF THE KEYWAY. RUBBER SEALANT SHOULD BE CONTINUOUS AROUND CORNERS.



INCORRECT - DO NOT OVERLAP THE RUBBER SEALANT MATERIAL AT SPLICE.



INCORRECT - DO NOT SPLICE RUBBER SEALANT MATERIAL AT A CORNER. RUBBER SEALANT SHOULD BE CONTINUOUS AROUND CORNERS.

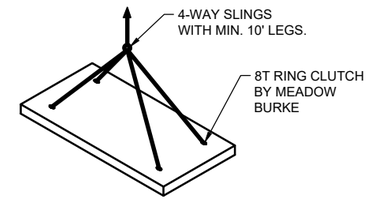
BUTYL RUBBER SEALANT (CONSEAL CS-102 OR EQUAL) PLACEMENT DETAIL

NTS

MAXIMUM EQUIPMENT OPERATING WEIGHT (OW) BY TRACK WIDTH				
TRACK WIDTH	12"	18"	24"	30"
MIN TRACK LENGTH	8'-0"	10'-0"	12'-0"	14'-0"
FILL DEPTH	OW (LBS)	OW (LBS)	OW (LBS)	OW (LBS)
0	35,000	45,000	52,500	54,500
1	35,000	45,000	56,000	60,500
2	35,000	45,000	56,000	64,000
3	76,000	78,500	83,500	88,000
4	94,000	100,000	106,000	113,000
5	100,000	116,000	132,000	149,000

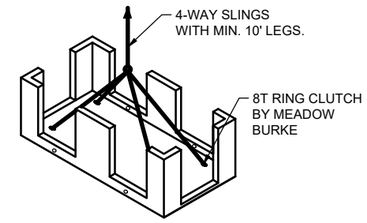
NOTES:

1. IF CONSTRUCTION EQUIPMENT EXCEEDS THE ABOVE OPERATING WEIGHT LIMITS REFER TO INSTALLATION NOTE 3.
2. FOR WHEELED CONSTRUCTION EQUIPMENT LIMITS REFER TO INSTALLATION NOTE 3.
3. MINIMUM AXLE SPACING FOR ALL TRACK WIDTHS IS 6'-0".



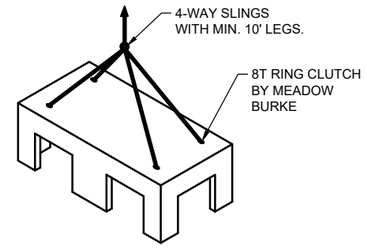
LINK SLAB LIFTING DETAIL

N.T.S.



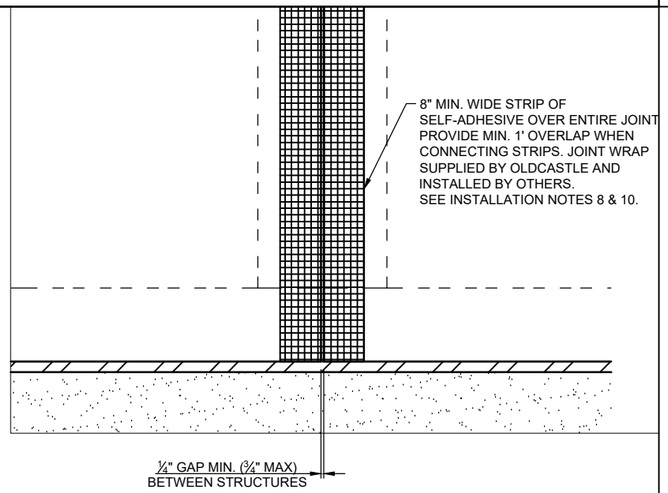
BOTTOM MODULE LIFTING DETAIL

N.T.S.



LIFTING DETAIL

N.T.S.



MODULE JOINT DETAIL

SCALE: 1/2" = 1'-0"

Detention/
Infiltration

REV	DESCRIPTION	DATE
	-	-

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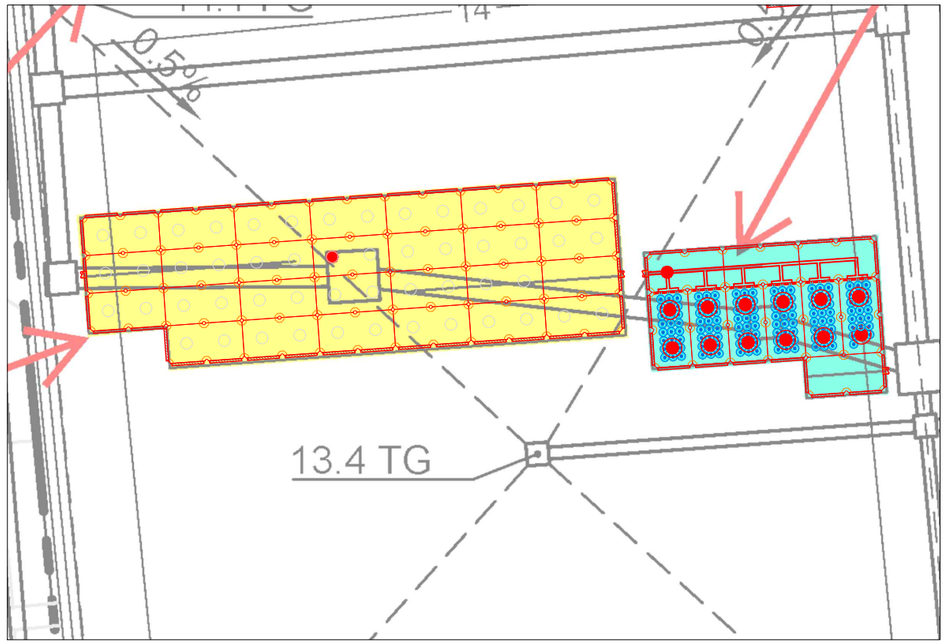
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STORMCAPTURE ® DETENTION SYSTEM	SYSTEM ID: 1	
CUSTOMER: Moffatt & Nichol		
JOB NAME: New Jersey Wind Port C1		JOB NUMBER: -

DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
10/30/2022	-	-	-	-	-

DRAWING NAME: SC2 3-3

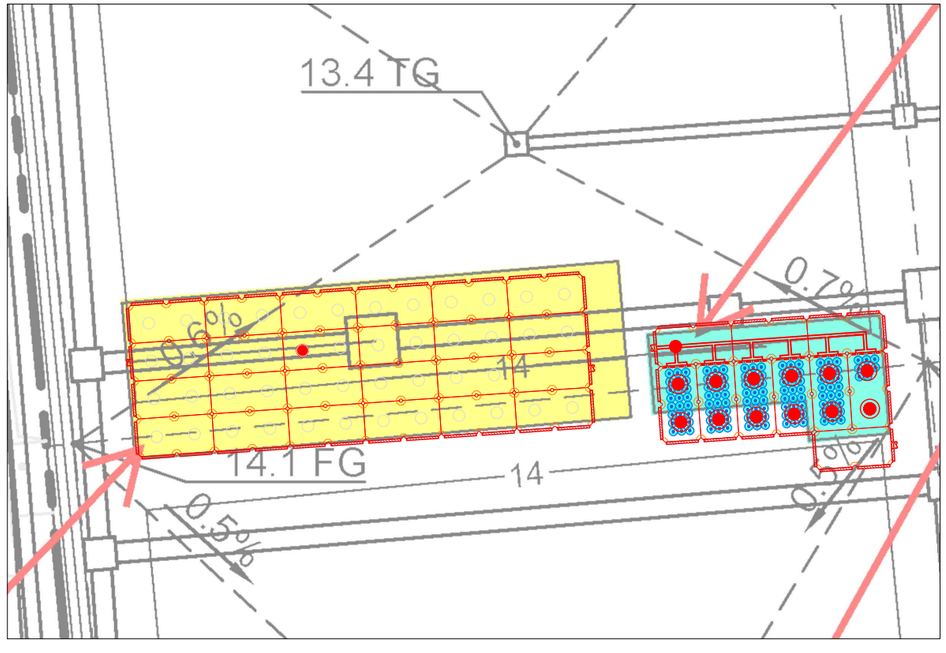
SHEET: 3 OF 3



SYSTEM 1



SYSTEM 3



SYSTEM 2

REVISIONS	
NO	DATE

StormPod®
UNIVERSAL STORMWATER MANAGEMENT SYSTEM
By ROTONDO Environmental Solutions, LLC
www.Rotondo-ES.com
US PATENT # 9580899 B2

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX
The Stormwater Management StormFilter®
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,322,629; 5,524,516; 5,707,527; 5,985,157; 6,027,639; 6,649,048. RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

DRAWN BY:	PAS
CHECKED BY:	JAR
DATE:	09/07/2022
SCALE:	NTS
JOB NO.:	----

PROJECT:
LO-PRO STORMPOD - STORMFILTER
NEW JERSEY WIND PORT - PHASE 2
SALEM, NJ

CUSTOMER: ----

DWG. NO. L-1

SHT.

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NOTE: PRODUCTION WILL NOT COMMENCE UNTIL RECEIPT OF SIGNED APPROVED SHOP DRAWINGS.

PRECAST CONCRETE DESIGN SPECIFICATIONS:

- CONCRETE MINIMUM (28-DAY) COMPRESSIVE STRENGTH: 6,000 PSI
- REINFORCING DEFORMED BAR CONFORMING TO ASTM A615 (FY=60 KSI)
- REINFORCING WELDED WIRE CONFORMING TO ASTM A1064 (FY=80 KSI)
- STRUCTURAL REINFORCING FIBERS CONFORMING TO ASTM C1116
- DESIGN LIVE LOAD: 3.0 KSF UNIFORM LIVE LOAD W/ IMPACT
- DESIGN EARTH COVER: 1'-0" MIN. TO 5'-0" MAX.
- SOIL UNIT WEIGHT: 120 PCF
- GROUNDWATER TABLE ASSUMED TO BE AT OR BELOW INVERT OF STRUCTURE
- DESIGN CRITERIA IN ACCORDANCE TO AASHTO LRFD 8TH ED.

WATERTIGHT JOINT NOTES:

- STOMFILTER SYSTEMS TO BE WATERTIGHT
- INTERNAL CAULK JOINTS TO BE A CONTINUOUS SEAL THROUGHOUT EACH CHAMBER BY FILLING JOINTS WITH SIKAFLEX 2CNS OR 1A POLYURETHANE ELASTOMERIC SEALANT WITH SIKAFLEX PRIMER.
- JOINTS TO BE SEALED ON SITE BY THE SYSTEM MANUFACTURER.
- WATERTIGHTNESS OF SYSTEM IS THE RESPONSIBILITY OF THE SYSTEM MANUFACTURER.

STRUCTURE CONSTRUCTION NOTES:

- TOP & BOTTOM SECTIONS TO BE BOLTED TOGETHER WITH (6) ¾"ø BOLTS TO HELP PREVENT DIFFERENTIAL SETTLEMENT.
- LATERAL INTERLOCKING TONGUE & GROOVES CAST INTO SIDES OF MODULES TO PROVIDE A LATERAL SHEAR CONNECTION BETWEEN MODULES TO PREVENT DIFFERENTIAL SETTLEMENT.
- LATERAL OPENINGS TO BE CAST IN AT PRECAST FACILITY.
- LATERAL PIPES TO EXTEND INTO THE STRUCTURE FLUSH WITH THE INSIDE WALL AND SEALED WITH GROUT. ANNULAR SPACE BETWEEN PIPE AND WALL OPENING TO BE SEALED WITH AN EXPANDABLE WATER-STOP AND AN APPROVED NON-SHRINK GROUT.
- LADDERS TO BE PROVIDED BY RES AND INSTALLED IN FIELD BY CONTRACTOR.
- MANHOLE ACCESS RISERS AND MANHOLE FRAMES & COVERS TO BE PROVIDED BY CONTECH, AND INSTALLED ON SITE BY THE CONTRACTOR.
- CONTRACTOR TO GROUT GRADE RINGS TO MATCH FINISHED GRADE.



DELIVERY
(Two modules per trailer)



HANDLING
(Base slab bolted to arch at factory)



INSTALLATION



INSTALLED SYSTEM



INSIDE VIEW
(Smooth floor w/ no obstructions)



ENDWALL INSTALLATION



STORMPOD W/ CARTRIDGES (INSIDE VIEW)



SEALING JOINTS



WATERTIGHT JOINTS
(Tested to 17.25 psi hydrostatic pressure)



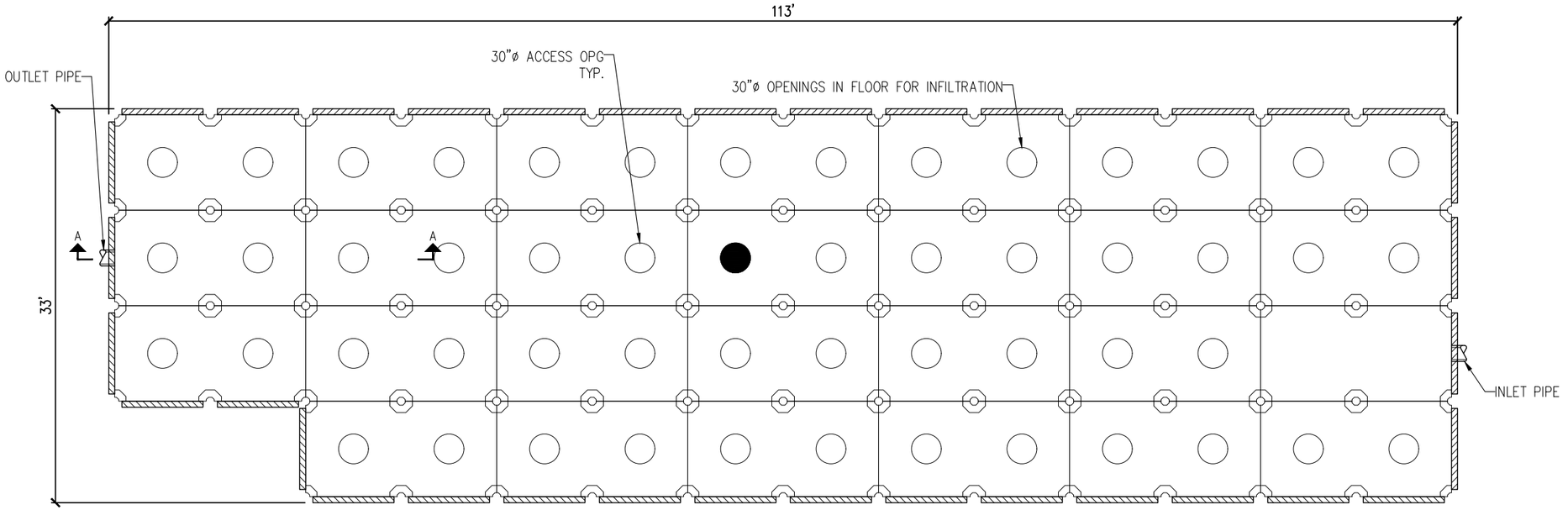
BACKFILL
(On-site soils around perimeter & #57 stone in aquifers)

REVISIONS	
NO	DATE

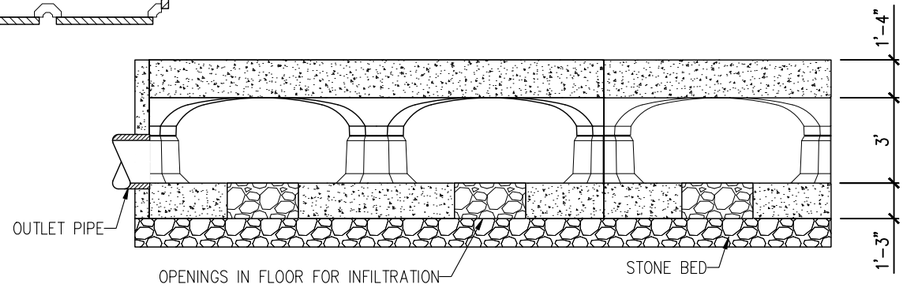
StormPod®
UNIVERSAL STORMWATER MANAGEMENT SYSTEM
by ROTONDO Environmental Solutions LLC
www.Rotondo-ES.com
US PATENT # 9580899 B2

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX
The Stormwater Management StormFilter®
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,322,629; 5,534,678; 5,707,527; 5,985,157; 6,027,639; 6,649,048; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

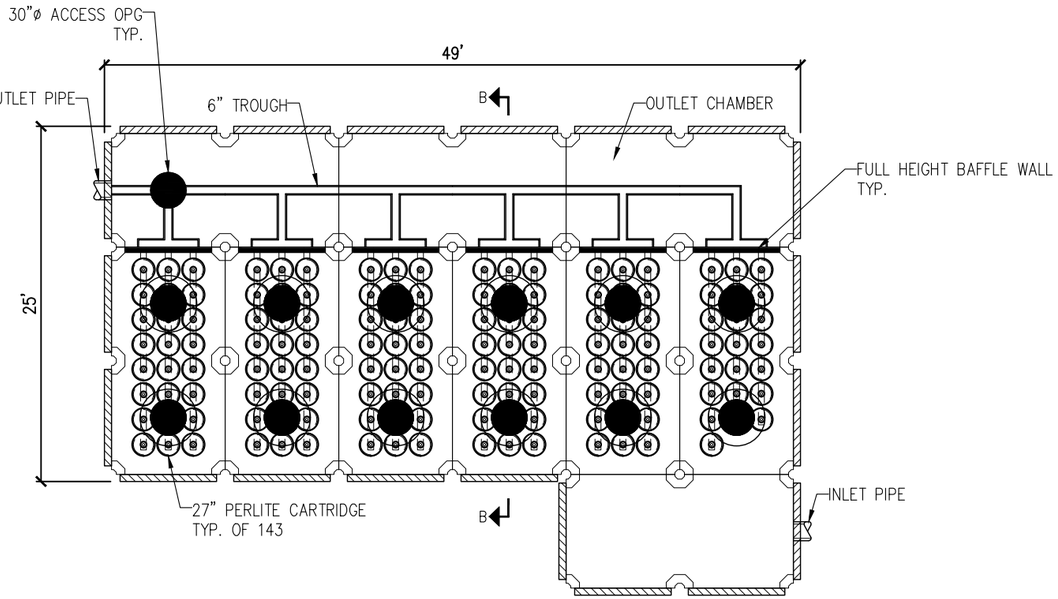
DRAWN BY: PAS	PROJECT: LO-PRO STORMPOD - STORMFILTER NEW JERSEY WIND PORT - PHASE 2 SALEM, NJ
CHECKED BY: JAR	
DATE: 09/07/2022	
SCALE: NTS	CUSTOMER: ----
JOB NO.: ----	DWG. NO. L-2
	SHT.



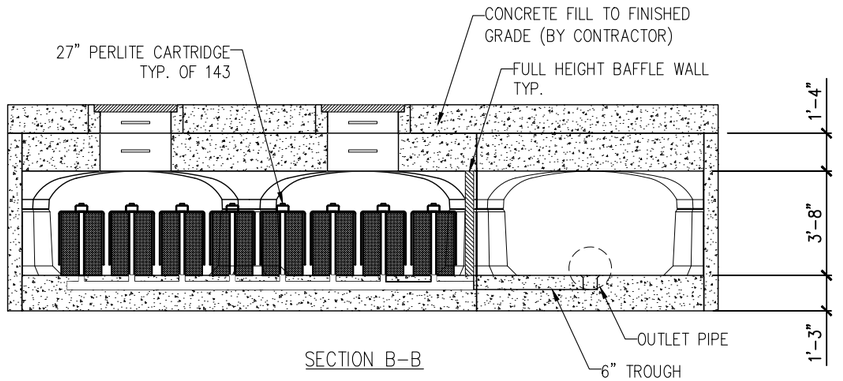
PLAN VIEW – 3–FT LO–PRO INFILTRATION



SECTION A–A



PLAN VIEW – 3–FT 8–INCH STORMPOD STORMFILTER



SECTION B–B

SYSTEM 1

REVISIONS	
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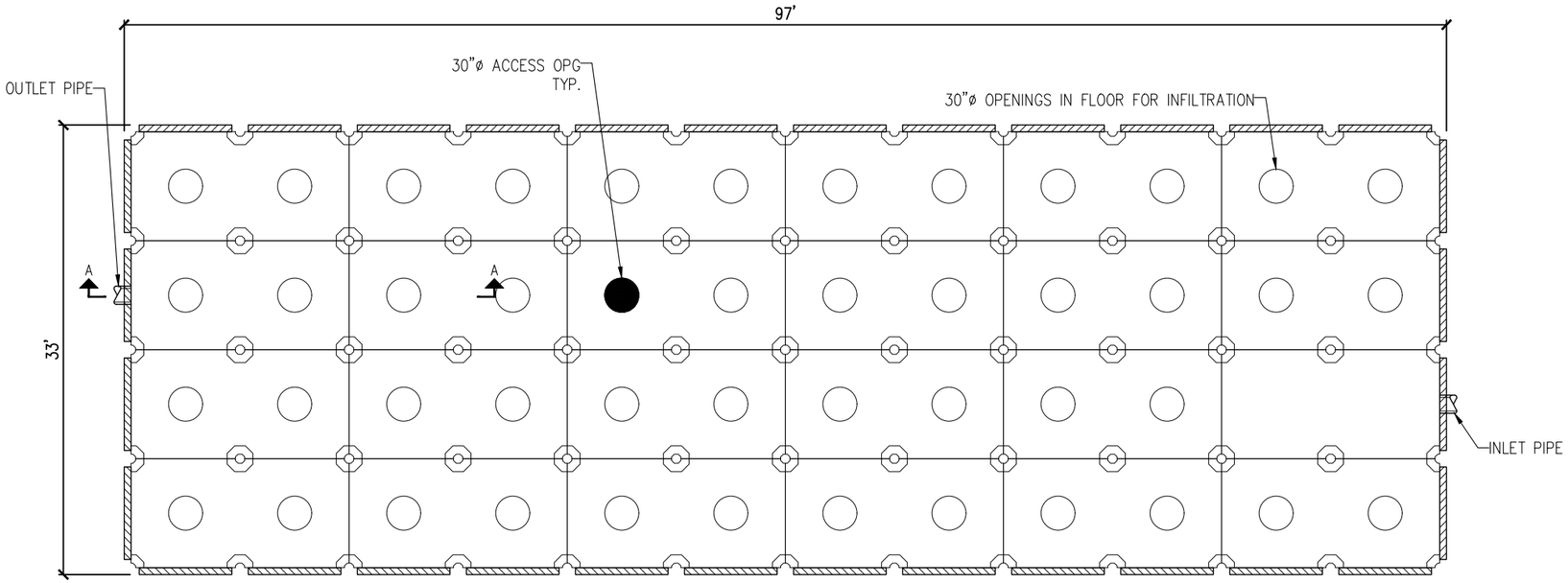
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CHECKED BY:	JAR
DATE:	09/07/2022
SCALE:	NTS
JOB NO.:	----

PROJECT:
LO-PRO STORMPOD - STORMFILTER
NEW JERSEY WIND PORT - PHASE 2
SALEM, NJ

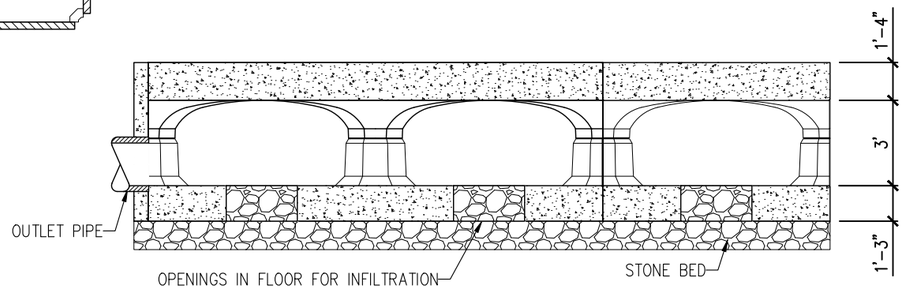
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DWG. NO. L–3

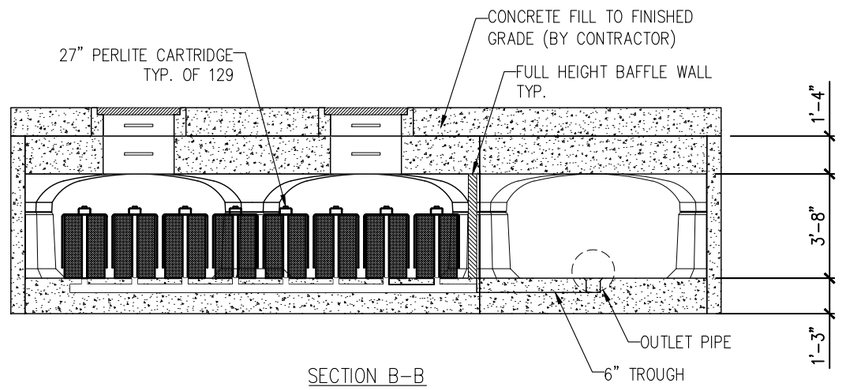
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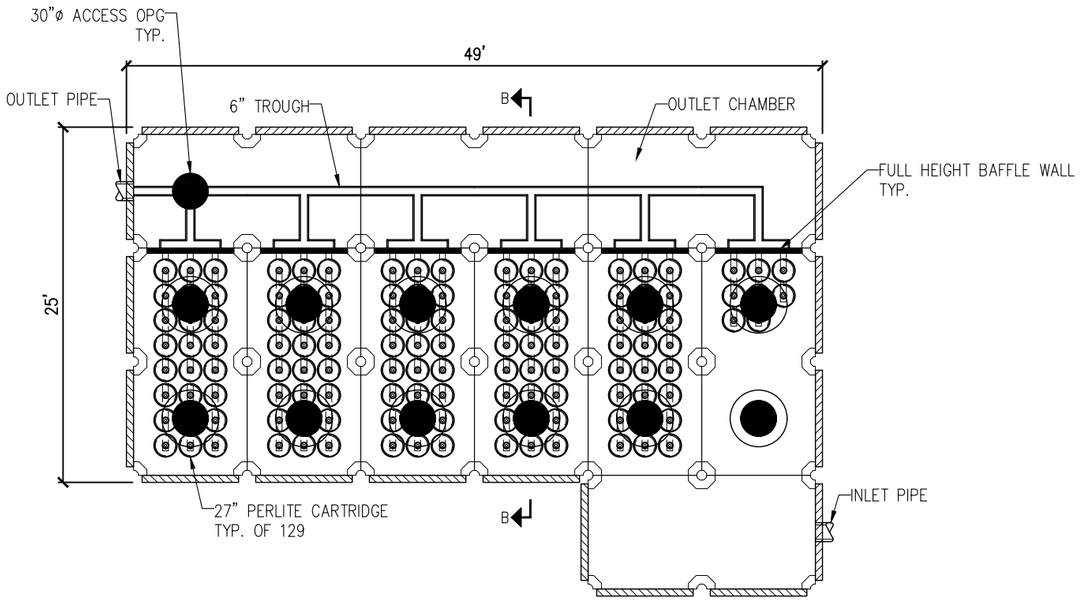
PLAN VIEW – 3-FT LO-PRO INFILTRATION



SECTION A-A



SECTION B-B



PLAN VIEW – 3-FT 8-INCH STORMPOD STORMFILTER

SYSTEM 2

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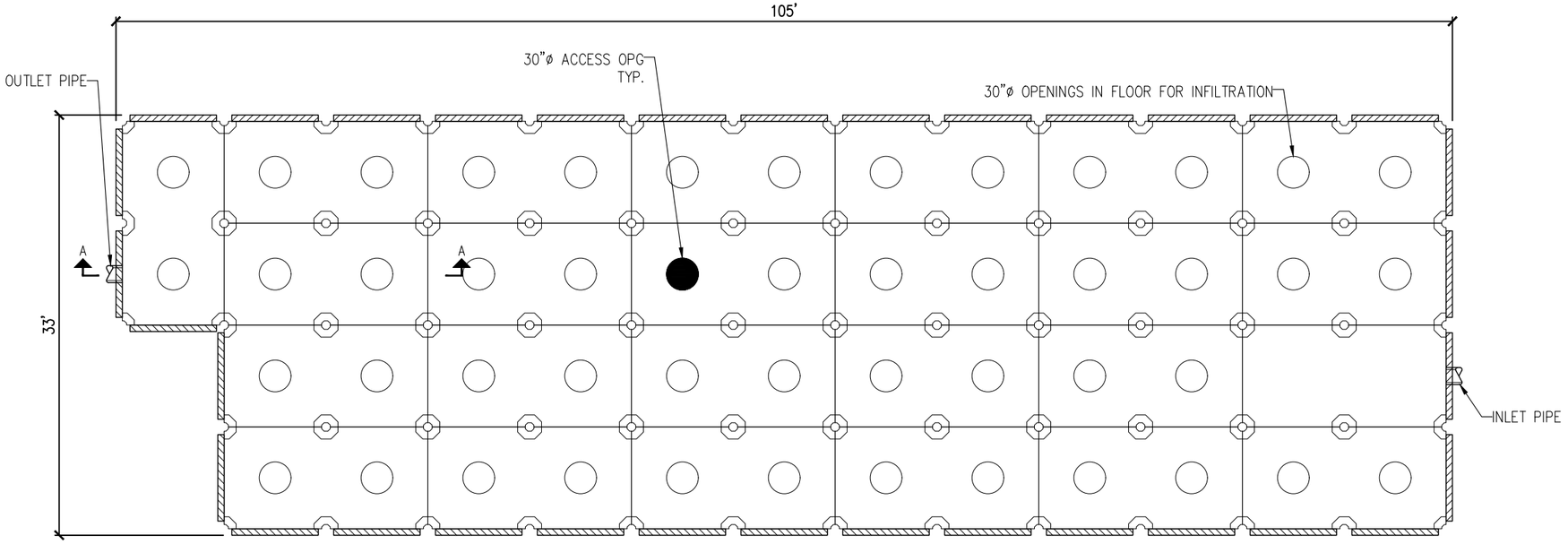
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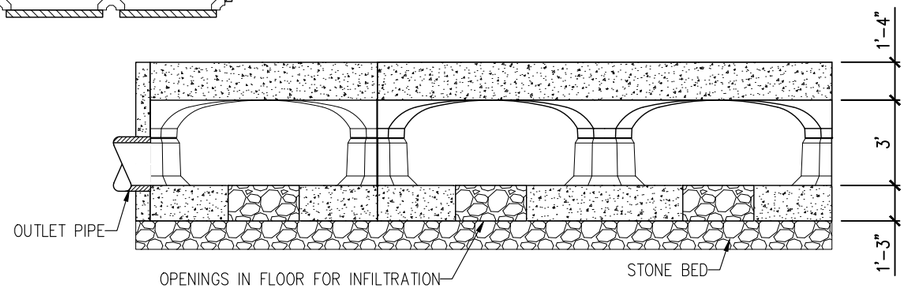
PROJECT:
LO-PRO STORMPOD - STORMFILTER
NEW JERSEY WIND PORT - PHASE 2
SALEM, NJ

CUSTOMER:

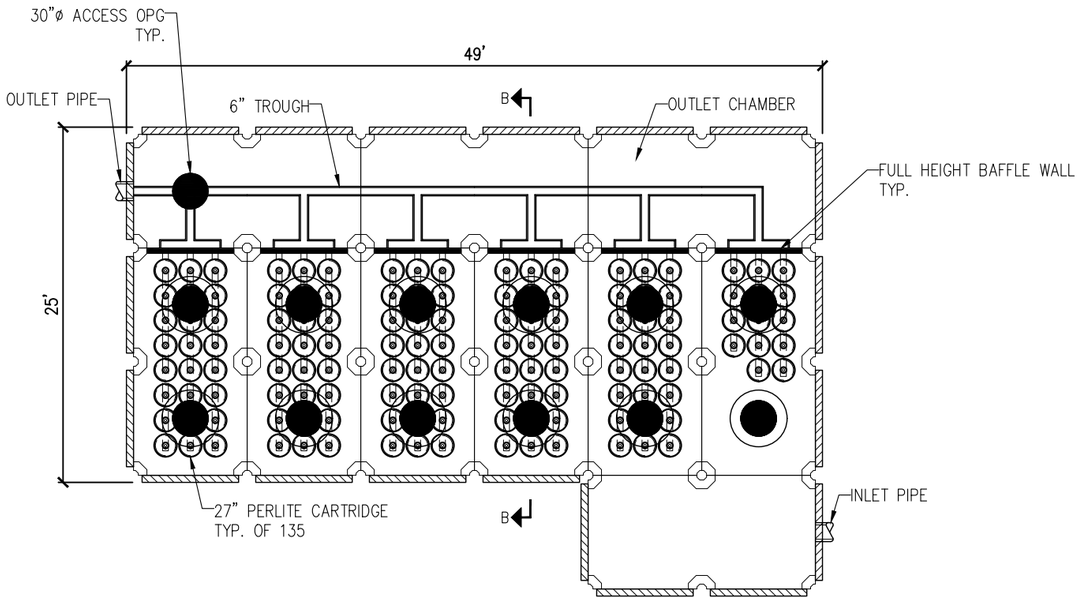
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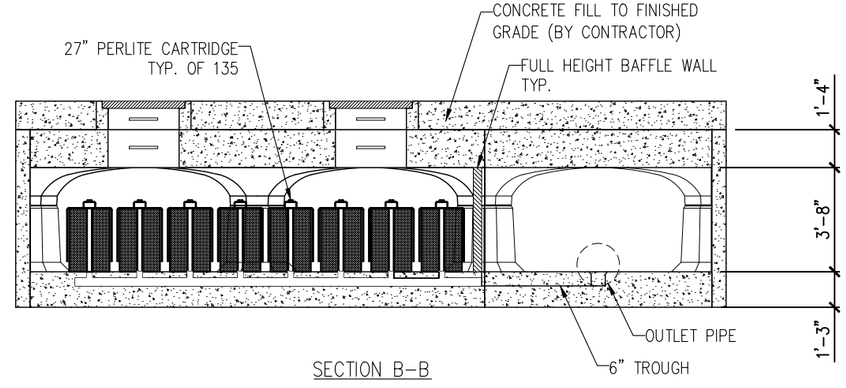
PLAN VIEW – 3-FT LO-PRO INFILTRATION



SECTION A-A



PLAN VIEW – 3-FT 8-INCH STORMPOD STORMFILTER



SECTION B-B

SYSTEM 3

REVISIONS	
NO	DATE

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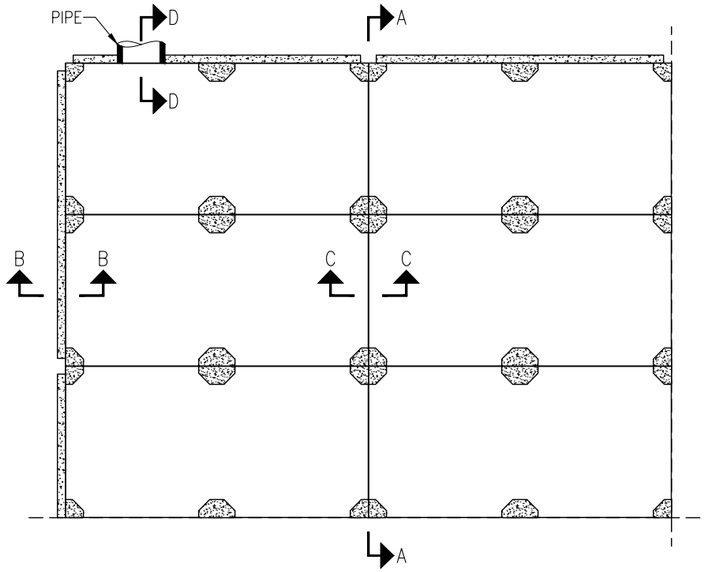
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DATE:	09/07/2022
SCALE:	NTS
JOB NO.:	----

PROJECT:
LO-PRO STORMPOD - STORMFILTER
NEW JERSEY WIND PORT - PHASE 2
SALEM, NJ

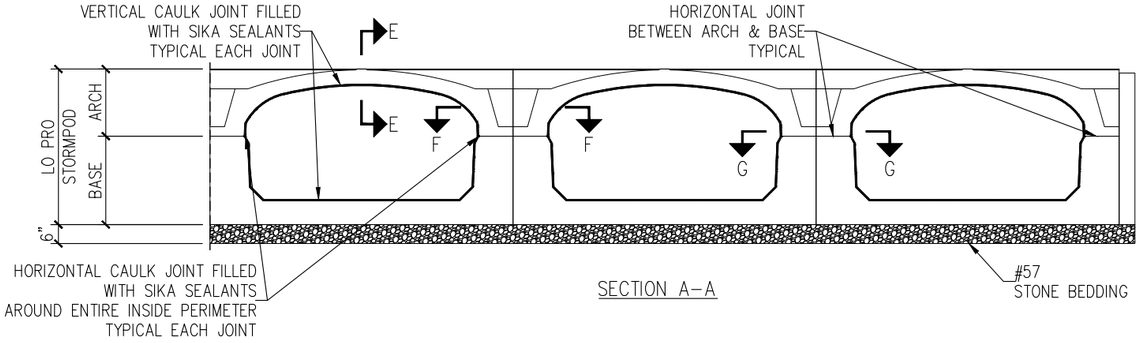
CUSTOMER: ----

DWG. NO. L-5

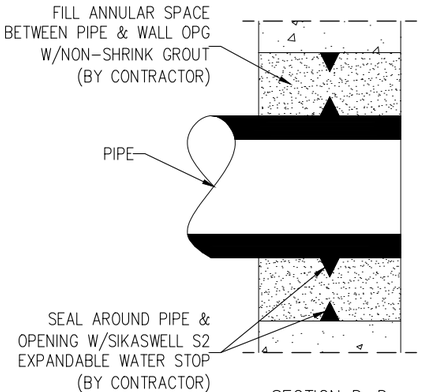
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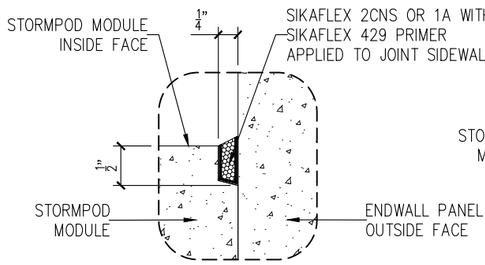
PLAN VIEW



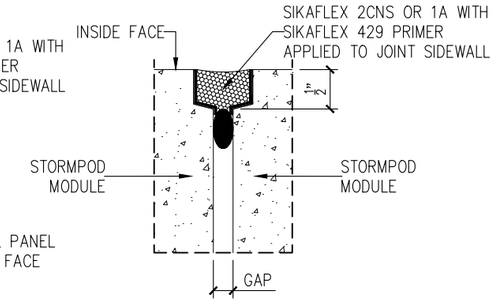
SECTION A–A



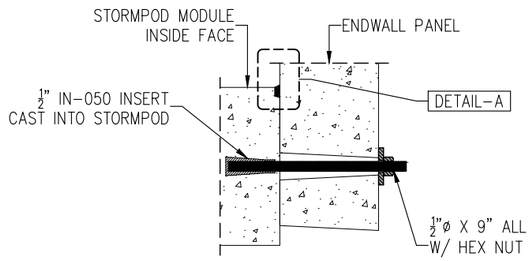
SECTION D–D



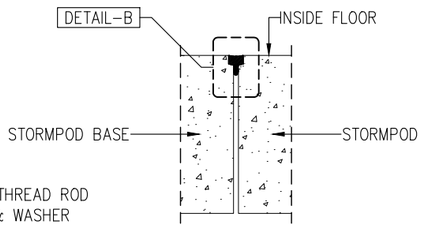
DETAIL–A
(MODULE AND ENDWALL PANEL JOINT)



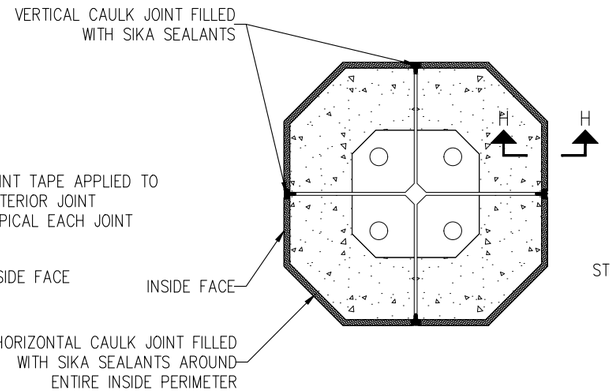
DETAIL–B
(VERTICAL INTERIOR JOINT BETWEEN MODULES)



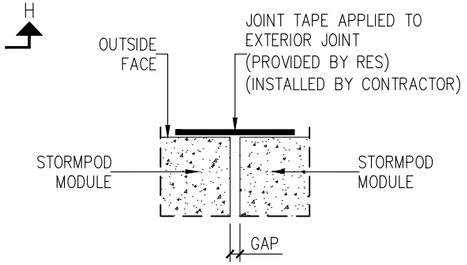
SECTION B–B
(BASE AND ENDWALL PANEL JOINT)



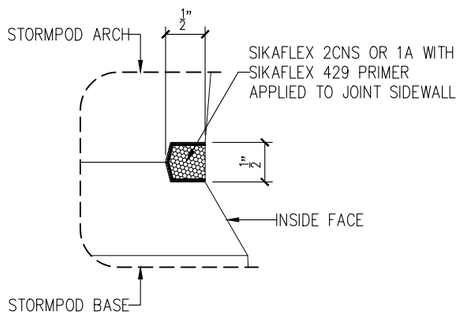
SECTION C–C
(JOINT BETWEEN BASE SECTIONS)



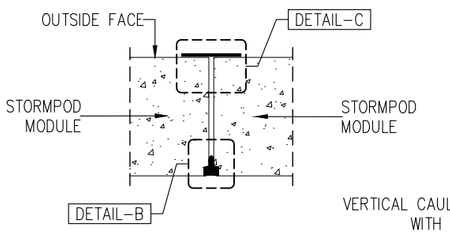
SECTION G–G
(HORIZONTAL JOINT BETWEEN ARCH & BASE)



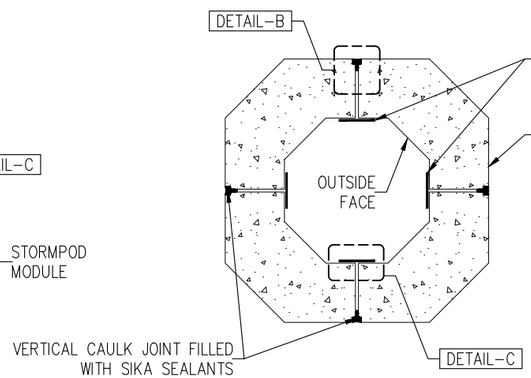
DETAIL–C
(JOINT TAPE BETWEEN MODULES)



SECTION H–H
(HORIZONTAL JOINT)



SECTION E–E
(VERTICAL JOINT)



SECTION F–F
(VERTICAL JOINT BETWEEN ARCHES)

REVISIONS	
NO	DATE
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US PATENT # 9580899 B2

DRAWN BY: PAS	PROJECT: LO-PRO STORMPOD - STORMFILTER NEW JERSEY WIND PORT - PHASE 2 SALEM, NJ
CHECKED BY: JAR	
DATE: 09/07/2022	
SCALE: NTS	CUSTOMER: ----
JOB NO.: ----	DWG. NO. L–6
	SHT.

SPECIFICATIONS FOR THE INSTALLATION & BACKFILLING OF THE STORMPOD LO-PRO DETENTION SYSTEM

1.0 DESCRIPTION

THIS WORK CONSISTS OF CONSTRUCTING AN UNDERGROUND STORMPOD LO-PRO STORMWATER FACILITY IN ACCORDANCE WITH THESE SPECIFICATIONS AND IN CONFORMITY WITH THE LINES, GRADES, DESIGN AND DIMENSIONS SHOWN ON THE PLANS OR AS ESTABLISHED BY THE PROJECT ENGINEER.

2.0 EQUIPMENT/TOOLS

2.1 EQUIPMENT/TOOLS PROVIDED BY ROTONDO

- LIFTING HARDWARE (I.E. FIXTURES THAT CONNECT TO THE PRODUCT).

2.2 EQUIPMENT/TOOLS PROVIDED BY CONTRACTOR

- CRANE/EXCAVATOR
- 4-HOOK CABLE OR CHAIN FOR HANDLING PRECAST ELEMENTS IN GOOD CONDITION AND PROPER CAPACITY
- (3) 1.5-TON (MIN.) CAPACITY RATCHET LEVER CHAIN HOIST (SEE PHOTO)
- (2) 5' LONG PRY BARS
- A TRANSIT OR LASER LEVEL WITH ROD
- A CARPENTER'S LEVEL 6 FOOT MINIMUM LENGTH
- A SURVEYOR'S TAPE MEASURE 100 FOOT MINIMUM LENGTH
- WRENCH AND SOCKET SET TO TIGHTEN BOLTED CONNECTIONS WHEN REQUIRED

3.0 MATERIALS

3.1 NON-WOVEN FILTER FABRIC – NOT REQUIRED FOR LO-PRO SYSTEM

3.2 ACCESS MATERIALS

- ACCESS HATCH – A 4-FT X 4-FT H 20 DOUBLE LEAF, GALVANIZED STEEL HATCH AS MANUFACTURED BY INWESCO, INC. OR APPROVED EQUAL.
- MANHOLE FRAME & COVER – H 20 CAST-IRON MANHOLE FRAMES AND COVERS AS SUPPLIED BY CAPITOL FOUNDRY OR APPROVED EQUAL.
- LADDERS – HOT-DIPPED GALVANIZED STEEL MANHOLE LADDERS AS MANUFACTURED BY INWESCO, INC. MODEL I-3400 OR APPROVED EQUAL.
- MANHOLE STEPS – COPOLYMER POLYPROPYLENE STEEL REINFORCED MANHOLE STEPS AS SUPPLIED BY MA INDUSTRIES MODEL PS1-PF OR APPROVED EQUAL.

4.0 INSTALLATION PREPARATION

TO ENSURE CORRECT INSTALLATION OF THE PRECAST STORMPOD SYSTEM, CARE AND CAUTION MUST BE EXERCISED IN PREPARING THE STONE BEDDING THAT GOES BENEATH THE STRUCTURE. EXERCISING SPECIAL CARE WILL FACILITATE THE RAPID INSTALLATION OF THE PRECAST COMPONENTS.

4.1 SUBGRADE

- SUBGRADE SOILS IN THE PLANNED STRUCTURE AREA SHOULD BE EXAMINED BY THE SITE SOILS ENGINEER. IN THE EVENT THAT ANY YIELDING MATERIALS ARE ENCOUNTERED, THOSE SUBGRADE SOILS SHOULD EITHER BE THOROUGHLY DENSIFIED IN PLACE OR UNDERCUT TO FIRM GROUND AND REPLACED WITH CONTROLLED, COMPACTED FILL TO FINAL SUBGRADE ELEVATIONS.
- THE SITE SOILS ENGINEER SHALL CERTIFY THAT THE SUBGRADE BEARING CAPACITY MEETS OR EXCEEDS THE APPLIED BEARING PRESSURES FROM THE STRUCTURE.

4.2 STONE BEDDING

- BEDDING MATERIAL SHALL BE #57 STONE.
- A 6 INCH MINIMUM LAYER OF THE SPECIFIED AGGREGATE SHALL BE PLACED AND LEVELED ON TOP OF THE PREPARED SUBGRADE UNDER THE ENTIRE STRUCTURE.
- BEDDING SHALL BE LIGHTLY AND UNIFORMLY COMPACTED.
- THE STONE BED SHALL BE LEVELED IN ACCORDANCE WITH GRADES SHOWN ON THE PLANS. WHEN CHECKED WITH A TRANSIT/LASER LEVEL, THE ELEVATION SHALL NOT VARY MORE THAN 1/4 INCH (+/-) FROM THE SPECIFIED ELEVATION.

5.0 INSTALLATION OF PRECAST SYSTEM

ROTONDO ENVIRONMENTAL SOLUTIONS SHALL HAVE A QUALIFIED TECHNICIAN ON SITE DURING THE INSTALLATION PROCESS TO INSURE THAT THE PRECAST SECTIONS ARE INSTALLED PER MANUFACTURER'S REQUIREMENTS. ROTONDO SHALL PROVIDE CERTIFICATION THAT THE PRECAST CONCRETE ELEMENTS ARE INSTALLED IN ACCORDANCE TO THE APPROVED PLANS AND TO MANUFACTURER'S REQUIREMENTS. ROTONDO IS NOT RESPONSIBLE FOR THE LOCATION OR ELEVATION OF THE STRUCTURE OR FOR PROVIDING CERTIFICATION FOR THE SUBGRADE OR BACKFILL PROCESS. A LICENSED SOILS ENGINEER SHALL BE RESPONSIBLE FOR THE CERTIFICATION THAT THE SUBGRADE AND STRUCTURE BEDDING AS WELL AS THE BACKFILL PROCESS AND MATERIALS MEET THE REQUIRED SPECIFICATIONS.

TO ENSURE A QUALITY ASSEMBLY OF THE PRECAST STORMPOD SYSTEM, THE INSTALLATION OF PERIMETER AND INTERIOR ELEMENTS SHOULD BE INSTALLED SIMULTANEOUSLY WHILE MONITORING ELEVATIONS, ALIGNMENT AND MINIMIZING GAPS IN JOINTS. IT IS IMPORTANT TO START AT ONE POINT AND MIGRATE ACROSS THE SYSTEM DRAWING ALL SECTIONS INWARD.

5.1 PLACEMENT OF POD ASSEMBLIES

- EACH STORMPOD ASSEMBLY CONSISTS OF AN ARCH SECTION ATTACHED TO A SINGLE PRECAST FLOOR SLAB. THE ARCH SECTION IS ATTACHED TO THE PRECAST FLOOR SLAB AT THE PRECAST FACILITY PRIOR TO DELIVERY TO THE JOBSITE.
- IDENTIFY THE CRITICAL BENCH MARK LOCATION TO BEGIN THE INSTALLATION OF PRECAST ELEMENTS. TYPICALLY, THIS LOCATION WOULD BE AT THE OUTLET OR ANOTHER CRITICAL POINT WHERE GROWTH AND ALIGNMENT ARE A CONCERN.
- TO ENSURE CORRECT INSTALLATION OF THE PRECAST STORMPOD SYSTEM, THE OUTER PERIMETER BARREL SHOULD BE MARKED USING A PRE-PLACED STRING-LINE PLACED AT THE TOP OF THE STONE BED OFFSET ALONG THE SIDE OF THE ARCH BARREL. SECURE STRING-LINE WITH WOOD STAKES PLACED AT EACH END OF THE BARREL WITH THE TOP OF THE STAKE SET TO APPROXIMATELY 3 INCHES ABOVE THE REQUIRED BED ELEVATION. FASTEN THE STRING-LINE TO THE STAKE BY STAPLING TO THE TOP OF THE STAKE.
- TO ESTABLISH PROPER EXTERIOR WALL ALIGNMENT FOR THE STRUCTURE, START INSTALLING PERIMETER POD SECTIONS IN EITHER DIRECTION UNTIL PROPER ALIGNMENT AND GROWTH HAS BEEN CONFIRMED. MEASURE FROM OFFSET STRING LINE TO MONITOR ALIGNMENT. ELEVATIONS AND LEVELNESS MUST ALSO BE MONITORED AND ADJUSTED AT ALL TIMES WHEN INSTALLING POD UNITS.





- WHEN INSTALLING THE POD UNITS, REMOVE ENOUGH STONE WHERE SECTIONS ARE DRAWN TOGETHER WHICH MAY PREVENT SECTIONS FROM TOUCHING. EACH SECTION MUST THEN BE DRAWN TOGETHER TIGHT, USING THE 1.5-TON RATCHET LEVER CHAIN HOISTS, TO MINIMIZE GAPS AND ENGAGE THE ALIGNMENT TONGUE AND GROOVES. VERIFY THE INVERT ELEVATIONS AT EACH JOINT AND FOLLOW THE LEVELING PROCEDURES IN PREVIOUS STEP.
- ONCE ACCEPTABLE, REPEAT THE PREVIOUS STEPS MIGRATING ACROSS THE SYSTEM TO ONE COMMON POINT.





- INSTALL ENDWALL PANELS BY BOLTING ONTO END OF STORMPOD MODULE.
- ONCE PRECAST ELEMENTS HAVE BEEN INSTALLED, WRAP EXTERIOR VERTICAL JOINTS WITH JOINT TAPE MATERIAL. THIS MATERIAL IS USED TO PREVENT FINES FROM PASSING THROUGH AND PROVIDE A SILT-TIGHT JOINT.





- IF THE SYSTEM IS REQUIRED TO BE WATER-TIGHT, ONCE THE PRECAST ELEMENTS HAVE BEEN INSTALLED, MAKE SURE ALL INTERIOR JOINT SURFACES ARE CLEAN AND FREE FROM DIRT/DEBRIS. STARTING WITH THE BOTTOM SECTION JOINTS, APPLY A CONTINUOUS UNIFORM BEAD OF SIKAFLEX 2CNS POLYURETHANE ELEASTOMERIC SEALANT.
- SYSTEM JOINTS TO BE SEALED AND MADE WATERTIGHT BY MANUFACTURER.







REVISIONS	
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DRAWN BY:	PAS
CHECKED BY:	JAR
DATE:	09/07/2022
SCALE:	NTS
JOB NO.:	----

PROJECT:
LO-PRO STORMPOD - STORMFILTER
NEW JERSEY WIND PORT - PHASE 2
SALEM, NJ

CUSTOMER: ----

DWG. NO. L-7

SHT.

6.0 BACKFILL

A LICENSED SOILS ENGINEER SHALL BE RESPONSIBLE FOR THE CERTIFICATION THAT THE SUBGRADE AND STRUCTURE BEDDING AS WELL AS THE BACKFILL PROCESS AND MATERIALS MEET THE REQUIRED SPECIFICATIONS.

6.1 DO NOT PERFORM BACKFILLING DURING WET OR FREEZING WEATHER.

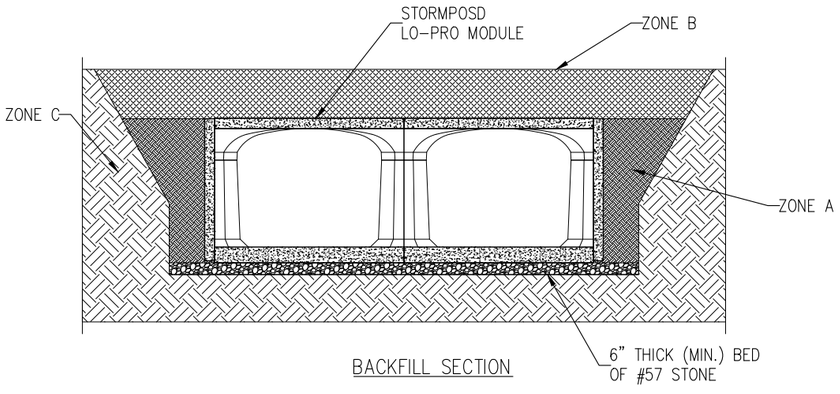
6.2 NO BACKFILL SHALL BE PLACED AGAINST ANY STRUCTURAL ELEMENTS UNTIL THE BACKFILL MATERIAL HAS BEEN APPROVED BY THE SITE SOILS ENGINEER.

6.3 CONSTRUCTION VEHICLES HEAVIER THAN A CATERPILLAR D-4 ARE NOT ALLOWED OVER THE STRUCTURE WHEN BACKFILL DEPTH IS LESS THAN 2 FEET OVER THE STRUCTURE CROWN. LIGHTWEIGHT DOZERS MAY BE OPERATED OVER UNITS HAVING 2 FEET OF COMPACTED COVER, BUT HEAVY EARTH MOVING EQUIPMENT (LARGER THAN A CAT D-4 DOZER WEIGHING IN EXCESS OF 12 TONS AND HAVING TRACK PRESSURES OF 8 PSI OR GREATER) SHALL REQUIRE A MINIMUM OF 4 FEET OF COVER. IN NO CASE SHALL EQUIPMENT OPERATING IN EXCESS OF THE DESIGN LOAD HL-93 BE PERMITTED OVER THE STRUCTURE UNLESS APPROVED BY ROTONDO ENVIRONMENTAL SOLUTION'S ENGINEER.



6.4 BACKFILL ZONES
- ZONE A – FILL THAT IS DIRECTLY AGAINST THE STRUCTURE AROUND THE OUTSIDE PERIMETER OF THE STRUCTURE.
- ZONE B – FILL THAT IS PLACED DIRECTLY OVER THE TOP OF THE STRUCTURE
- ZONE C – CONSTRUCTED EMBANKMENT OR OVERFILL

6.5 REQUIRED BACKFILL PROPERTIES
- ZONE A – GENERALLY, SOILS SHALL BE REASONABLY FREE OF ORGANIC MATTER, AND FREE OF STONES LARGER THAN 3-INCHES IN DIAMETER NEAR CONCRETE SURFACES.
- ZONE B – GENERALLY, SOILS SHALL BE REASONABLY FREE OF ORGANIC MATTER, AND FREE OF STONES LARGER THAN 3-INCHES IN DIAMETER NEAR CONCRETE SURFACES.
- ZONE C –SHALL BE REGULAR BACKFILL MATERIAL.
- IN-SITU SOIL – NATURAL GROUND IS TO BE SUFFICIENTLY STABLE TO ALLOW EFFECTIVE SUPPORT TO THE PRECAST CONCRETE STRUCTURE.



BACKFILL SECTION

6.6 BACKFILL SEQUENCE
- PHASE 1 – BACKFILL ZONE A TO TOP OF STRUCTURE AROUND THE ENTIRE PERIMETER OF STRUCTURE TO THE DIMENSIONS SHOWN.
- PHASE 2 – BACKFILL ZONE B ON TOP OF THE STRUCTURE TO THE DIMENSION SHOWN.

6.7 PLACING AND COMPACTING BACKFILL AROUND STRUCTURE – ZONE A
- DUMPING OF BACKFILL MATERIAL IS NOT ALLOWED ANY NEARER THAN 3 FT FROM THE SIDE OF THE STRUCTURE.
- THE FILL MUST BE PLACED AND COMPACTED IN LAYERS NOT EXCEEDING 6 INCHES IN THICKNESS, LOOSE MEASUREMENT. THE MAXIMUM DIFFERENCE IN THE SURFACE LEVELS OF THE FILL AROUND THE PERIMETER OF THE STRUCTURE MUST NOT EXCEED 2 FEET.
- EACH LAYER SHALL BE COMPACTED WITHIN A TOLERANCE OF OMC (OPTIMUM MOISTURE CONTENT) TO OMC+2 POINTS TO A DENSITY OF AT LEAST 95% OF THE THEORETICAL DENSITY.
- EACH LAYER SHALL BE COMPACTED BY ROLLING, TAMPING WITH MECHANICAL RAMMERS OR PNEUMATIC BACKFILL TAMPERS, OR HAND TAMPING WITH HEAVY METAL TAMPERS WITH A FACE OF AT LEAST 25 SQUARE INCHES. IF VIBRATORY ROLLERS ARE USED IN THE BACKFILL OPERATIONS, VIBRATORY MOTORS SHALL NOT BE ACTIVATED UNTIL AT LEAST 4 FEET OF BACKFILL HAS BEEN PLACED AND COMPACTED OVER THE TOP OF THE STRUCTURE.





6.8 PLACING AND COMPACTING BACKFILL ON TOP OF STRUCTURE – ZONE B
- DUMPING BACKFILL MATERIAL IS NOT ALLOWED ON TOP OF THE STRUCTURE. BACKFILL MATERIAL SHALL BE DUMPED NO CLOSER THAN 3 FEET FROM THE OUTSIDE PERIMETER OF THE STRUCTURE AND SPREAD ACROSS THE TOP OF THE STRUCTURE USING LIGHT EQUIPMENT SUCH AS A LIGHT DOZER OR BOBCAT.
- THE FILL MUST BE PLACED AND COMPACTED IN LAYERS NOT EXCEEDING 6 INCHES THICKNESS, LOOSE MEASUREMENT.
- EACH LAYER SHALL BE COMPACTED WITHIN A TOLERANCE OF OMC (OPTIMUM MOISTURE CONTENT) TO OMC+2 POINTS TO A DENSITY OF AT LEAST 95% OF THE THEORETICAL DENSITY.
- EACH LAYER MATERIAL SHALL BE COMPACTED BY ROLLING, TAMPING WITH MECHANICAL RAMMERS OR PNEUMATIC BACKFILL TAMPERS, OR HAND TAMPING WITH HEAVY METAL TAMPERS WITH A FACE OF AT LEAST 25 SQUARE INCHES. IF VIBRATORY ROLLERS ARE USED IN THE BACKFILL OPERATIONS, VIBRATORY MOTORS SHALL NOT BE ACTIVATED UNTIL AT LEAST 4 FEET OF BACKFILL HAS BEEN PLACED AND COMPACTED OVER THE TOP OF THE STRUCTURE.





REVISIONS	
NO	DATE
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StormPod®
UNIVERSAL STORMWATER MANAGEMENT SYSTEM
by ROTONDO ENVIRONMENTAL SOLUTIONS, LLC
www.Rotondo-ES.com
US PATENT # 9580899 B2

DRAWN BY:	PAS
CHECKED BY:	JAR
DATE:	09/07/2022
SCALE:	NTS
JOB NO.:	----

PROJECT:
LO-PRO STORMPOD - STORMFILTER
NEW JERSEY WIND PORT - PHASE 2
SALEM, NJ

CUSTOMER: ----

DWG. NO. L-8

SHT.

NJWP Substation

10/23/22

Sizing Basis:

Filterra High Capacity biofiltration system has received final certification from the NJDEP for 80% TSS removal. Per the NJDEP, Filterra HC is considered a Green Infrastructure (GI) MTD. The sizing for the Filterra HC system under NJDEP regulations is based on the methodology outlined in Chapter 5 of the NJDEP BMP Manual. The NRCS method is utilized to determine a water quality flow rate for the drainage area in question. To validate the sizing, the parameters below were assumed.

Design Parameters:

Design Storm = NJDEP Water Quality Design Storm (1.25-inch/2-hour storm event)
Filterra HC Media Flow Rate = 300 inches/hour
Allowable Ponding in Filterra = 9”

Design Summary:

Utilizing NRCS Method and HydroCAD software, a hydrograph can be derived to represent the design storm. As seen in the provided HydroCAD report, the WQ flow is routed to an appropriately sized Filterra unit. Since the Filterra system can provide up to 9” of ponding, some flow attenuation is possible. The Filterra system is able to accommodate a portion of the water quality volume in the head space above the media and release it at the system’s NJDEP certified maximum treatment flow rate.

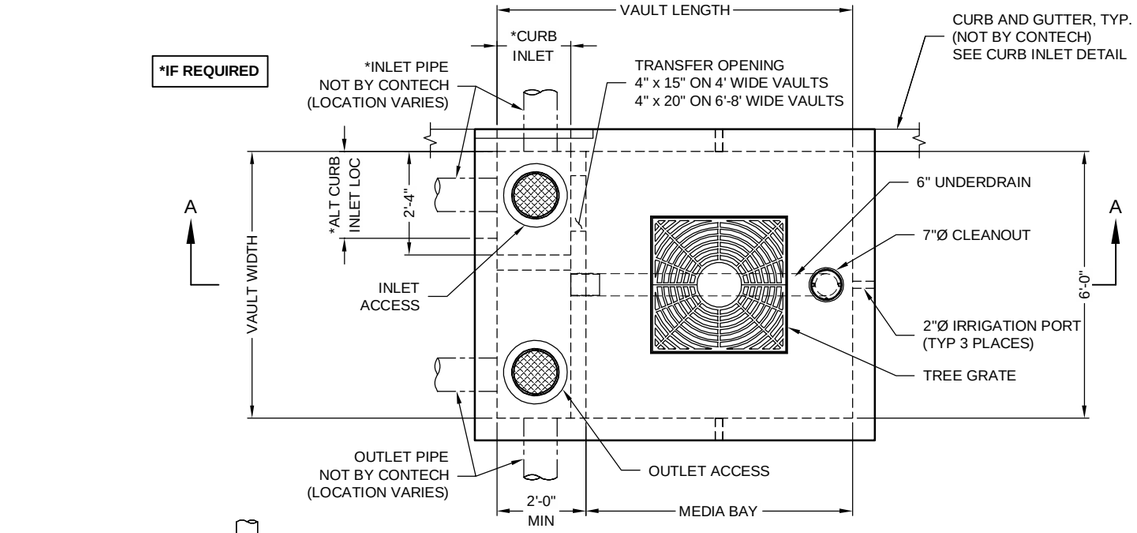
Drainage Area ID	Impervious Drainage Area (ac)	Filterra HC Model Analyzed
1	0.30	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
2	0.25	8'x10.5' Peak Diversion Filterra HC (8'x14' vault)
3	0.31	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
4	0.30	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
5	0.25	8'x10.5' Peak Diversion Filterra HC (8'x14' vault)
6	0.28	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
7	0.31	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
8	0.32	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
9	0.31	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
10	0.30	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
11	0.25	8'x10.5' Peak Diversion Filterra HC (8'x14' vault)
12	0.29	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
13	0.27	8'x10.5' Peak Diversion Filterra HC (8'x14' vault)
14	0.29	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
15	0.19	6'x10' Peak Diversion Filterra HC (6'x12' vault)
16	0.19	6'x10' Peak Diversion Filterra HC (6'x12' vault)
17	0.25	8'x10.5' Peak Diversion Filterra HC (8'x14' vault)
18	0.31	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
19	0.27	8'x10.5' Peak Diversion Filterra HC (8'x14' vault)
20	0.30	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
23	0.32	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
26	0.23	8'x10.5' Peak Diversion Filterra HC (8'x14' vault)
27	0.26	8'x10.5' Peak Diversion Filterra HC (8'x14' vault)
28	0.30	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
29	0.30	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
54	0.15	14’x8’ Standard Offline Filterra HC
55	0.17	

56	0.14	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
57	0.14	
58	0.14	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
59	0.15	
60	0.17	8'x12.5' Peak Diversion Filterra HC (8'x16' vault)
61	0.14	
62	0.14	6'x8' Peak Diversion Filterra HC (6'x10' vault)
63	0.20	7'x10' Peak Diversion Filterra HC (7'x13' vault)
Substation Area	0.59	14'x8' Offline Filterra HC Bioscape vault

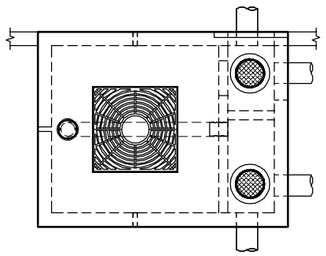
Thank you for the opportunity to present this to you and your client. Please do not hesitate to contact me should you have any additional questions.

Sincerely,

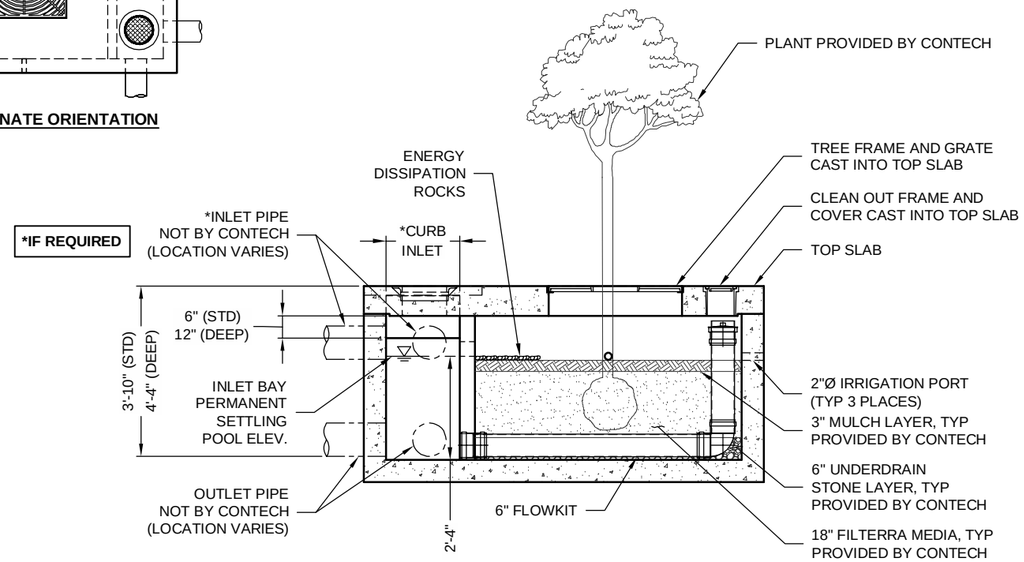
Taylor Murdock
Stormwater Design Engineer
Contech Engineered Solutions, LLC.



PLAN VIEW



ALTERNATE ORIENTATION



SECTION A-A
(STANDARD DEPTH SHOWN)

INTERNAL PIPE CONFIGURATION MAY VARY DEPENDING UPON OUTLET LOCATION.

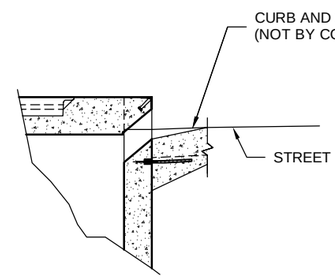
FTPD-HC STANDARD HEIGHT CONFIGURATION

DESIGNATION (OPTIONS: -P, -T, -PT)	DESIGNATION (OPTIONS: -P, -T, -PT)	MEDIA BAY SIZE	VAULT SIZE (W x L)	WEIR LENGTH/ MAX CURB OPENING	*MAX BYPASS FLOW (CFS)	INLET/ OUTLET ACCESS DIA	TREE GRATE QTY & SIZE
FTPD0404-HC	ALL	4 x 4	4 x 6	1'-8"	1.4	12"/12"	(1) 3' x 3'
FTPD0406-HC	N/A DE, MD, NJ, PA, VA, WV	4 x 6	4 x 8	1'-8"	1.4	12"/12"	(1) 3' x 3'
FTPD045058-HC	DE, MD, NJ, PA, VA, WV ONLY	4.5 x 5.83	4.5 x 7.83	1'-8"	1.4	12"/12"	(1) 3' x 3'
FTPD0604-HC	ALL	6 x 4	6 x 6	1'-8"	1.4	12"/12"	(1) 3' x 3'
FTPD0606-HC	ALL	6 x 6	6 x 8	1'-8"	1.4	12"/12"	(1) 3' x 3'
FTPD0608-HC	ALL	6 x 8	6 x 10	1'-8"	1.4	12"/12"	(1) 4' x 4'
FTPD0610-HC	ALL	6 x 10	6 x 12	1'-8"	1.4	12"/12"	(1) 4' x 4'
FTPD0710-HC	ALL	7 x 10	7 x 13	2'-6"	2.1	24"/24"	(1) 4' x 4'
FTPD08105-HC	ALL	8 x 10.5	8 x 14	3'-0"	2.5	24"/24"	(1) 4' x 4'
FTPD08125-HC	N/A OR, WA	8 x 12.5	8 x 16	3'-0"	2.5	24"/24"	(2) 4' x 4'
FTPD09115-HC	OR, WA ONLY	9 x 11.5	9 x 15	3'-0"	2.5	24"/24"	(2) 4' x 4'
N/A = NOT AVAILABLE							

FTPD-D-HC DEEP OPTION CONFIGURATION

DESIGNATION (OPTIONS: -P, -T, -PT)	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	WEIR LENGTH/ MAX CURB OPENING	*MAX BYPASS FLOW (CFS)	INLET/ OUTLET ACCESS DIA	TREE GRATE QTY & SIZE
FTPD0404-D-HC	ALL	4 x 4	4 x 6	1'-8"	4.6	12"/12"	(1) 3' x 3'
FTPD0406-D-HC	N/A DE, MD, NJ, PA, VA, WV	4 x 6	4 x 8	1'-8"	4.6	12"/12"	(1) 3' x 3'
FTPD045058-D-HC	DE, MD, NJ, PA, VA, WV ONLY	4.5 x 5.83	4.5 x 7.83	1'-8"	4.6	12"/12"	(1) 3' x 3'
FTPD0604-D-HC	ALL	6 x 4	6 x 6	1'-8"	4.6	12"/12"	(1) 3' x 3'
FTPD0606-D-HC	ALL	6 x 6	6 x 8	1'-8"	4.6	12"/12"	(1) 3' x 3'
FTPD0608-D-HC	ALL	6 x 8	6 x 10	1'-8"	4.6	12"/12"	(1) 4' x 4'
FTPD0610-D-HC	ALL	6 x 10	6 x 12	1'-8"	4.6	12"/12"	(1) 4' x 4'
FTPD0710-D-HC	ALL	7 x 10	7 x 13	2'-6"	6.8	24"/24"	(1) 4' x 4'
FTPD08105-D-HC	ALL	8 x 10.5	8 x 14	3'-0"	8.2	24"/24"	(1) 4' x 4'
FTPD08125-D-HC	N/A OR, WA	8 x 12.5	8 x 16	3'-0"	8.2	24"/24"	(2) 4' x 4'
FTPD09115-D-HC	OR, WA ONLY	9 x 11.5	9 x 15	3'-0"	2.5	24"/24"	(2) 4' x 4'
N/A = NOT AVAILABLE							

*MAX BYPASS FLOW IS INTERNAL WEIR FLOW. SITE SPECIFIC ANALYSIS IS REQUIRED TO DETERMINE CURB INLET FLOW CAPACITY



CURB INLET DETAIL

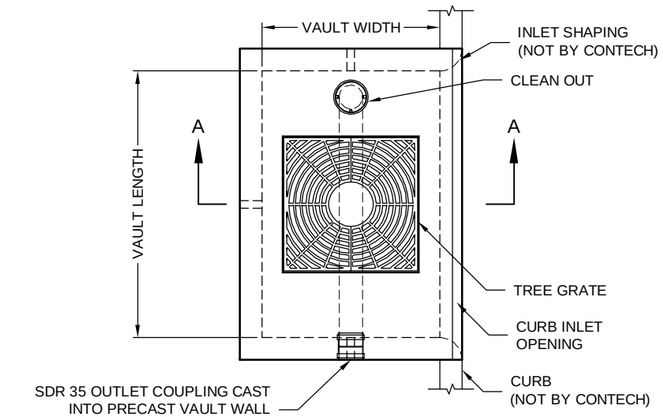
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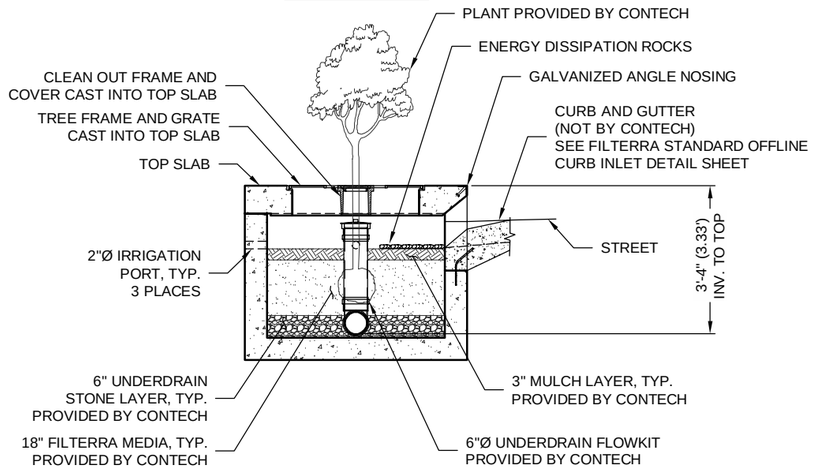
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

FILTERRA HC PEAK DIVERSION (FTPD-HC) CONFIGURATION DETAIL

I:\STORMWATER\COMMOPS\54 FILTERRA\40 STANDARD DRAWINGS\FT-HC - FILTERRA HC (NEW JERSEY ONLY)\FTPD-HC - FILTERRA PEAK DIVERSION CONFIG DTL.DWG 9/8/2022 11:36 AM



PLAN VIEW

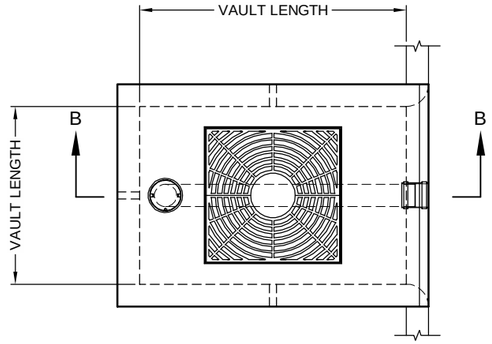


SECTION A-A

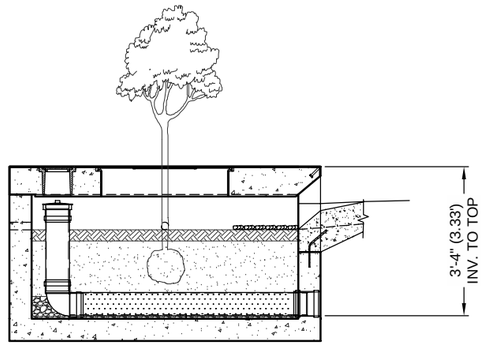
FT-HC LONG SIDE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (L x W)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0604-HC	ALL	6 x 4	6 x 4	6" SDR 35	(1) 3' x 3'
FT078045-HC	DE, MD, NJ, PA, VA, WV ONLY	7.83 x 4.5	7.83 x 4.5	6" SDR 35	(1) 3' x 3'
FT0804-HC	N/A DE, MD, NJ, PA, VA, WV	8 x 4	8 x 4	6" SDR 35	(1) 3' x 3'
FT0806-HC	ALL	8 x 6	8 x 6	6" SDR 35	(1) 4' x 4'
FT1006-HC	ALL	10 x 6	10 x 6	6" SDR 35	(1) 4' x 4'
FT1206-HC	ALL	12 x 6	12 x 6	6" SDR 35	(2) 4' x 4'
FT1307-HC	ALL	13 x 7	13 x 7	6" SDR 35	(2) 4' x 4'
FT1408-HC	CALL CONTECH	14 x 8	14 x 8	6" SDR 35	(2) 4' x 4'
FT1509-HC	CALL CONTECH	15 x 9	15 x 9	6" SDR 35	(2) 4' x 4'
FT1608-HC	CALL CONTECH	16 x 8	16 x 8	6" SDR 35	(2) 4' x 4'
FT1808-HC	CALL CONTECH	18 x 8	18 x 8	6" SDR 35	(2) 4' x 4'
FT2008-HC	CALL CONTECH	20 x 8	20 x 8	6" SDR 35	(3) 4' x 4'
FT2208-HC	CALL CONTECH	22 x 8	22 x 8	6" SDR 35	(3) 4' x 4'

N/A = NOT AVAILABLE



PLAN VIEW

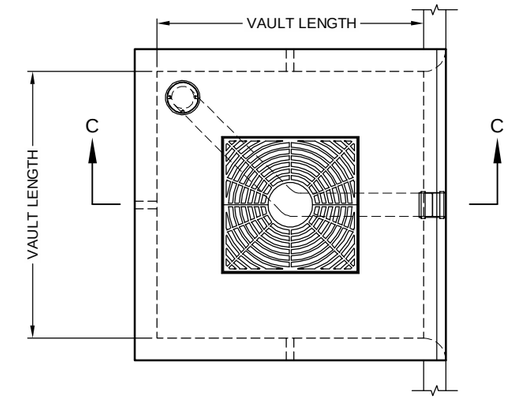


SECTION B-B

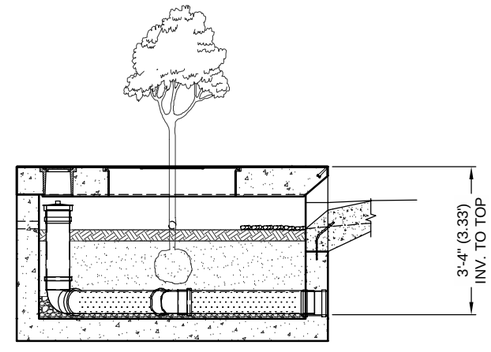
FT-HC SHORT SIDE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0406-HC	ALL	4 x 6	4 x 6	6" SDR 35	(1) 3' x 3'
FT0408-HC	N/A DE, MD, NJ, PA, VA, WV	4 x 8	4 x 8	6" SDR 35	(1) 3' x 3'
FT045078-HC	DE, MD, NJ, PA, VA, WV ONLY	4.5 x 7.83	4.5 x 7.83	6" SDR 35	(1) 3' x 3'
FT0608-HC	ALL	6 x 8	6 x 8	6" SDR 35	(1) 4' x 4'
FT0610-HC	ALL	6 x 10	6 x 10	6" SDR 35	(1) 4' x 4'
FT0612-HC	ALL	6 x 12	6 x 12	6" SDR 35	(2) 4' x 4'
FT0713-HC	ALL	7 x 13	7 x 13	6" SDR 35	(2) 4' x 4'

N/A = NOT AVAILABLE



PLAN VIEW



SECTION C-C

FT-HC SQUARE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0404-HC	ALL	4 x 4	4 x 4	6" SDR 35	(1) 3' x 3'
FT0606-HC	ALL	6 x 6	6 x 6	6" SDR 35	(1) 3' x 3'

N/A = NOT AVAILABLE

INTERNAL PIPE CONFIGURATION MAY VARY DEPENDING UPON OUTLET LOCATION.

filterra®
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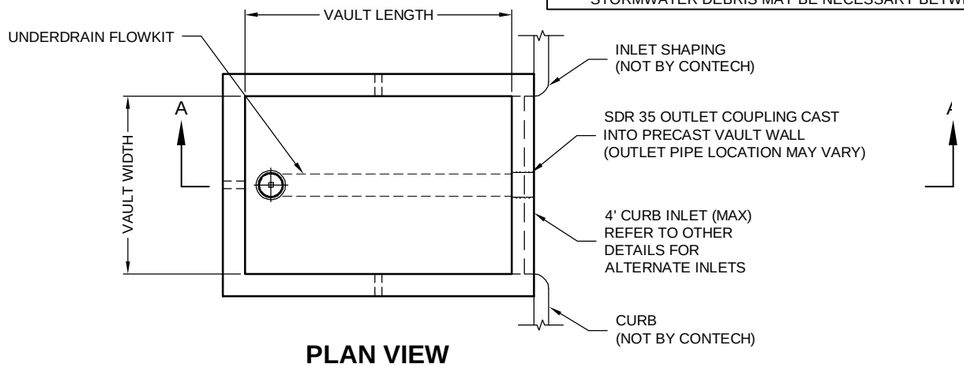
CONTECH®
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

FILTERRA HC OFFLINE (FT-HC) CONFIGURATION DETAIL

I:\STORMWATER\COMMOPS\54 FILTERRA\40 STANDARD DRAWINGS\FT-HC - FILTERRA HC (NEW JERSEY ONLY)\FT-HC - FILTERRA OFFLINE CONFIG DTL.DWG 9/8/2022 11:23 AM

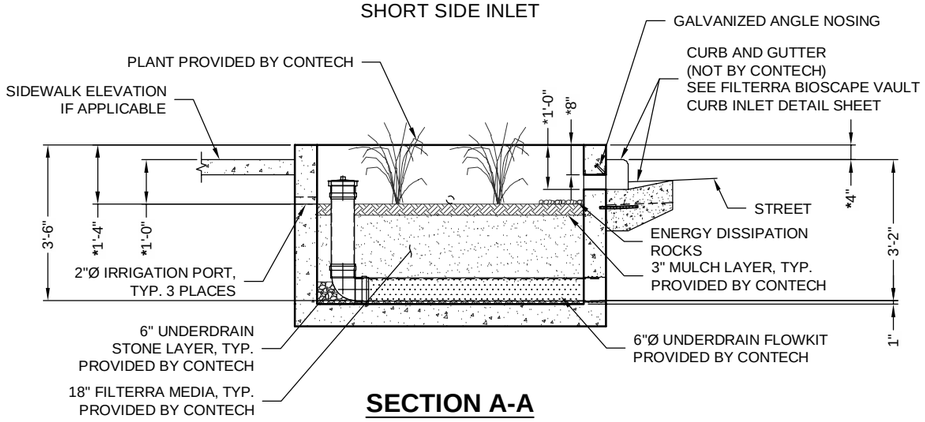
DIMENSIONS PRECEDED BY " * " ARE CRITICAL AND MAY NOT BE MODIFIED WITHOUT CONSULTING CONTECH

AS WITH ALL OPEN TOP BIORETENTION SYSTEMS, FILTERRA BIOSCAPE IS OPEN TO THE ATMOSPHERE WITH A MEDIA SURFACE RECESSED BELOW FINISHED GRADE. CONTRACTOR OR OWNER IS RESPONSIBLE FOR PROVIDING ANY REQUIRED SAFETY MEASURES AROUND SYSTEM PERIMETER. TO MAINTAIN AESTHETICS, REMOVAL OF HEAVY STORMWATER DEBRIS MAY BE NECESSARY BETWEEN REGULAR FILTERRA SYSTEM MAINTENANCE EVENTS.



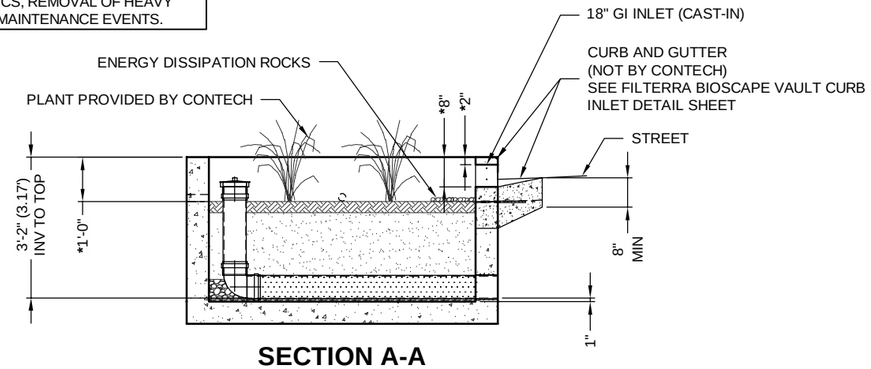
PLAN VIEW

SHORT SIDE INLET



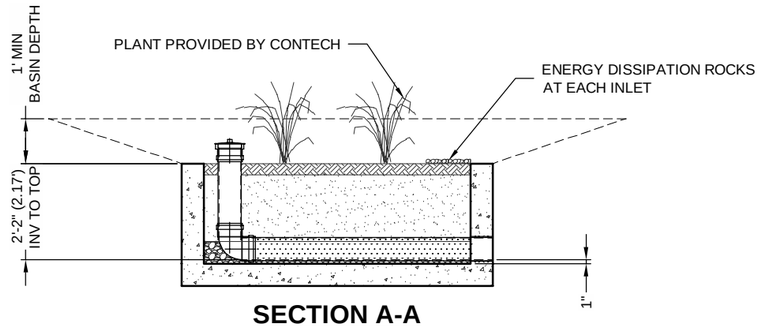
SECTION A-A

SLOTTED THROAT INLET



SECTION A-A

GREEN INFRASTRUCTURE INLET - TOP FLUSH WITH TOP OF CURB, NOT INTENDED FOR SIDEWALK APPLICATIONS



SECTION A-A

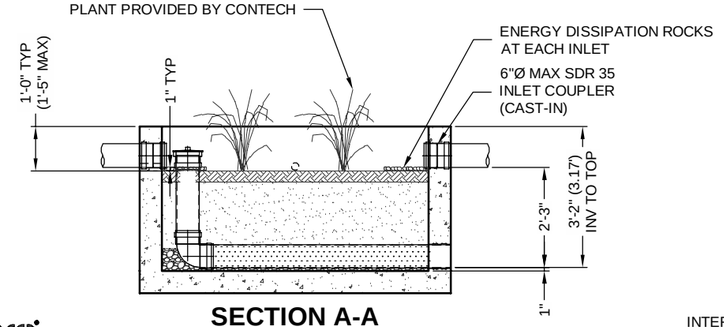
BASIN - CURB INLET OR PIPE INLETS OPTIONAL

FTBSV-HC CONFIGURATION

(OPTIONS: BASIN "-B", GREEN INFR. INLET "-I", PIPE INLET "-P", SLOTTED THROAT INLET "-T")

MEDIA BAY SIZE	VAULT SIZE (L x W)	LONG SIDE INLET DESIGNATION	SHORT SIDE INLET DESIGNATION	AVAILABILITY	OUTLET PIPE DIA	MIN. NO. OF INLET PIPES (-P ONLY)
4 x 4	4 x 4	FTBSV0404-HC	FTBSV0404-HC	ALL	6" SDR 35	1
6 x 4	6 x 4	FTBSV0604-HC	FTBSV0406-HC	ALL	6" SDR 35	1
7.83 x 4.5	7.83 x 4.5	FTBSV078045-HC	FTBSV045078-HC	DE,MD,NJ,PA,VA,WV ONLY	6" SDR 35	1
8 x 4	8 x 4	FTBSV0804-HC	FTBSV0408-HC	N/A DE,MD,NJ,PA,VA,WV	6" SDR 35	1
6 x 6	6 x 6	FTBSV0606-HC	FTBSV0606-HC	ALL	6" SDR 35	1
8 x 6	8 x 6	FTBSV0806-HC	FTBSV0608-HC	ALL	6" SDR 35	1
10 x 6	10 x 6	FTBSV1006-HC	FTBSV0610-HC	ALL	6" SDR 35	2
12 x 6	12 x 6	FTBSV1206-HC	FTBSV0612-HC	ALL	6" SDR 35	2
13 x 7	13 x 7	FTBSV1307-HC	FTBSV0713-HC	ALL	6" SDR 35	2
14 x 8	14 x 8	FTBSV1408-HC†	N/A	ALL	6" SDR 35	3
16 x 8	16 x 8	FTBSV1608-HC†	N/A	N/A OR,WA	6" SDR 35	3
15 x 9	15 x 9	FTBSV1509-HC†	N/A	OR,WA ONLY	6" SDR 35	3
18 x 8	18 x 8	FTBSV1808-HC†	N/A	CALL CONTECH	6" SDR 35	3
20 x 8	20 x 8	FTBSV2008-HC†	N/A	CALL CONTECH	6" SDR 35	4
22 x 8	22 x 8	FTBSV2208-HC†	N/A	CALL CONTECH	6" SDR 35	4

†UTILIZES (2) CURB OPENINGS WITH MIN 1' SPACING N/A = NOT AVAILABLE



SECTION A-A

PIPE INLET

INTERNAL PIPE CONFIGURATION MAY VARY DEPENDING ON VAULT SIZE.

filterra®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 6,277,274; 6,569,321; 7,625,486; 7,425,261; 7,639,412; RELATED FOREIGN PATENTS.

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FILTERRA HC BIOSCAPE VAULT STANDARD OFFLINE (FTBSV-HC) CONFIGURATION DETAIL

I:\STORMWATER\COMMOPS\54 FILTERRA\40 STANDARD DRAWINGS\FT-HC - FILTERRA HC (NEW JERSEY ONLY)\FTBSV-HC - F... 9/8/2022 11:20 AM

Summary for Subcatchment 1S: DA 1

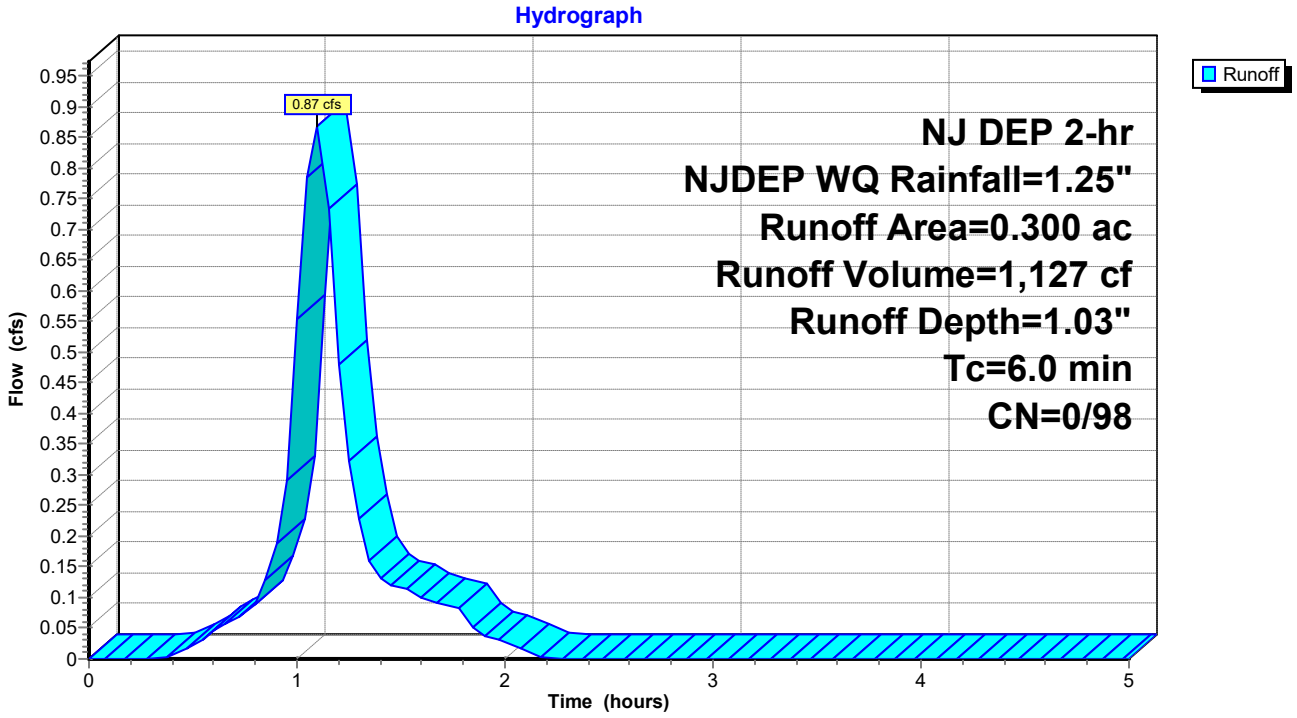
Runoff = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf, Depth= 1.03"
Routed to Pond 1P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.300	98	
	0.300	98	100.00% Impervious Area

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

Subcatchment 1S: DA 1



Summary for Pond 1P: Filterra 8x12.5

Inflow Area = 0.300 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 951 cf, Atten= 20%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 951 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.48' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 48 cf

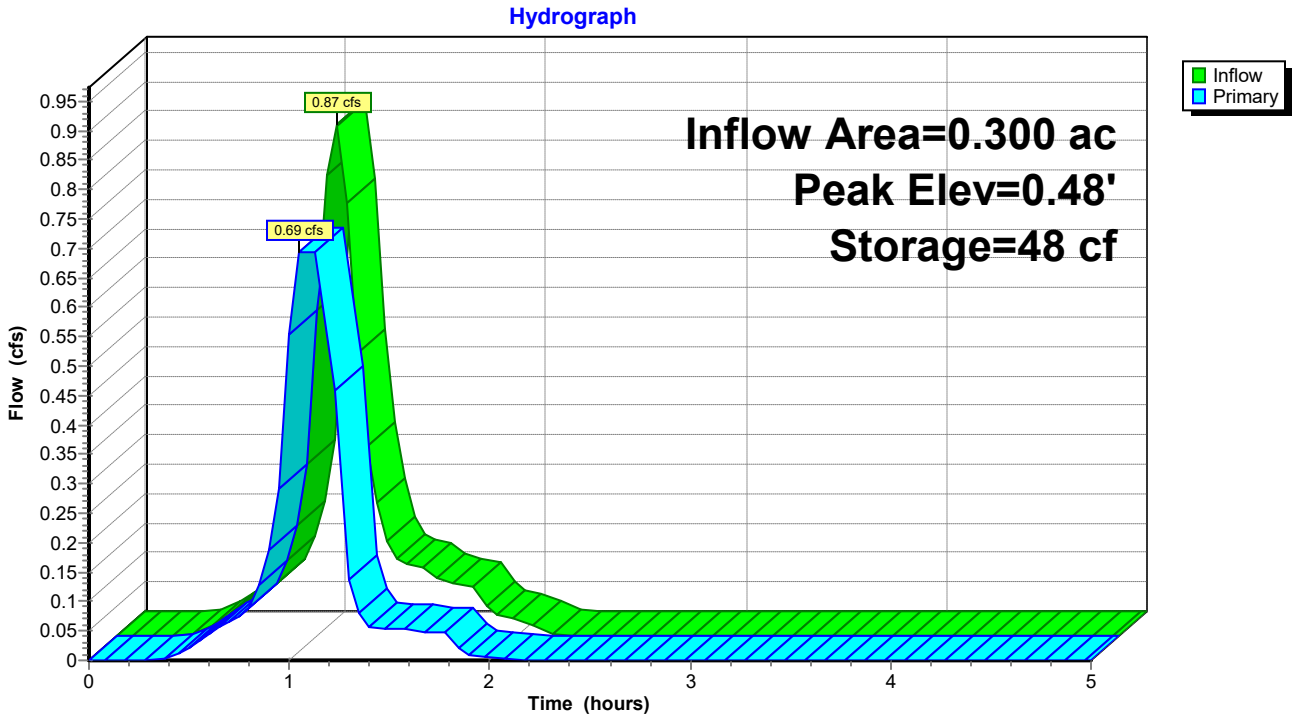
Plug-Flow detention time= 2.2 min calculated for 951 cf (84% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 1P: Filterra 8x12.5



Summary for Subcatchment 2S: DA 2

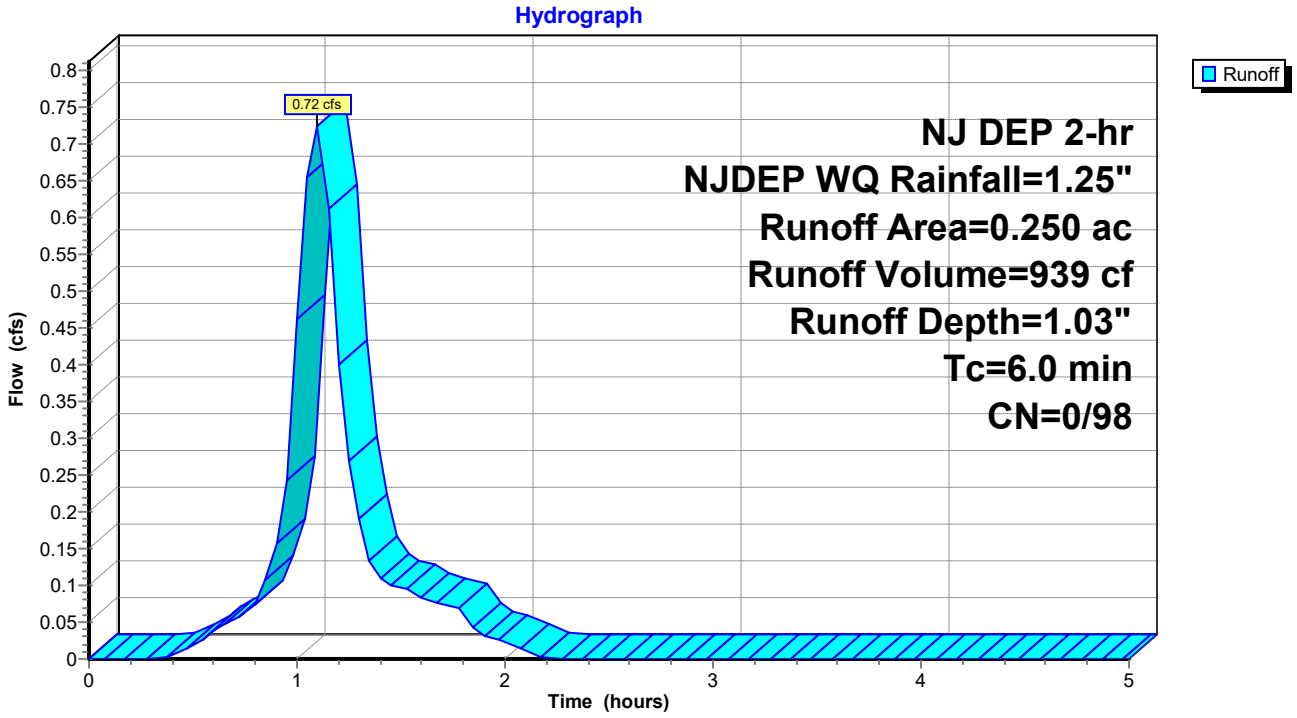
Runoff = 0.72 cfs @ 1.09 hrs, Volume= 939 cf, Depth= 1.03"
Routed to Pond 2P : Filterra 8x10.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.250	98	
	0.250	98	100.00% Impervious Area

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

Subcatchment 2S: DA 2



Summary for Pond 2P: Filterra 8x10.5

Inflow Area = 0.250 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.72 cfs @ 1.09 hrs, Volume= 939 cf
Outflow = 0.58 cfs @ 1.05 hrs, Volume= 701 cf, Atten= 19%, Lag= 0.0 min
Primary = 0.58 cfs @ 1.05 hrs, Volume= 701 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.45' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 38 cf

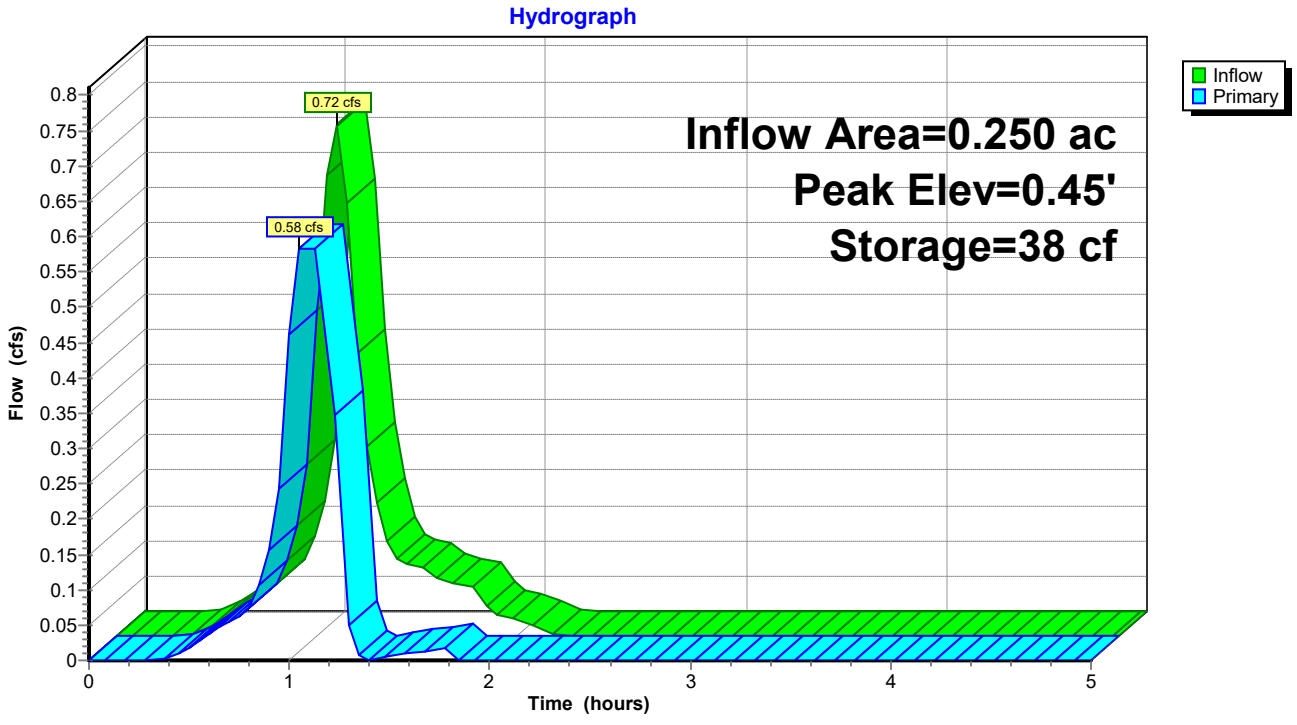
Plug-Flow detention time= 1.2 min calculated for 701 cf (75% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	63 cf	**8.00'W x 10.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.58 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.58 cfs @ 0.01 fps)

Pond 2P: Filterra 8x10.5



Summary for Subcatchment 3S: DA 3

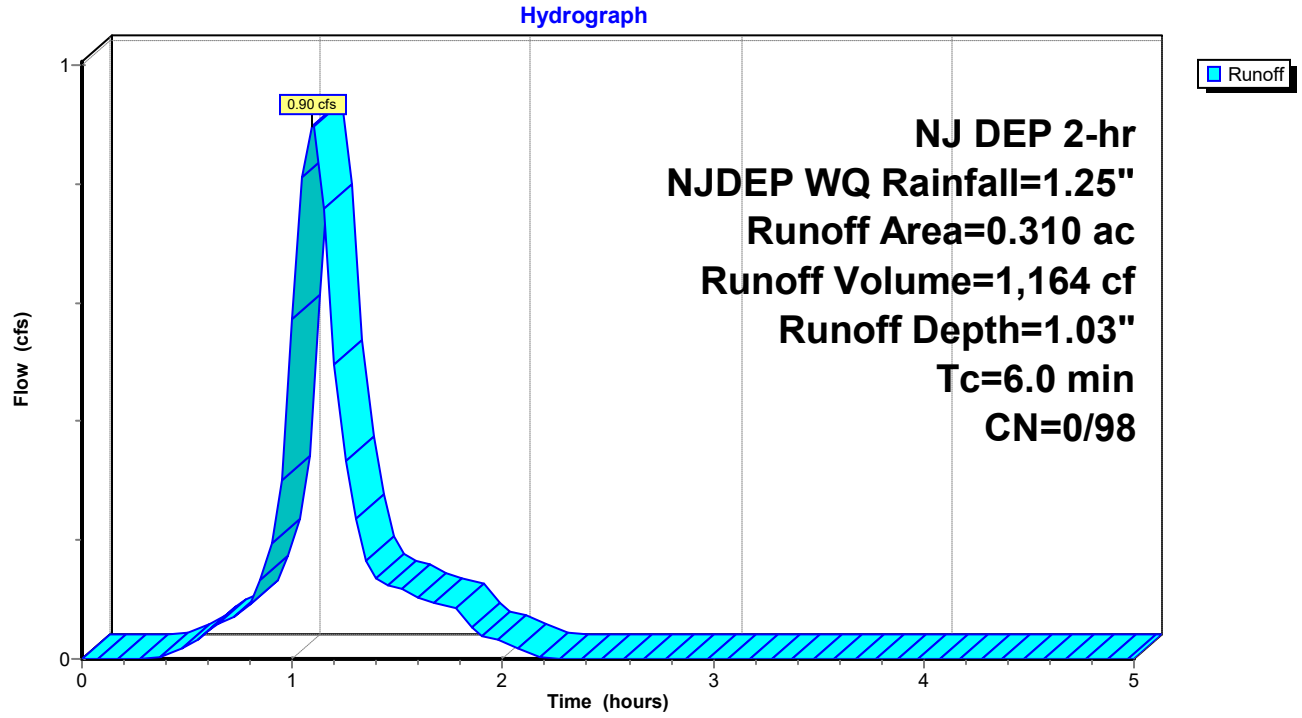
Runoff = 0.90 cfs @ 1.09 hrs, Volume= 1,164 cf, Depth= 1.03"
Routed to Pond 3P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.310	98	
	0.310	98	100.00% Impervious Area

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

Subcatchment 3S: DA 3



Summary for Pond 3P: Filterra 8x12.5

Inflow Area = 0.310 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.90 cfs @ 1.09 hrs, Volume= 1,164 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf, Atten= 23%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.59' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 59 cf

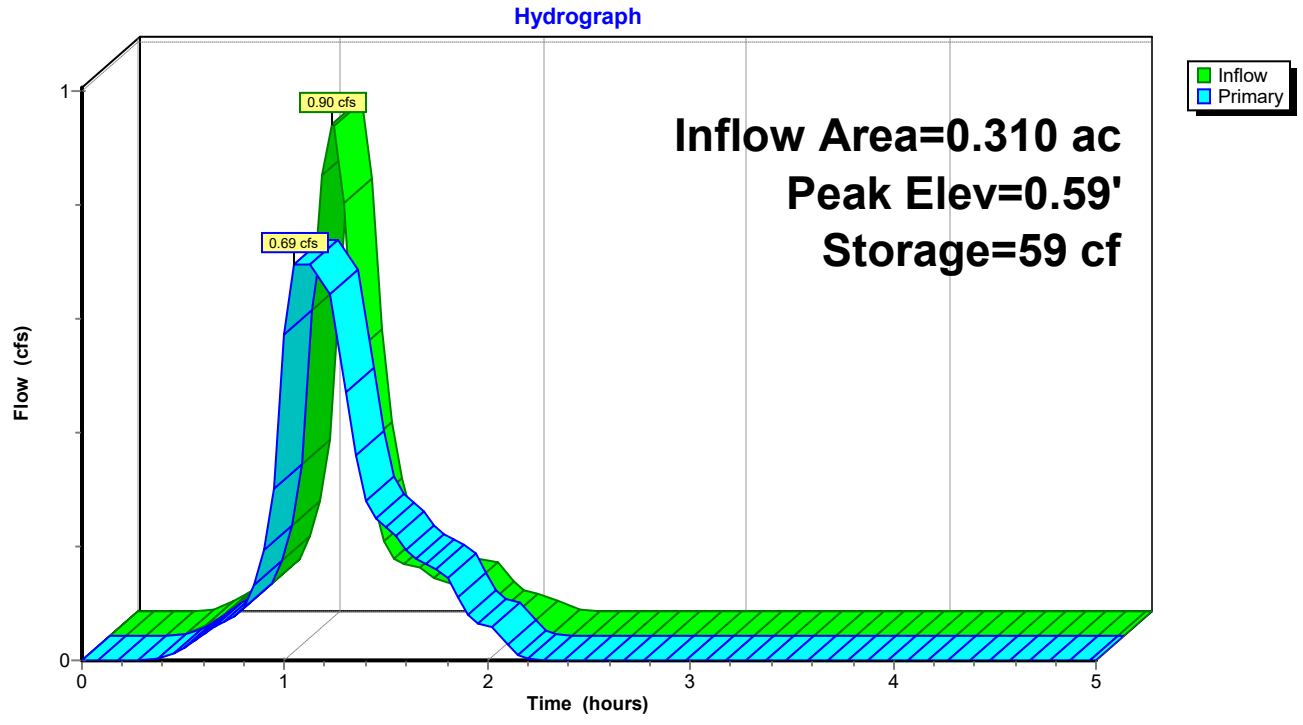
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (75.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 3P: Filterra 8x12.5



Summary for Subcatchment 4S: DA 4

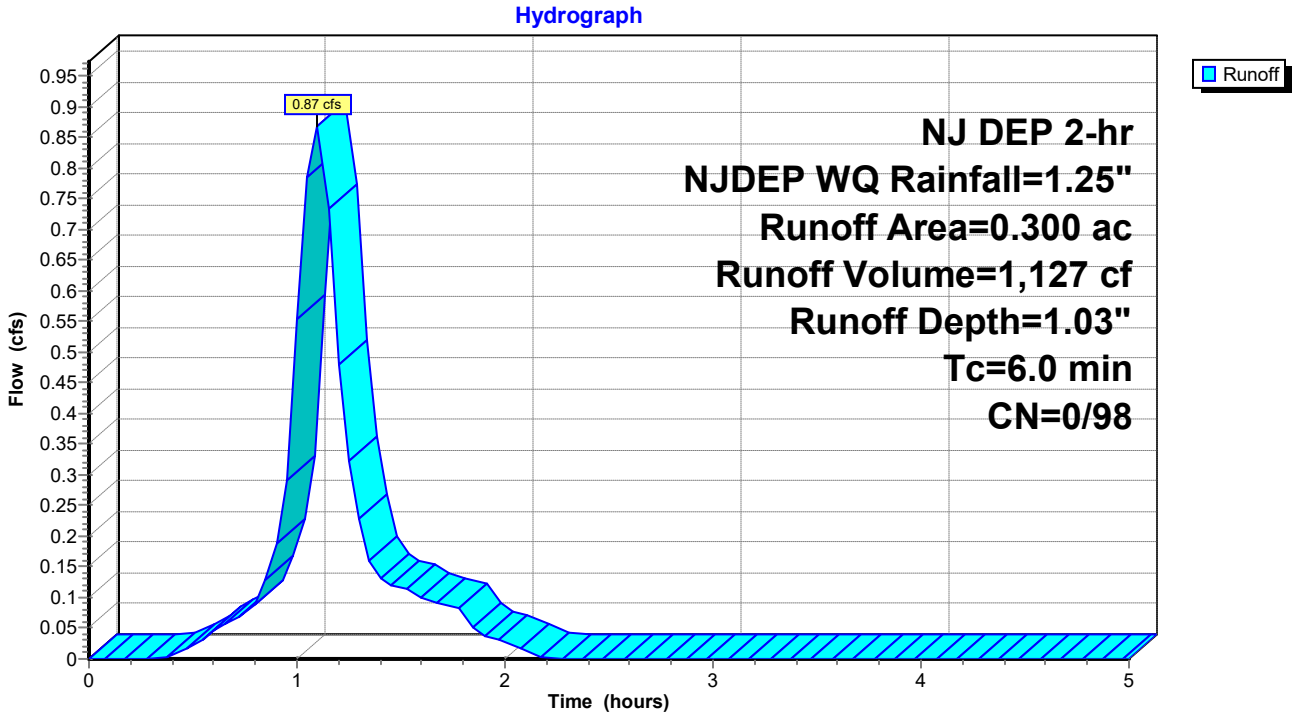
Runoff = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf, Depth= 1.03"
Routed to Pond 4P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.300	98	
	0.300	98	100.00% Impervious Area

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

Subcatchment 4S: DA 4



Summary for Pond 4P: Filterra 8x12.5

Inflow Area = 0.300 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 951 cf, Atten= 20%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 951 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.48' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 48 cf

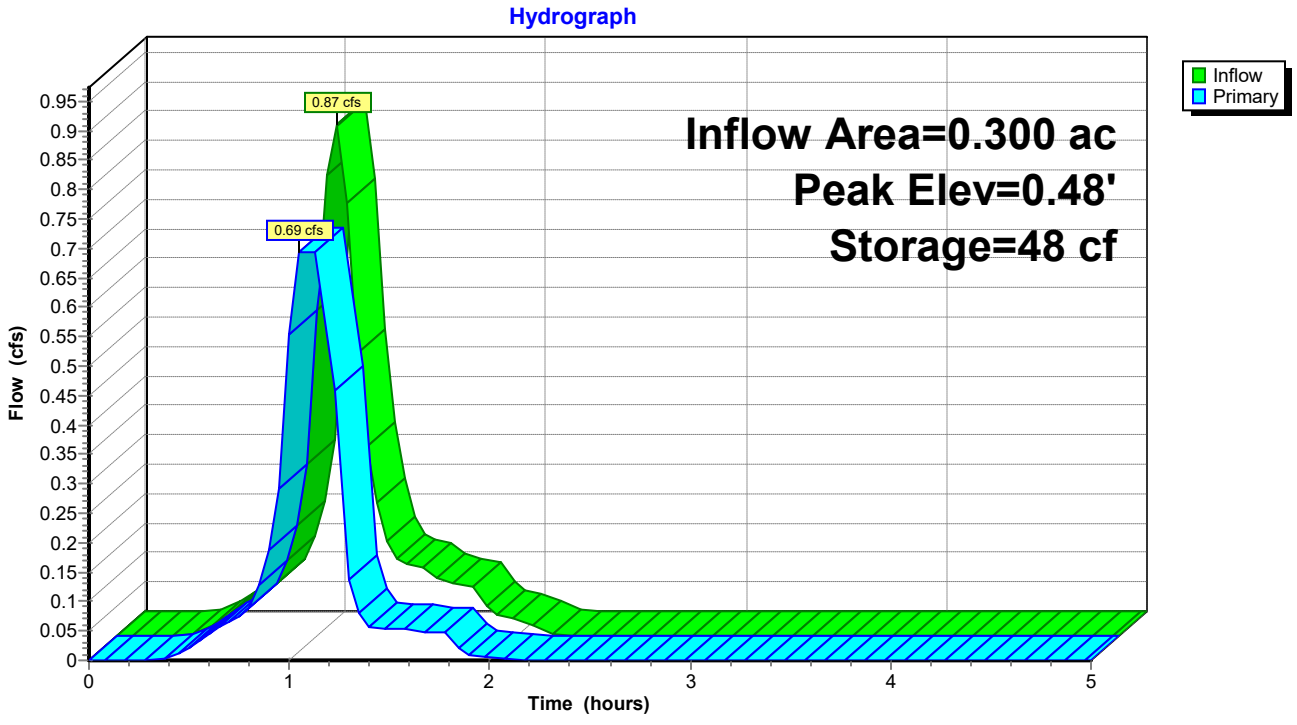
Plug-Flow detention time= 2.2 min calculated for 951 cf (84% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 4P: Filterra 8x12.5



Summary for Subcatchment 5S: DA 5

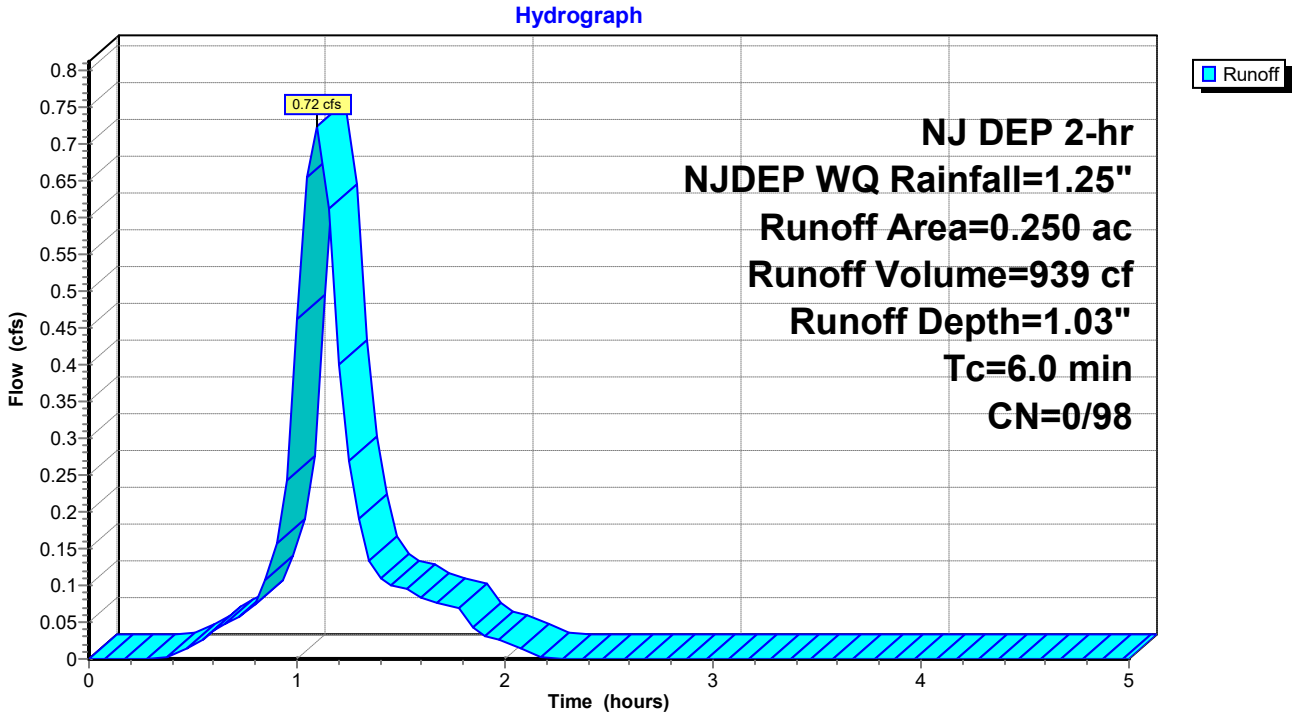
Runoff = 0.72 cfs @ 1.09 hrs, Volume= 939 cf, Depth= 1.03"
Routed to Pond 5P : Filterra 8x10.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.250	98	
	0.250	98	100.00% Impervious Area

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

Subcatchment 5S: DA 5



Summary for Pond 5P: Filterra 8x10.5

Inflow Area = 0.250 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.72 cfs @ 1.09 hrs, Volume= 939 cf
Outflow = 0.58 cfs @ 1.05 hrs, Volume= 701 cf, Atten= 19%, Lag= 0.0 min
Primary = 0.58 cfs @ 1.05 hrs, Volume= 701 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.45' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 38 cf

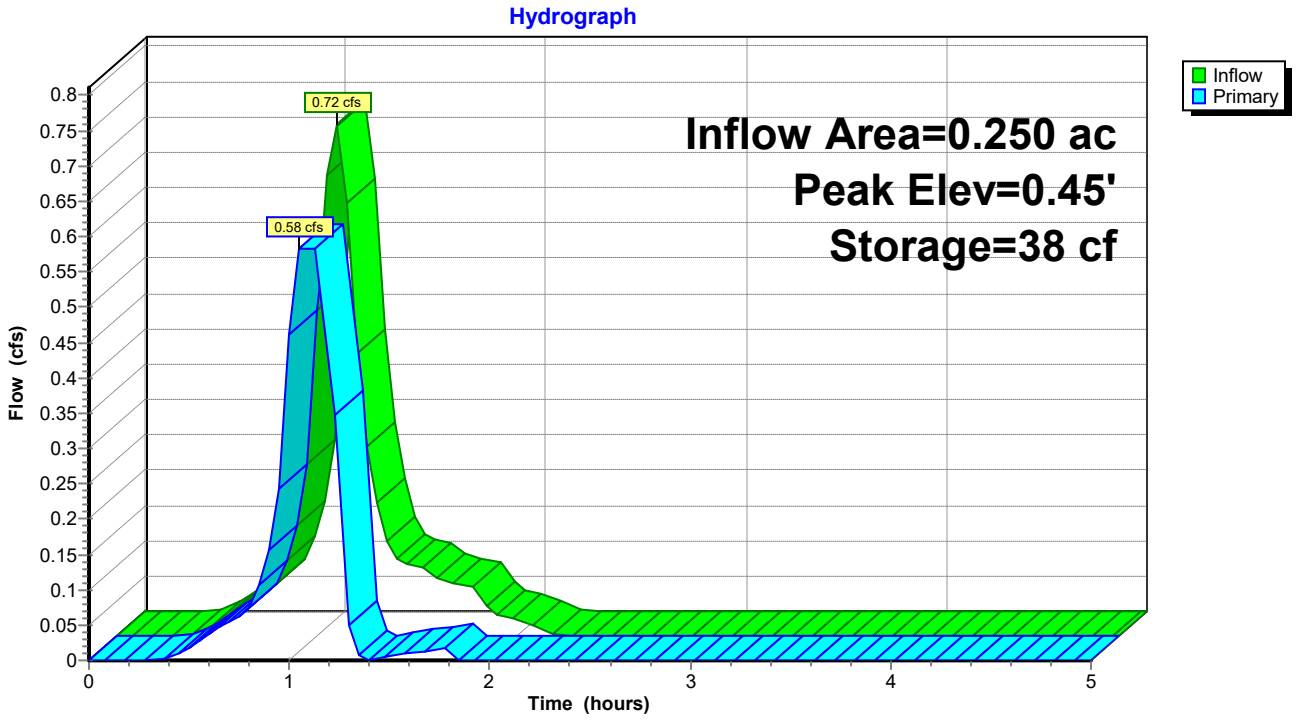
Plug-Flow detention time= 1.2 min calculated for 701 cf (75% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	63 cf	**8.00'W x 10.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.58 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.58 cfs @ 0.01 fps)

Pond 5P: Filterra 8x10.5



Summary for Subcatchment 6S: DA 6

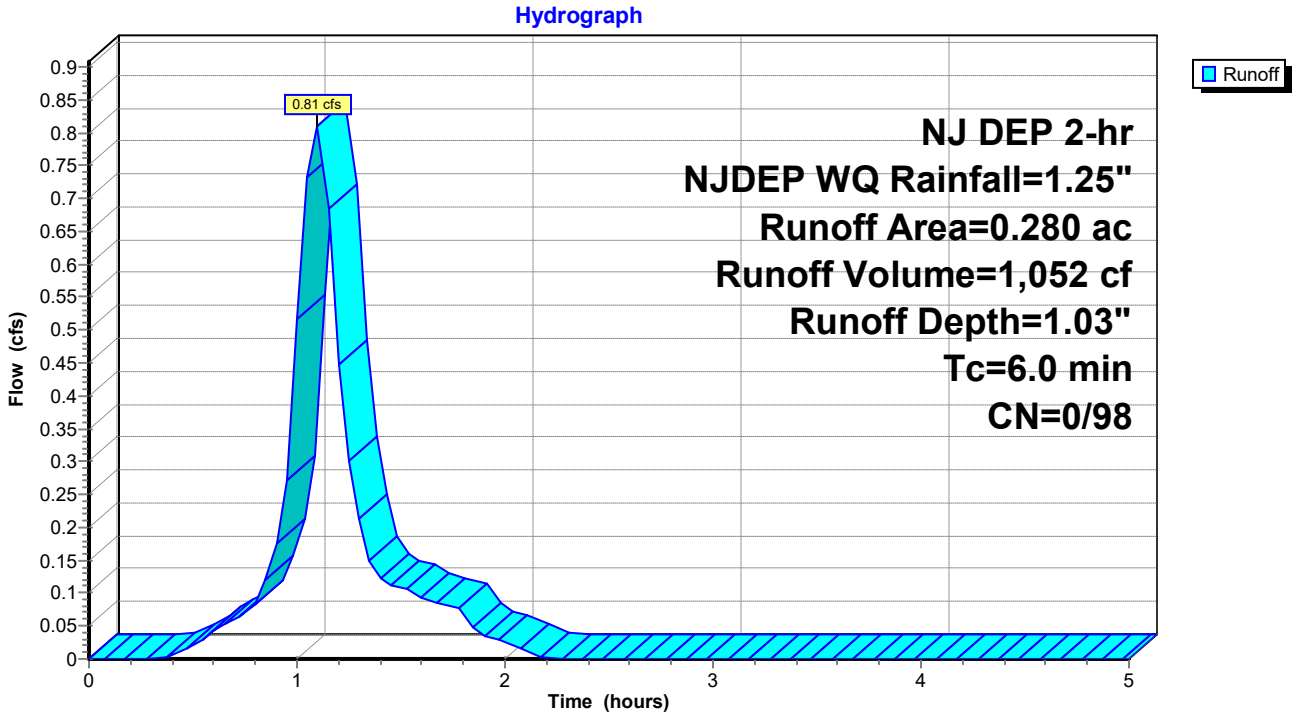
Runoff = 0.81 cfs @ 1.09 hrs, Volume= 1,052 cf, Depth= 1.03"
Routed to Pond 6P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.280	98	
	0.280	98	100.00% Impervious Area

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

Subcatchment 6S: DA 6



Summary for Pond 6P: Filterra 8x12.5

Inflow Area = 0.280 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.81 cfs @ 1.09 hrs, Volume= 1,052 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 1,338 cf, Atten= 14%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 1,338 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.26' @ 1.14 hrs Surf.Area= 0.002 ac Storage= 26 cf

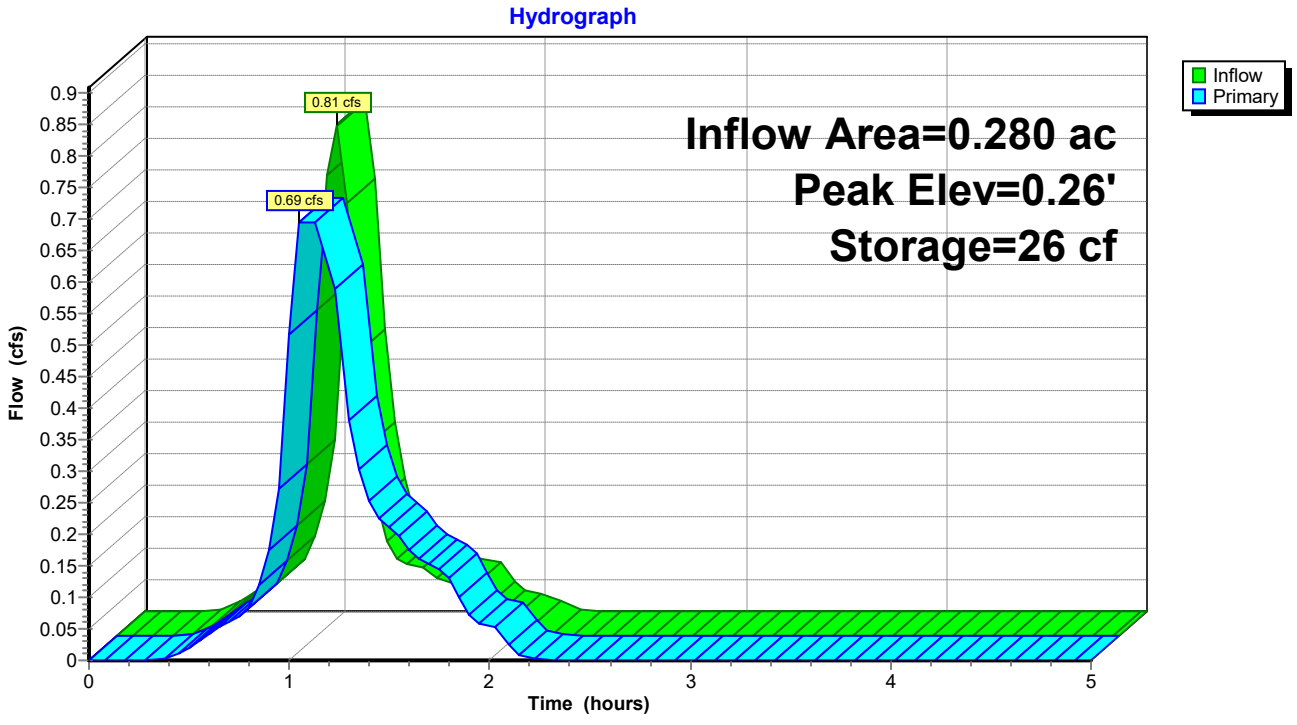
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.4 min (74.7 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 6P: Filterra 8x12.5



Summary for Subcatchment 7S: DA 7

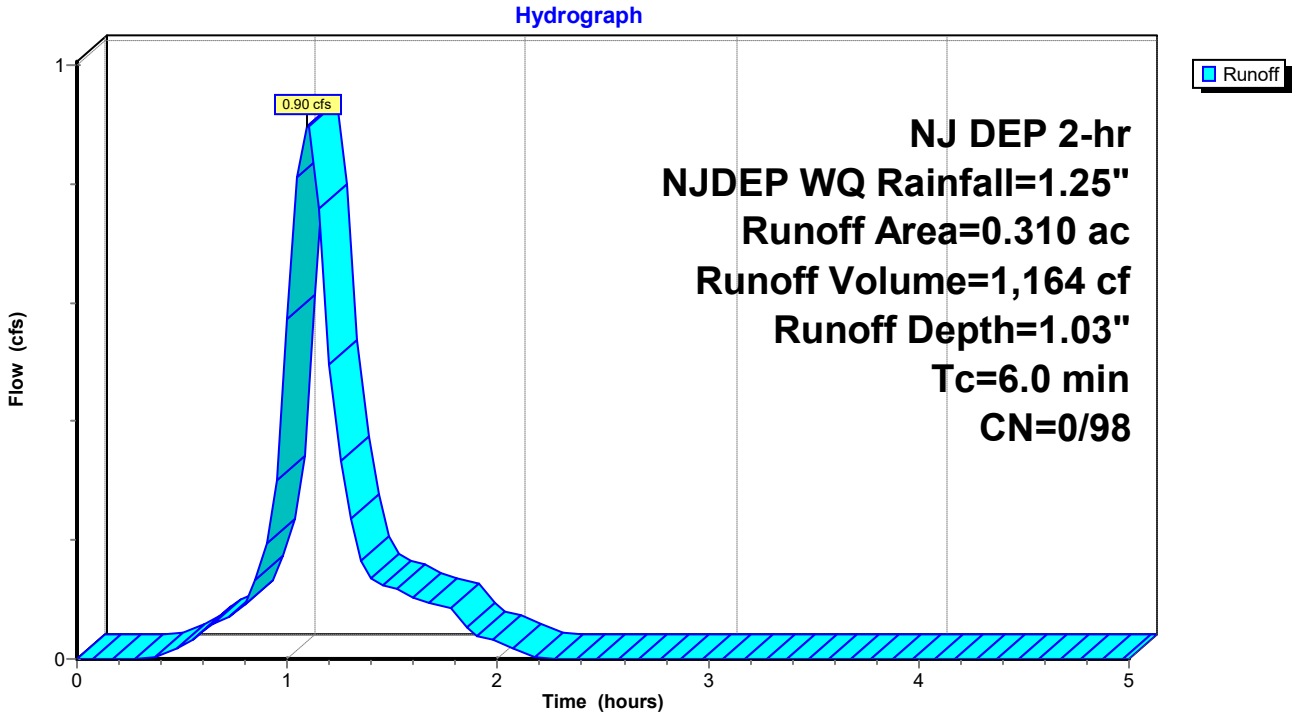
Runoff = 0.90 cfs @ 1.09 hrs, Volume= 1,164 cf, Depth= 1.03"
Routed to Pond 7P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.310	98	
	0.310	98	100.00% Impervious Area

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

Subcatchment 7S: DA 7



Summary for Pond 7P: Filterra 8x12.5

Inflow Area = 0.310 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.90 cfs @ 1.09 hrs, Volume= 1,164 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf, Atten= 23%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.59' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 59 cf

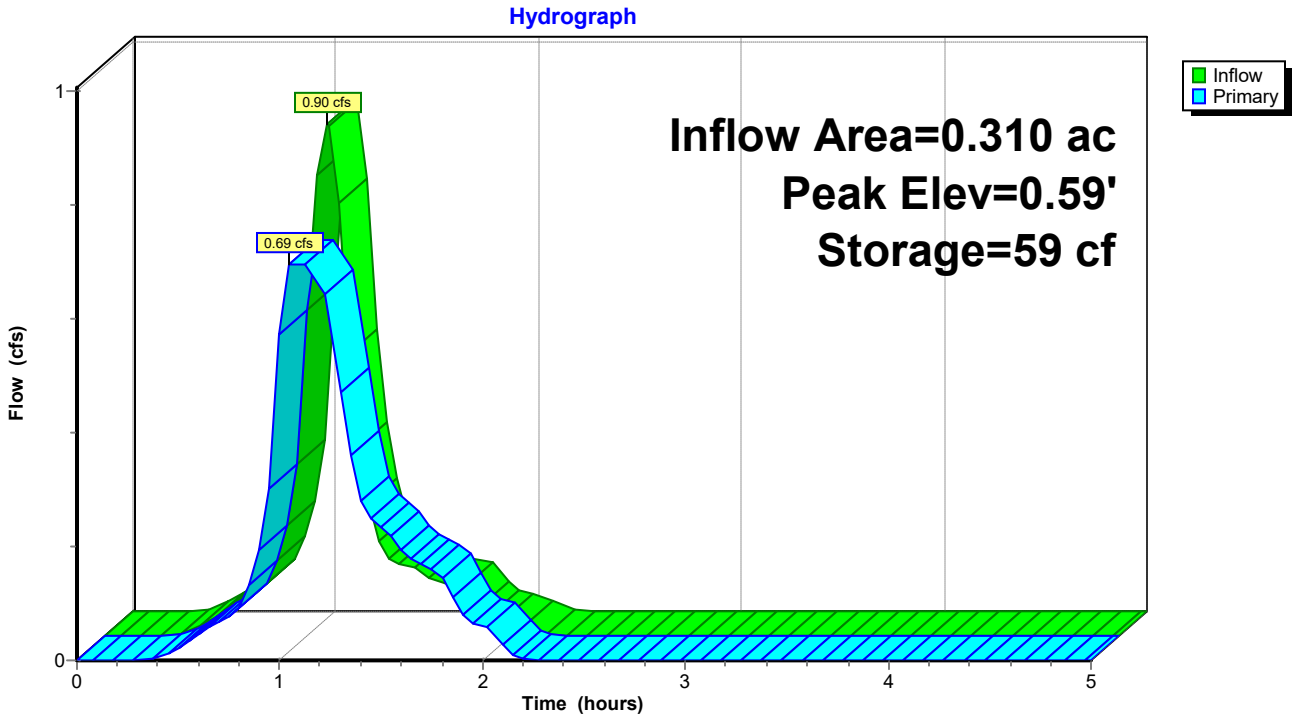
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (75.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 7P: Filterra 8x12.5



Summary for Subcatchment 8S: DA 8

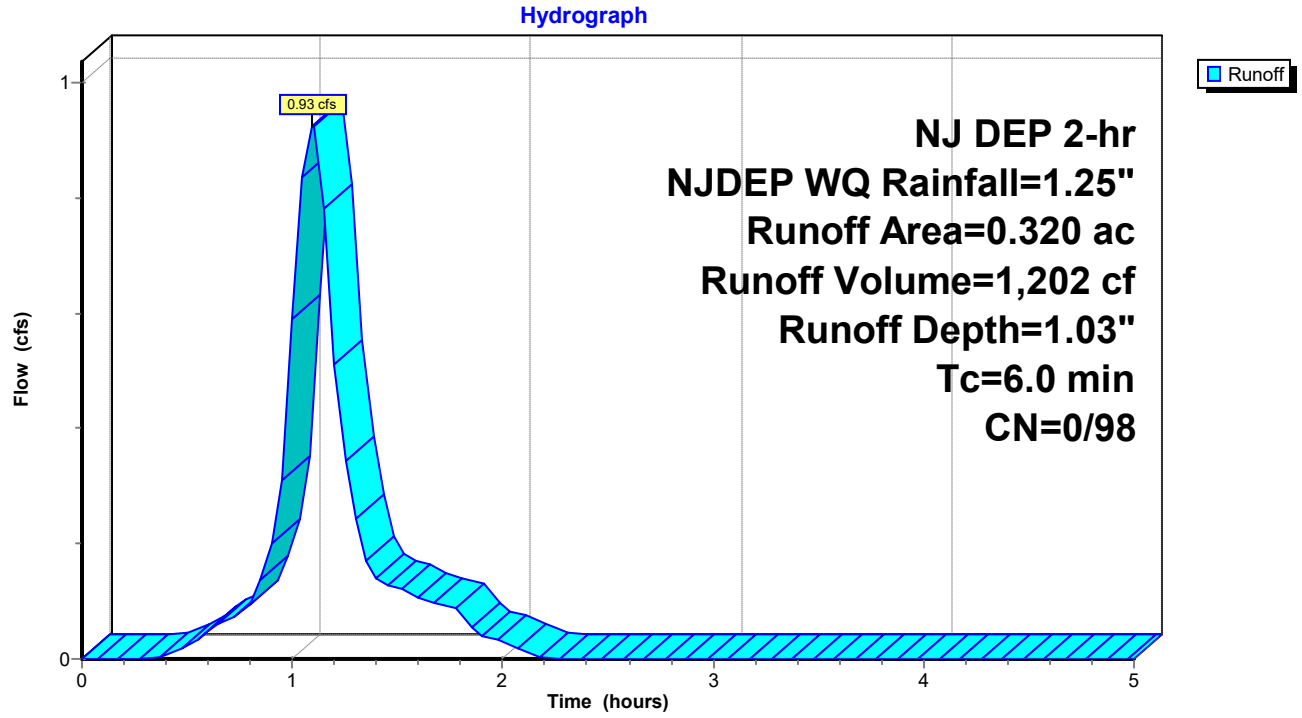
Runoff = 0.93 cfs @ 1.09 hrs, Volume= 1,202 cf, Depth= 1.03"
Routed to Pond 8P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.320	98	
	0.320	98	100.00% Impervious Area

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

Subcatchment 8S: DA 8



Summary for Pond 8P: Filterra 8x12.5

Inflow Area = 0.320 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.93 cfs @ 1.09 hrs, Volume= 1,202 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 1,272 cf, Atten= 25%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 1,272 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.72' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 72 cf

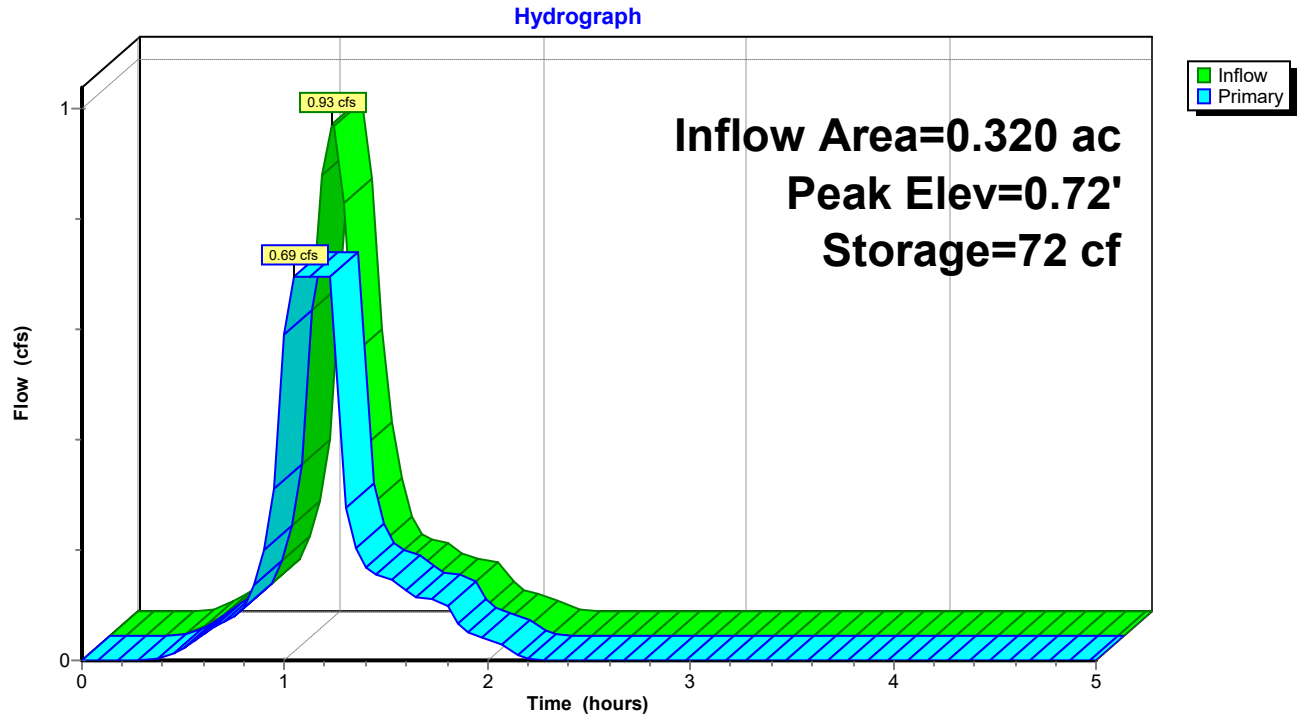
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.8 min (72.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.09' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 8P: Filterra 8x12.5



Summary for Subcatchment 9S: DA 9

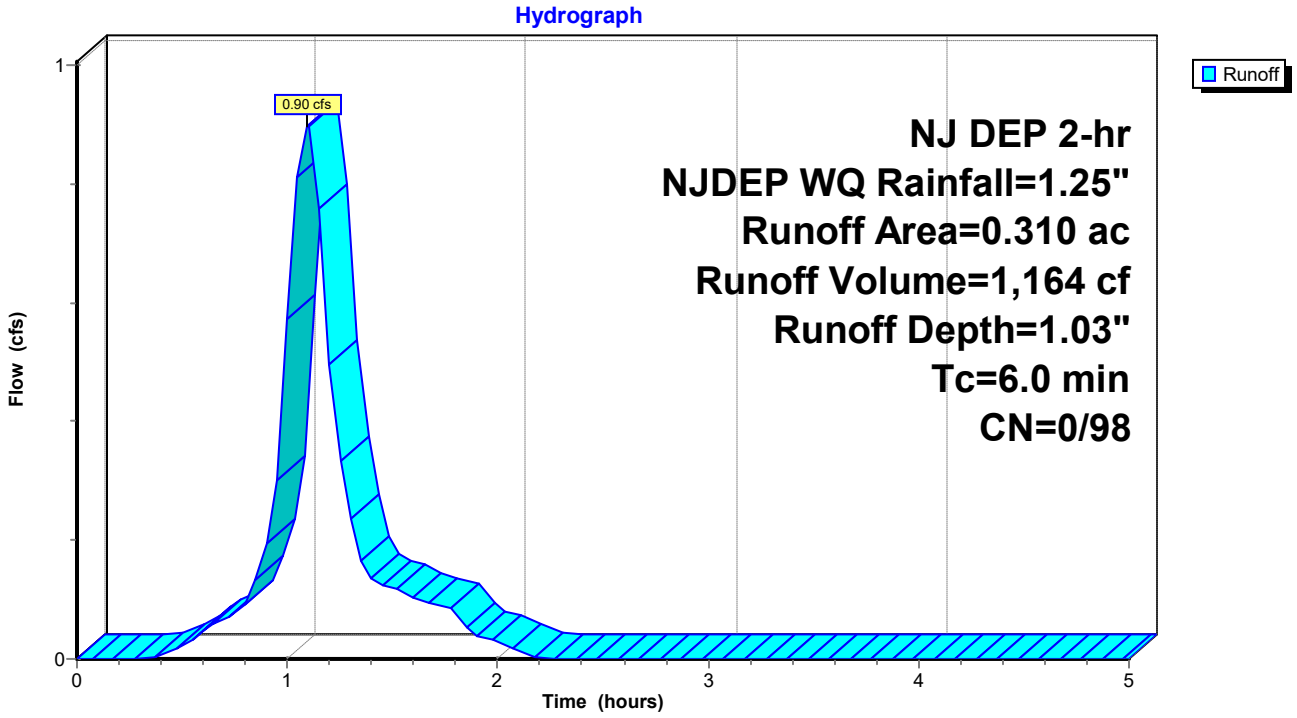
Runoff = 0.90 cfs @ 1.09 hrs, Volume= 1,164 cf, Depth= 1.03"
Routed to Pond 9P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.310	98	
	0.310	98	100.00% Impervious Area

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

Subcatchment 9S: DA 9



Summary for Pond 9P: Filterra 8x12.5

Inflow Area = 0.310 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.90 cfs @ 1.09 hrs, Volume= 1,164 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf, Atten= 23%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.59' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 59 cf

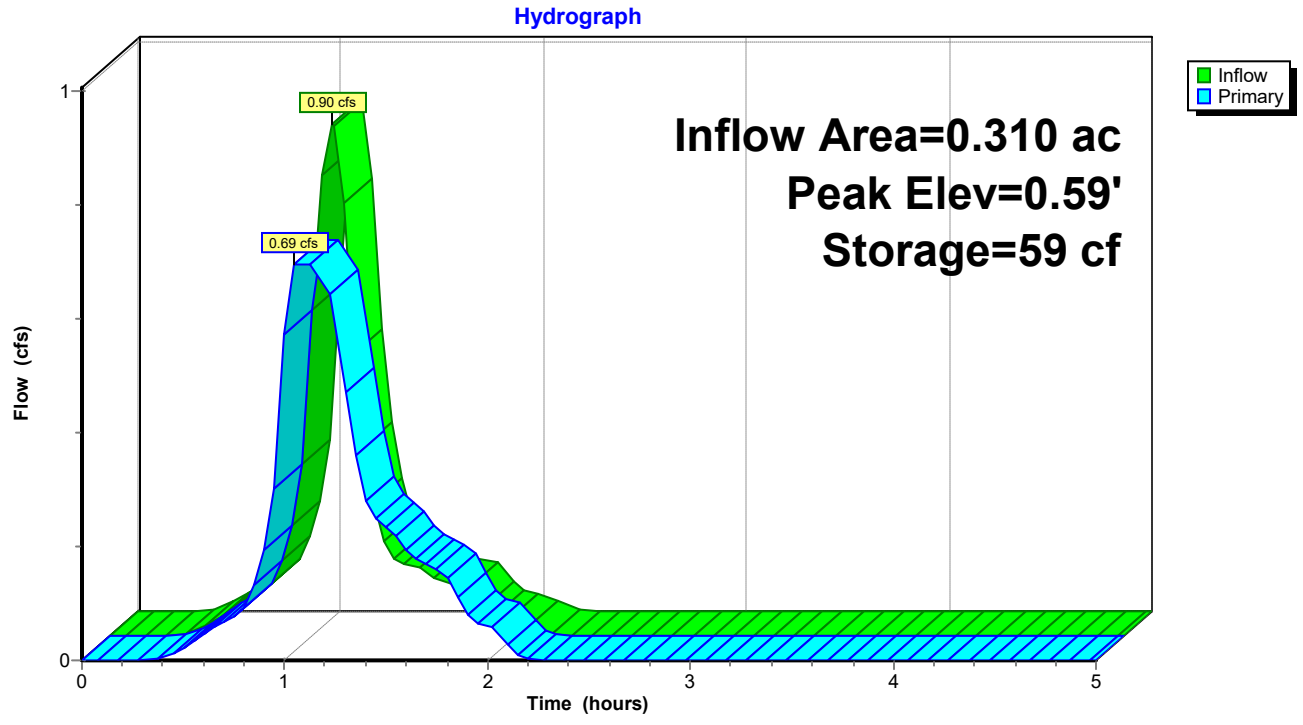
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (75.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 9P: Filterra 8x12.5



Summary for Subcatchment 10S: DA 10

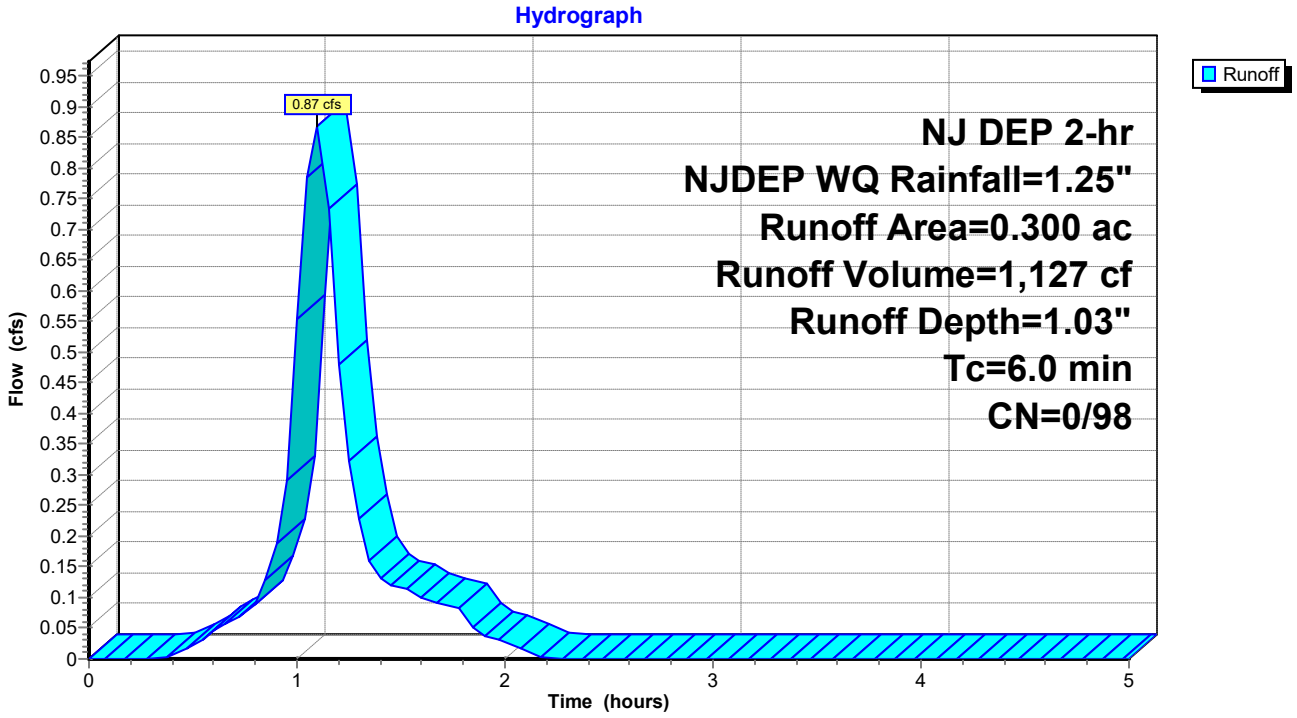
Runoff = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf, Depth= 1.03"
Routed to Pond 10P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.300	98	
	0.300	98	100.00% Impervious Area

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

Subcatchment 10S: DA 10



Summary for Pond 10P: Filterra 8x12.5

Inflow Area = 0.300 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 951 cf, Atten= 20%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 951 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.48' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 48 cf

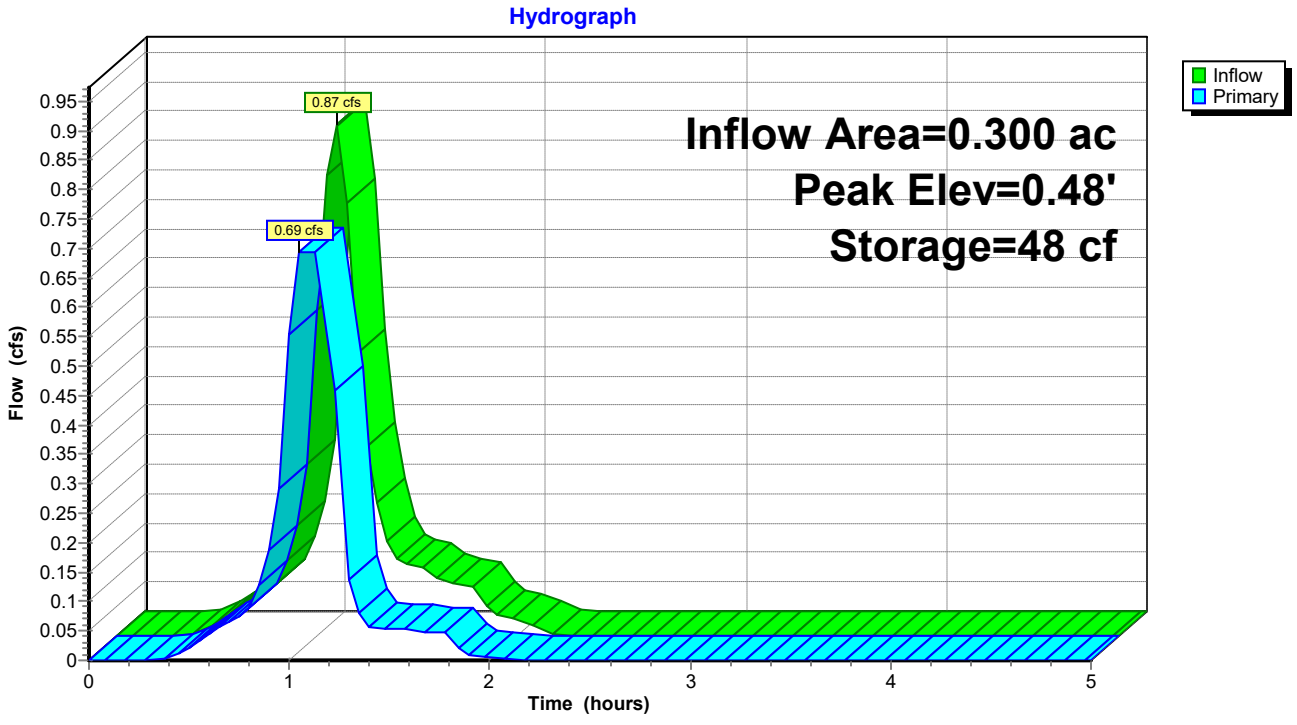
Plug-Flow detention time= 2.2 min calculated for 951 cf (84% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 10P: Filterra 8x12.5



Summary for Subcatchment 11S: DA 11

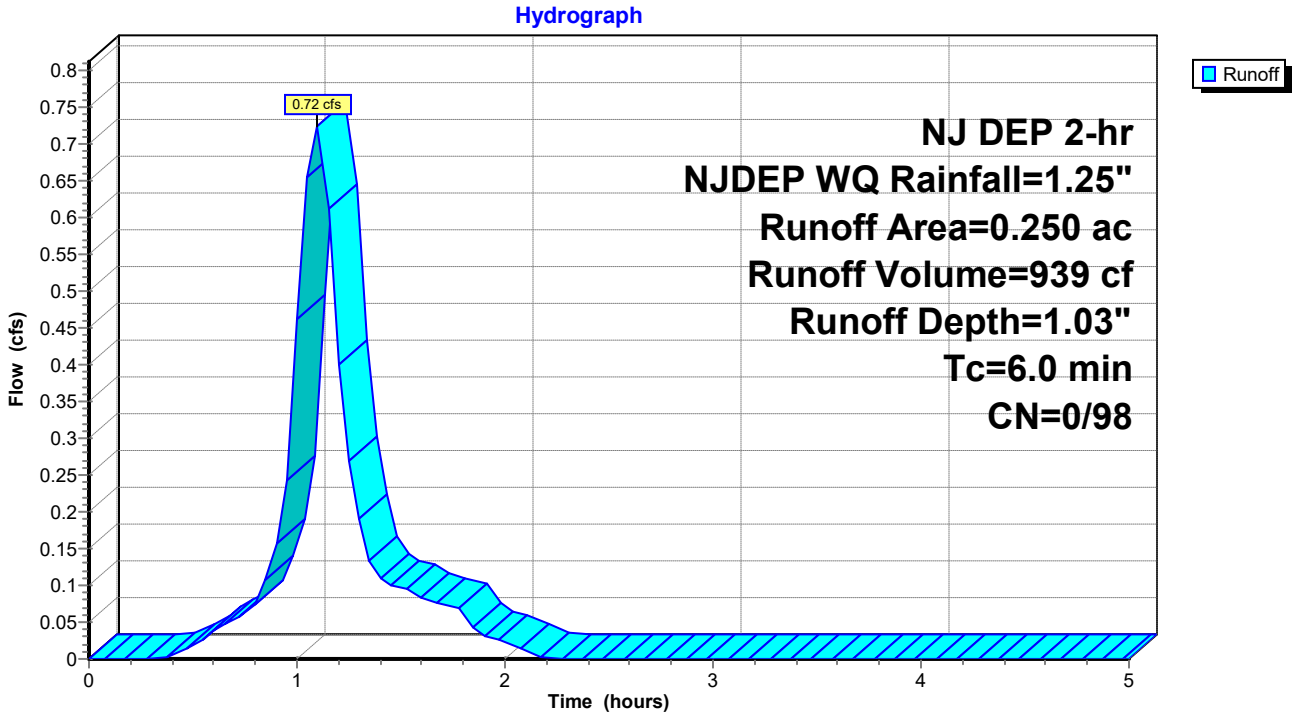
Runoff = 0.72 cfs @ 1.09 hrs, Volume= 939 cf, Depth= 1.03"
Routed to Pond 11P : Filterra 8x10.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.250	98	
	0.250	98	100.00% Impervious Area

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

Subcatchment 11S: DA 11



Summary for Pond 11P: Filterra 8x10.5

Inflow Area = 0.250 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.72 cfs @ 1.09 hrs, Volume= 939 cf
Outflow = 0.58 cfs @ 1.05 hrs, Volume= 701 cf, Atten= 19%, Lag= 0.0 min
Primary = 0.58 cfs @ 1.05 hrs, Volume= 701 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.45' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 38 cf

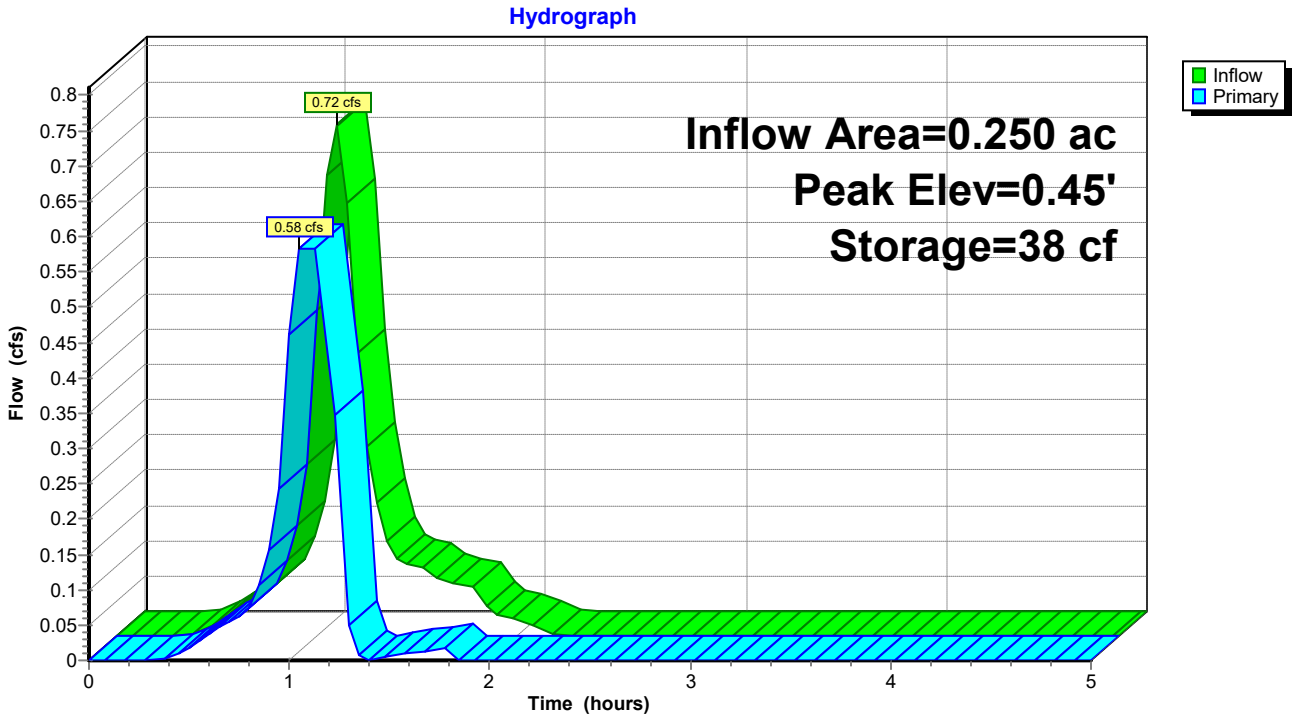
Plug-Flow detention time= 1.2 min calculated for 701 cf (75% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	63 cf	**8.00'W x 10.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.58 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.58 cfs @ 0.01 fps)

Pond 11P: Filterra 8x10.5



Summary for Subcatchment 12S: DA 12

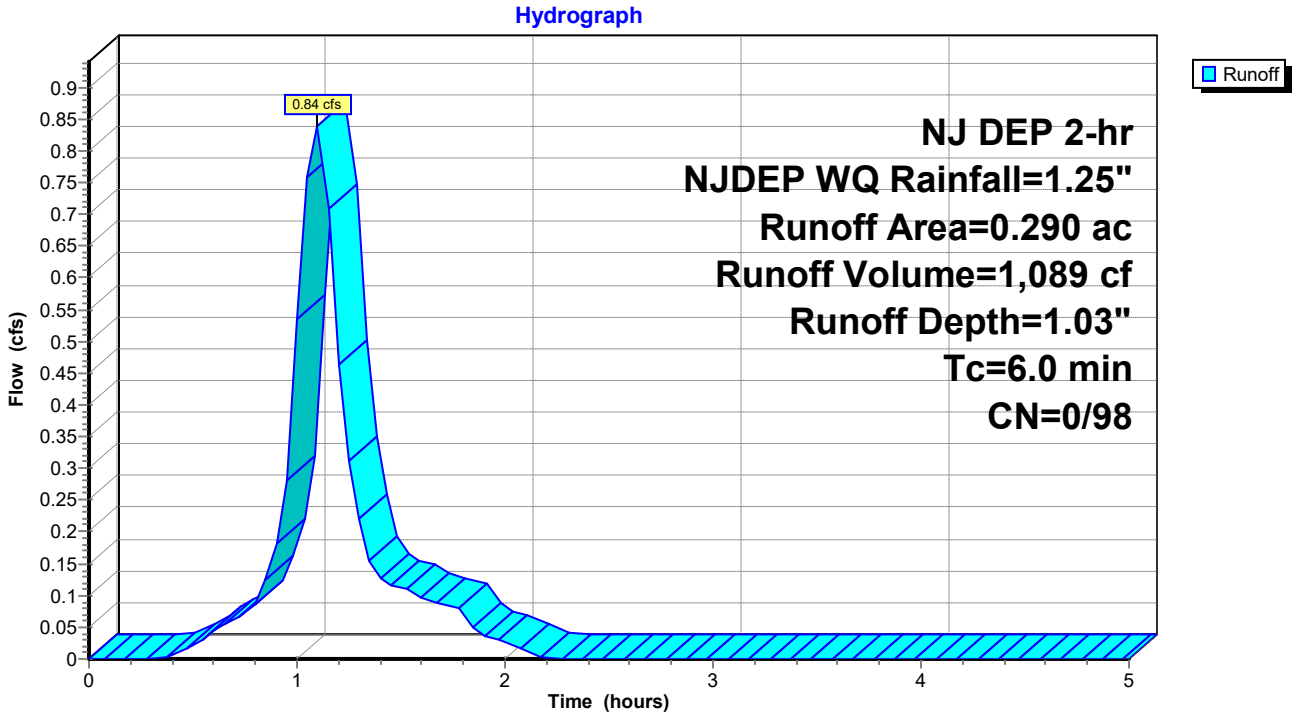
Runoff = 0.84 cfs @ 1.09 hrs, Volume= 1,089 cf, Depth= 1.03"
Routed to Pond 12P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.290	98	
	0.290	98	100.00% Impervious Area

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

Subcatchment 12S: DA 12



Summary for Pond 12P: Filterra 8x12.5

Inflow Area = 0.290 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.84 cfs @ 1.09 hrs, Volume= 1,089 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 883 cf, Atten= 17%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 883 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.37' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 37 cf

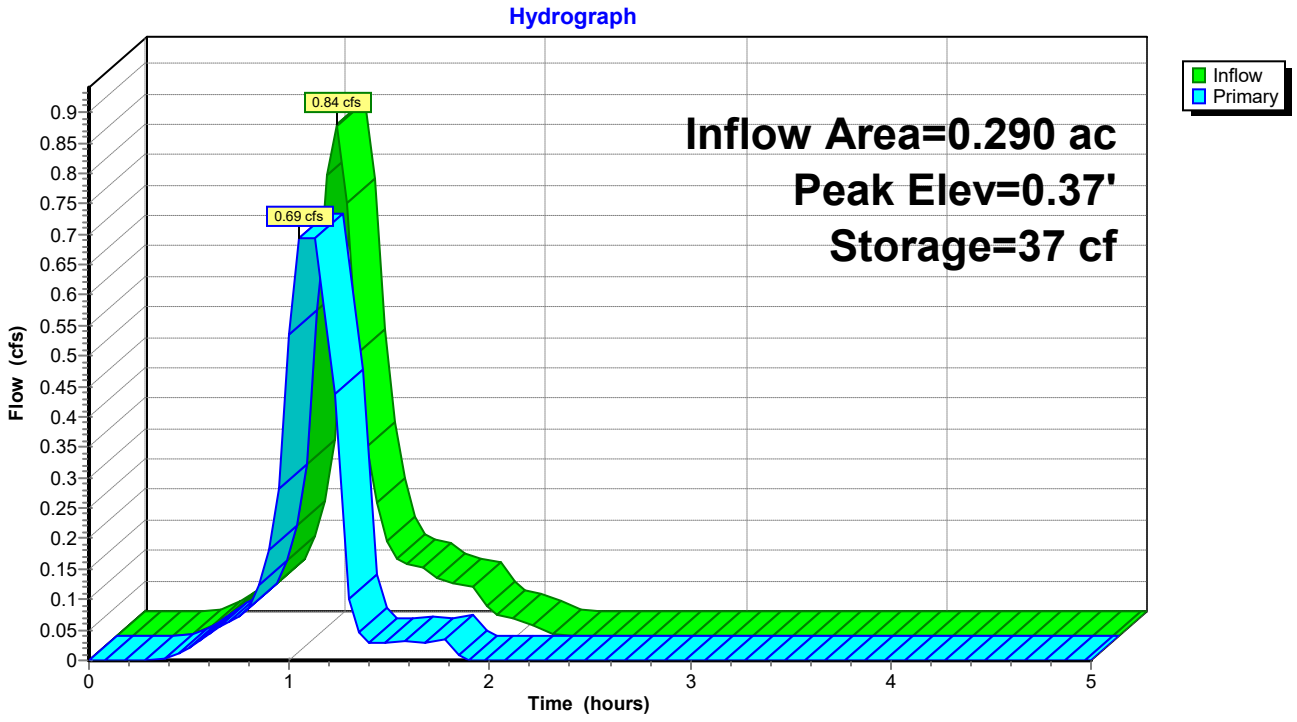
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 12P: Filterra 8x12.5



Summary for Subcatchment 13S: DA 13

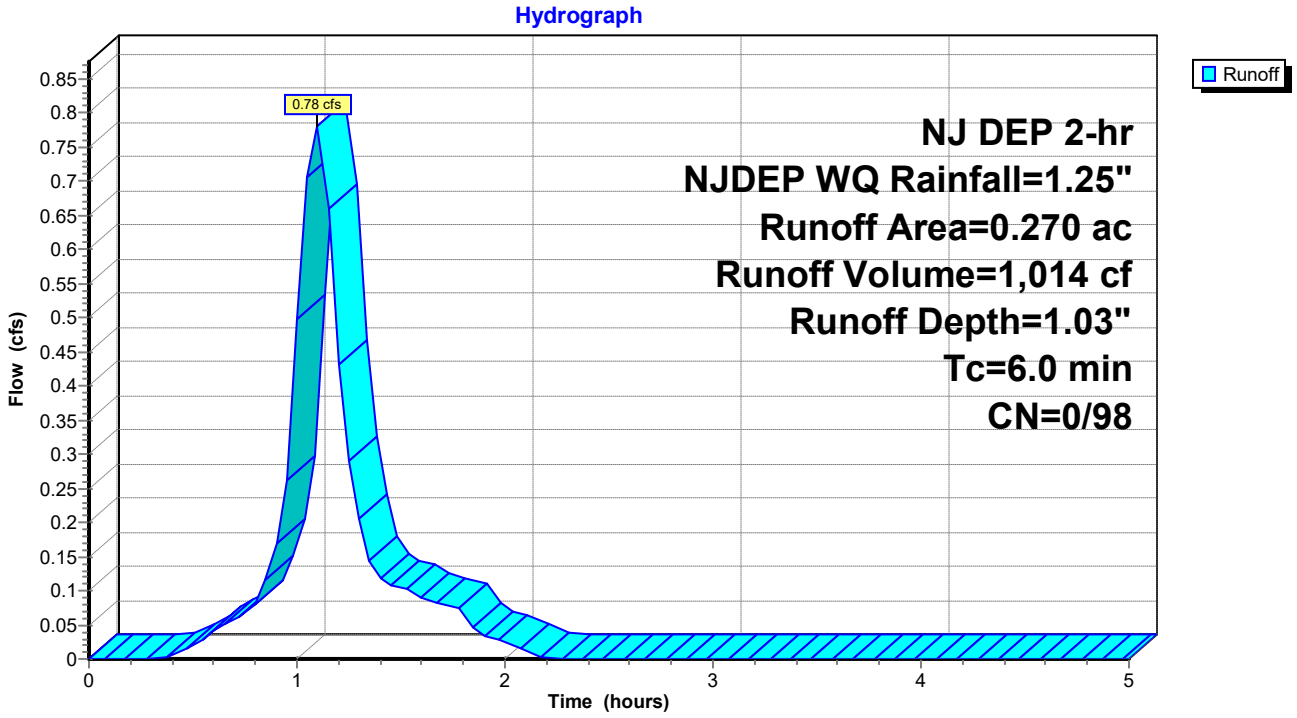
Runoff = 0.78 cfs @ 1.09 hrs, Volume= 1,014 cf, Depth= 1.03"
Routed to Pond 13P : Filterra 8x10.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.270	98	
	0.270	98	100.00% Impervious Area

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

Subcatchment 13S: DA 13



Summary for Pond 13P: Filterra 8x10.5

Inflow Area = 0.270 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.78 cfs @ 1.09 hrs, Volume= 1,014 cf
Outflow = 0.58 cfs @ 1.05 hrs, Volume= 992 cf, Atten= 25%, Lag= 0.0 min
Primary = 0.58 cfs @ 1.05 hrs, Volume= 992 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.74' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 62 cf

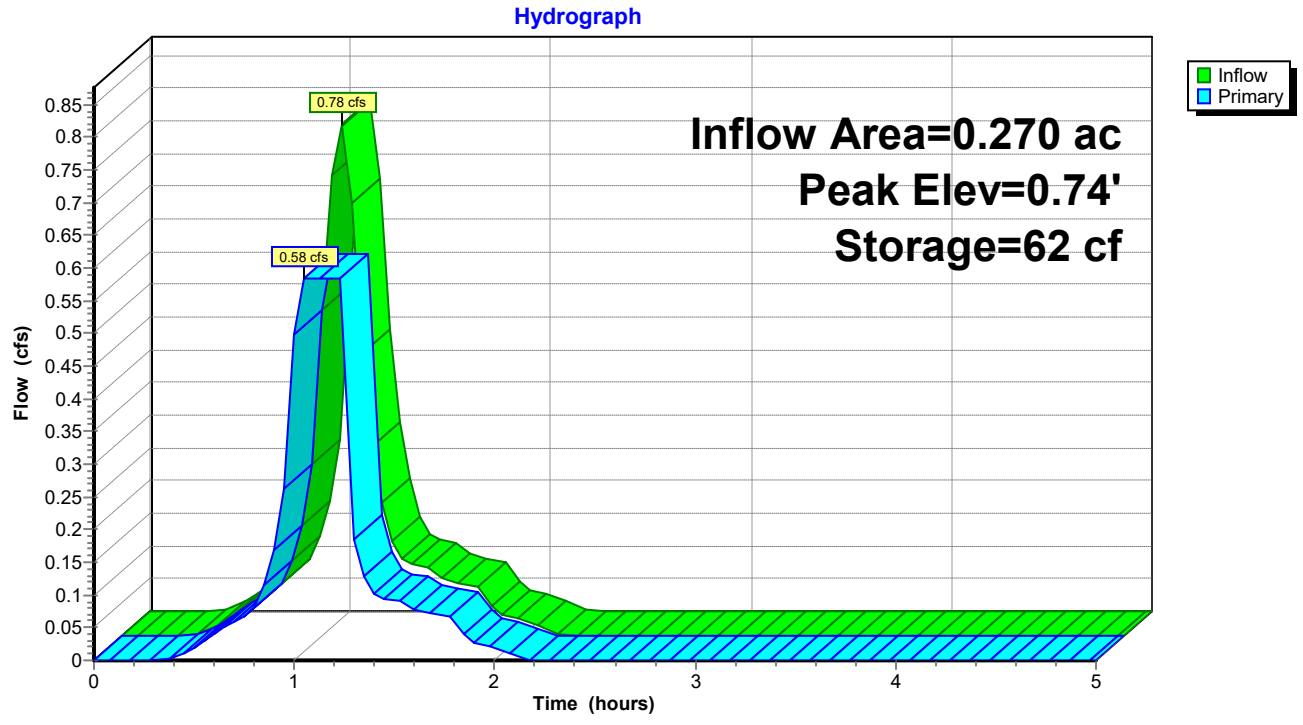
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	63 cf	**8.00'W x 10.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.58 cfs @ 1.05 hrs HW=0.09' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.58 cfs @ 0.01 fps)

Pond 13P: Filterra 8x10.5



Summary for Subcatchment 14S: DA 14

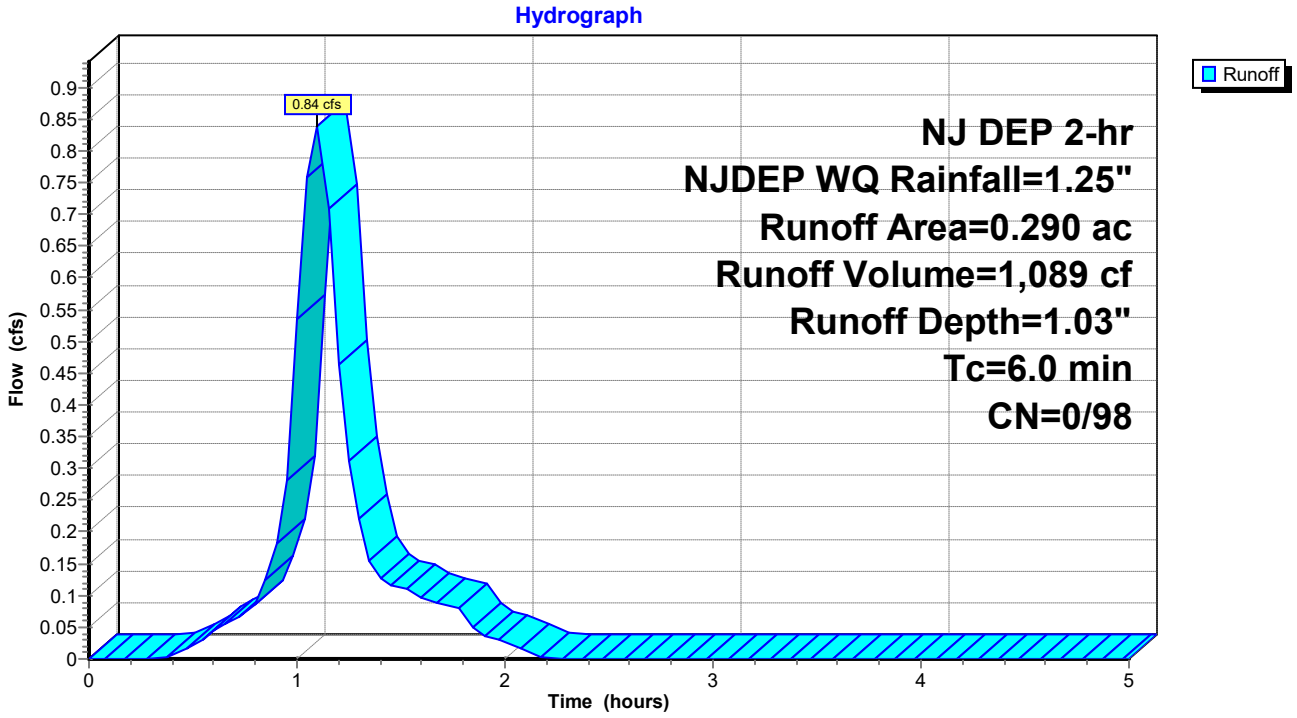
Runoff = 0.84 cfs @ 1.09 hrs, Volume= 1,089 cf, Depth= 1.03"
Routed to Pond 14P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.290	98	
	0.290	98	100.00% Impervious Area

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

Subcatchment 14S: DA 14



Summary for Pond 14P: Filterra 8x12.5

Inflow Area = 0.290 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.84 cfs @ 1.09 hrs, Volume= 1,089 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 883 cf, Atten= 17%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 883 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.37' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 37 cf

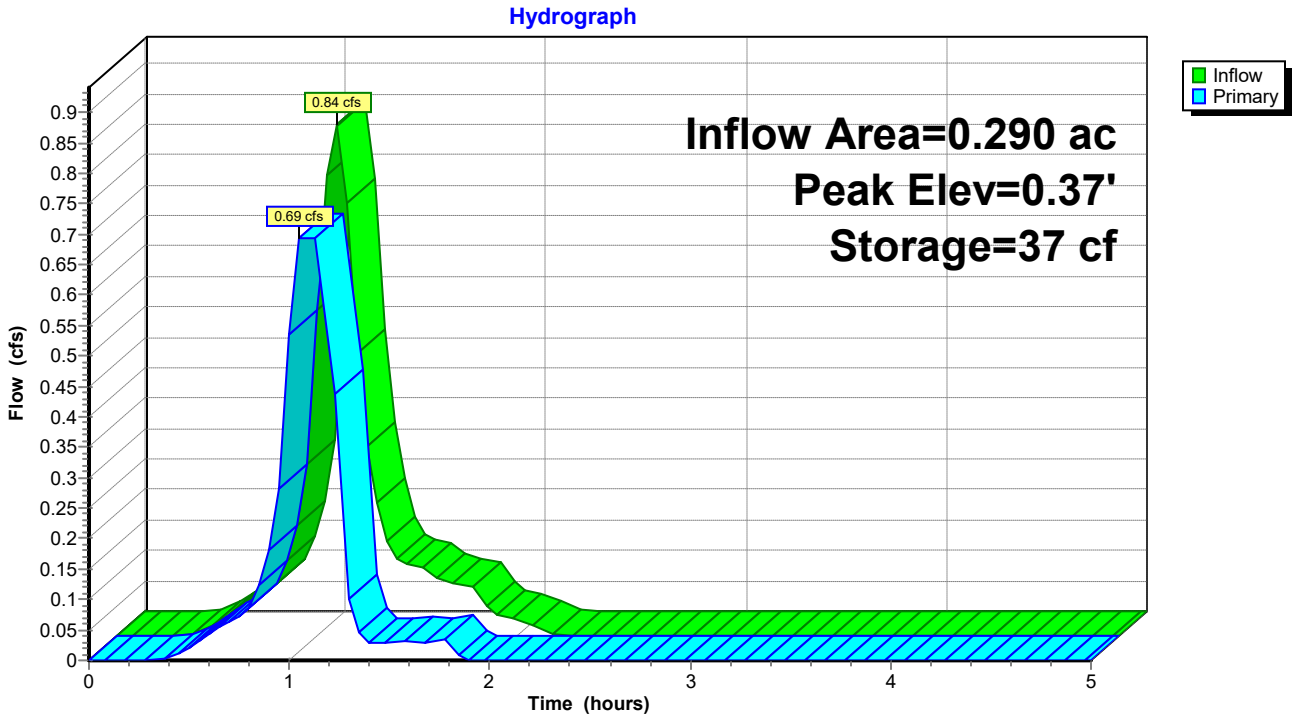
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 14P: Filterra 8x12.5



Summary for Subcatchment 15S: DA 15

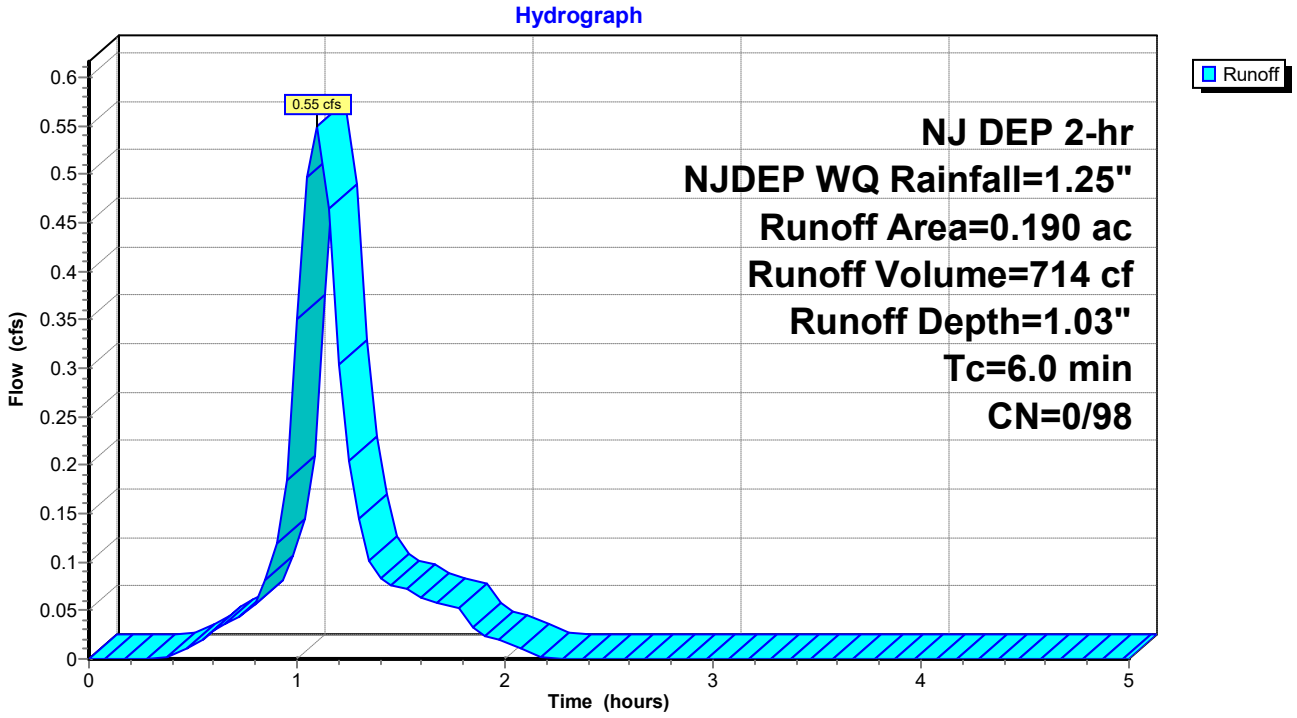
Runoff = 0.55 cfs @ 1.09 hrs, Volume= 714 cf, Depth= 1.03"
Routed to Pond 15P : Filterra 6x10

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.190	98	
	0.190	98	100.00% Impervious Area

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

Subcatchment 15S: DA 15



Summary for Pond 15P: Filterra 6x10

Inflow Area = 0.190 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.55 cfs @ 1.09 hrs, Volume= 714 cf
Outflow = 0.42 cfs @ 1.05 hrs, Volume= 879 cf, Atten= 24%, Lag= 0.0 min
Primary = 0.42 cfs @ 1.05 hrs, Volume= 879 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.68' @ 1.16 hrs Surf.Area= 0.001 ac Storage= 41 cf

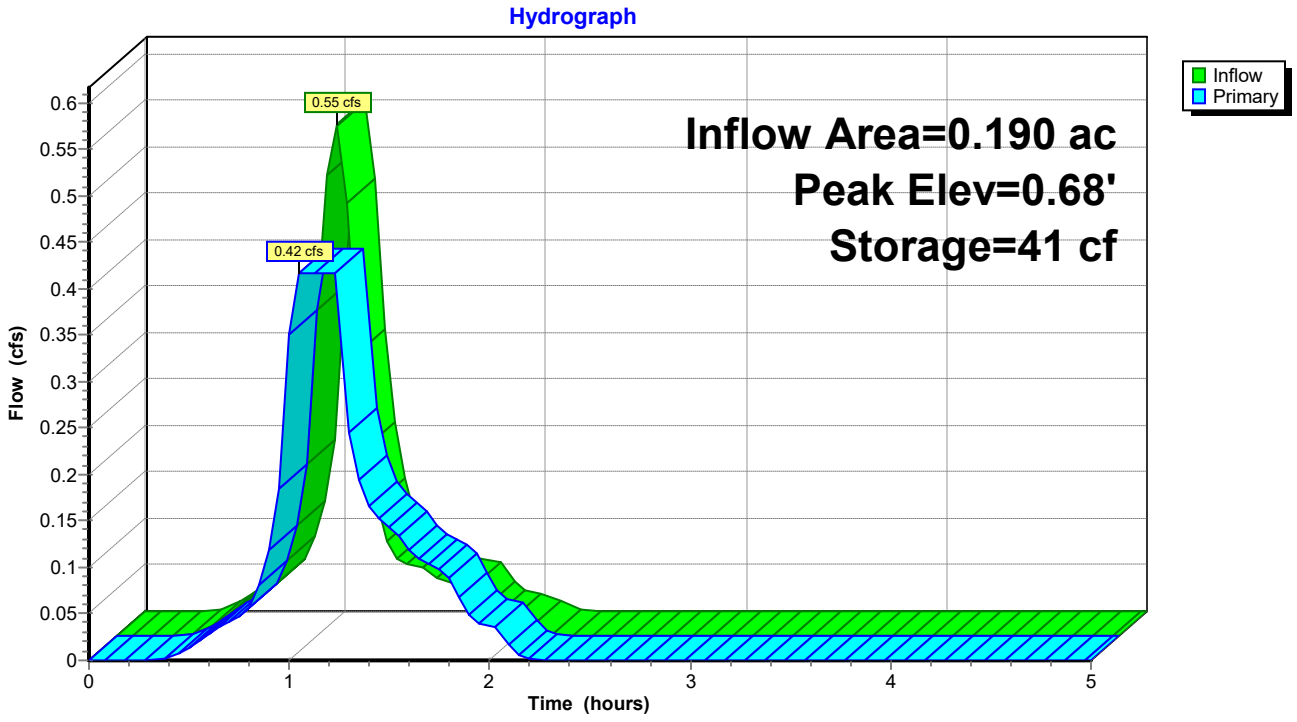
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (75.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	45 cf	**6.00'W x 10.00'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.42 cfs @ 1.05 hrs HW=0.08' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.42 cfs @ 0.01 fps)

Pond 15P: Filterra 6x10



Summary for Subcatchment 16S: DA 16

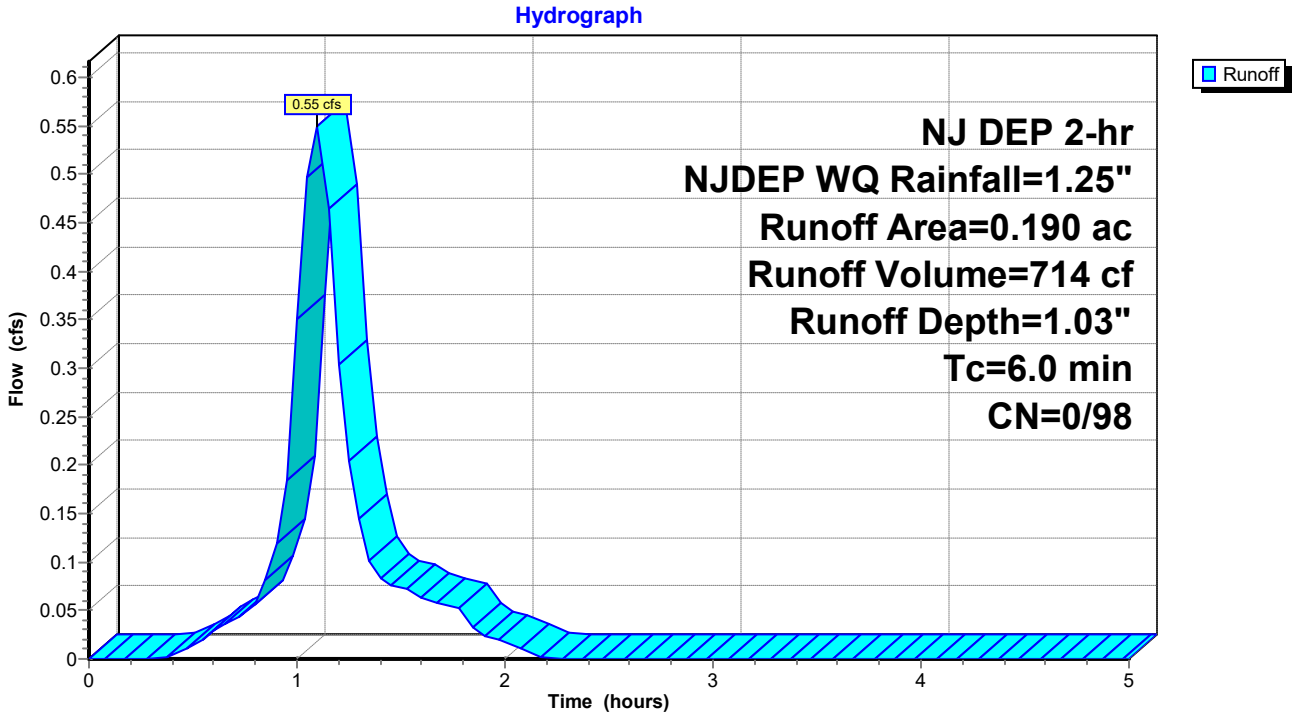
Runoff = 0.55 cfs @ 1.09 hrs, Volume= 714 cf, Depth= 1.03"
Routed to Pond 16P : Filterra 6x10

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.190	98	
	0.190	98	100.00% Impervious Area

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

Subcatchment 16S: DA 16



Summary for Pond 16P: Filterra 6x10

Inflow Area = 0.190 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.55 cfs @ 1.09 hrs, Volume= 714 cf
Outflow = 0.42 cfs @ 1.05 hrs, Volume= 879 cf, Atten= 24%, Lag= 0.0 min
Primary = 0.42 cfs @ 1.05 hrs, Volume= 879 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.68' @ 1.16 hrs Surf.Area= 0.001 ac Storage= 41 cf

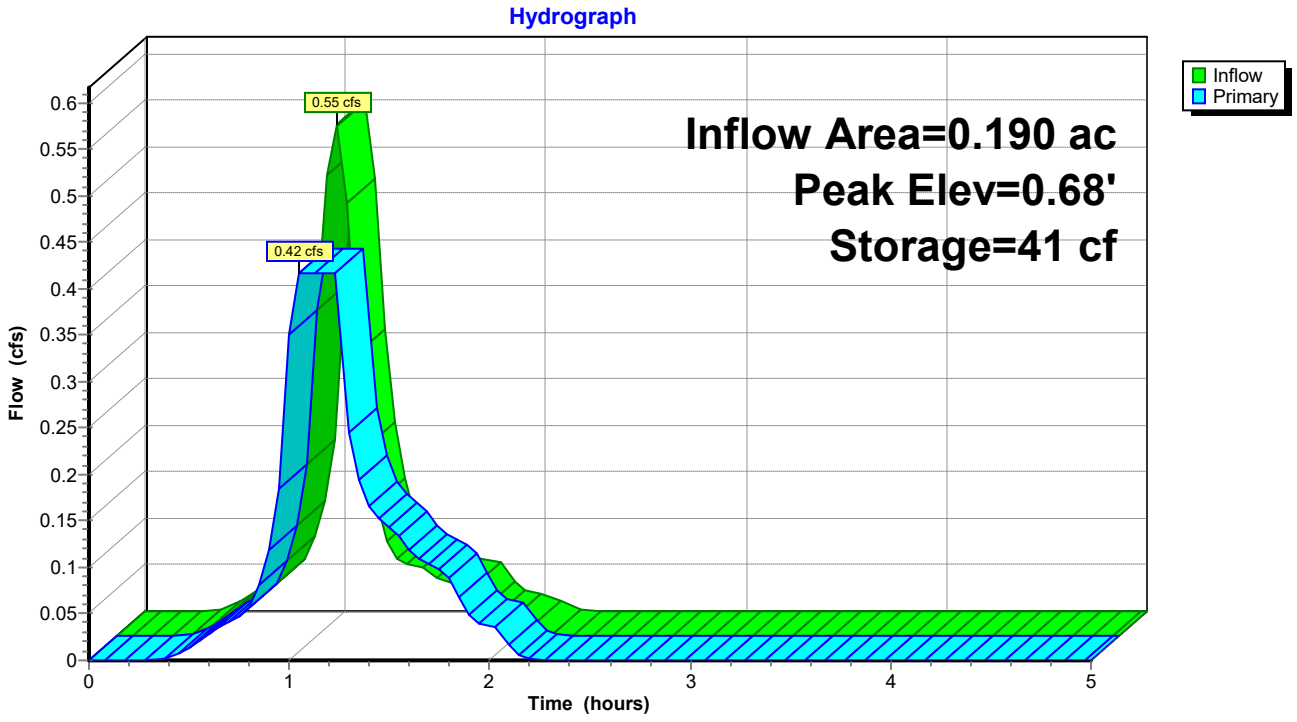
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (75.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	45 cf	**6.00'W x 10.00'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.42 cfs @ 1.05 hrs HW=0.08' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.42 cfs @ 0.01 fps)

Pond 16P: Filterra 6x10



Summary for Subcatchment 17S: DA 17

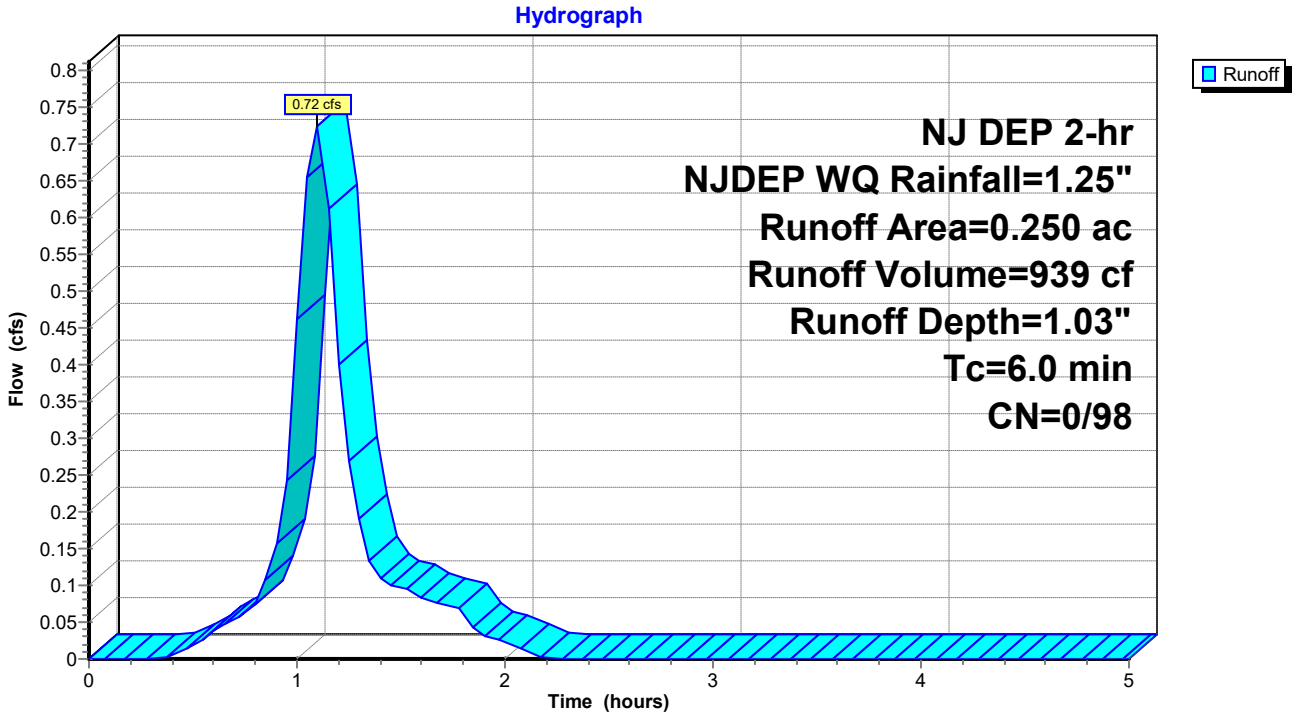
Runoff = 0.72 cfs @ 1.09 hrs, Volume= 939 cf, Depth= 1.03"
Routed to Pond 17P : Filterra 8x10.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.250	98	
	0.250	98	100.00% Impervious Area

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

Subcatchment 17S: DA 17



Summary for Pond 17P: Filterra 8x10.5

Inflow Area = 0.250 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.72 cfs @ 1.09 hrs, Volume= 939 cf
Outflow = 0.58 cfs @ 1.05 hrs, Volume= 701 cf, Atten= 19%, Lag= 0.0 min
Primary = 0.58 cfs @ 1.05 hrs, Volume= 701 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.45' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 38 cf

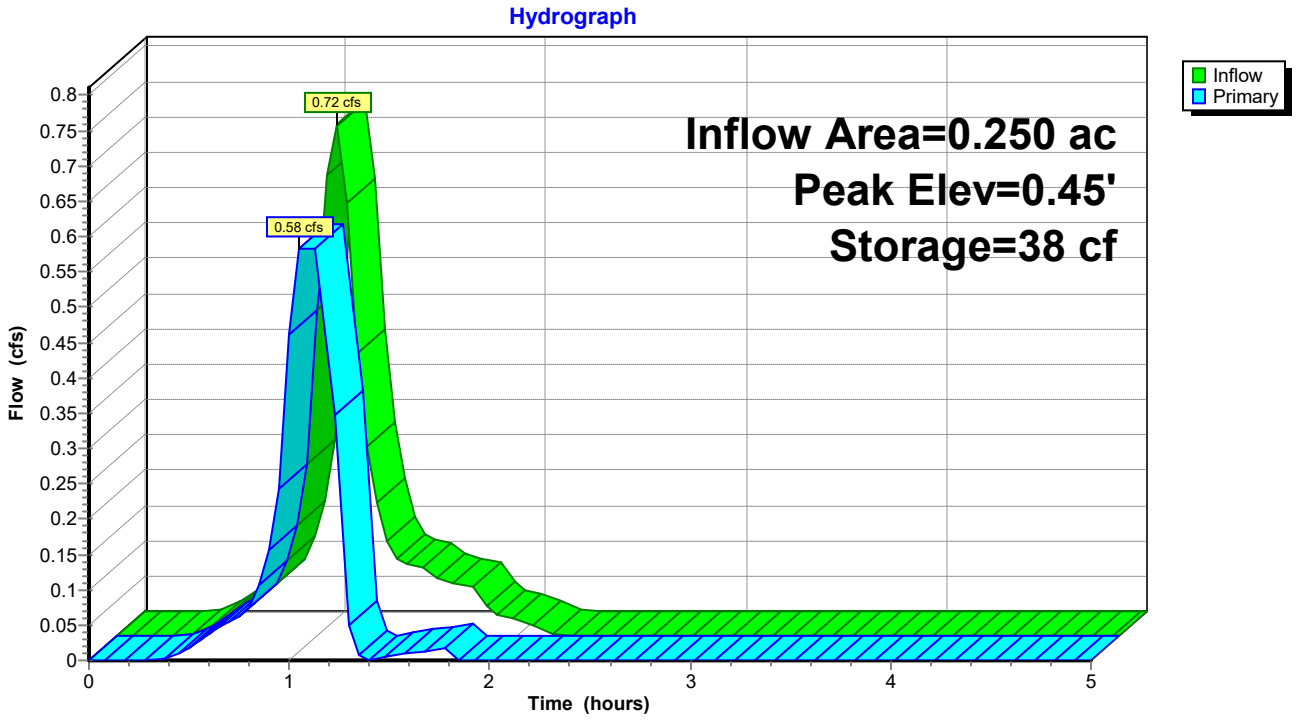
Plug-Flow detention time= 1.2 min calculated for 701 cf (75% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	63 cf	**8.00'W x 10.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.58 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.58 cfs @ 0.01 fps)

Pond 17P: Filterra 8x10.5



Summary for Subcatchment 18S: DA 18

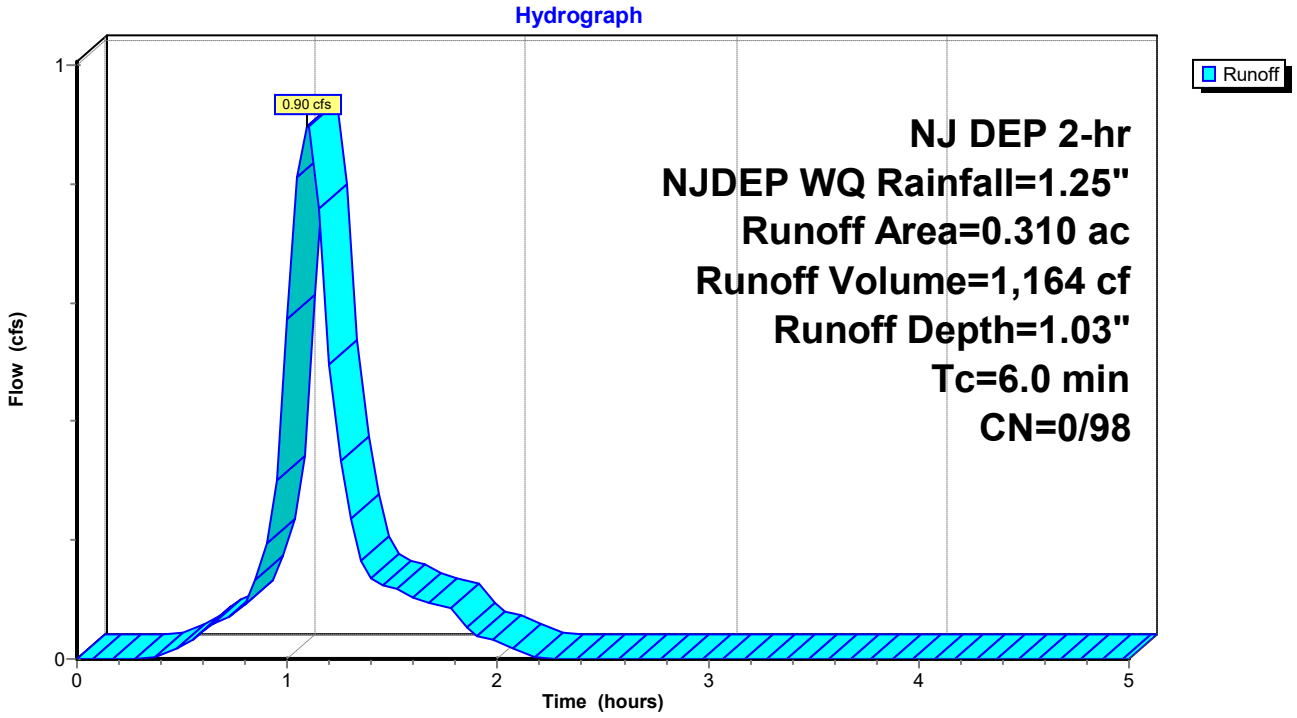
Runoff = 0.90 cfs @ 1.09 hrs, Volume= 1,164 cf, Depth= 1.03"
Routed to Pond 18P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.310	98	
	0.310	98	100.00% Impervious Area

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

Subcatchment 18S: DA 18



Summary for Pond 18P: Filterra 8x12.5

Inflow Area = 0.310 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.90 cfs @ 1.09 hrs, Volume= 1,164 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf, Atten= 23%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.59' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 59 cf

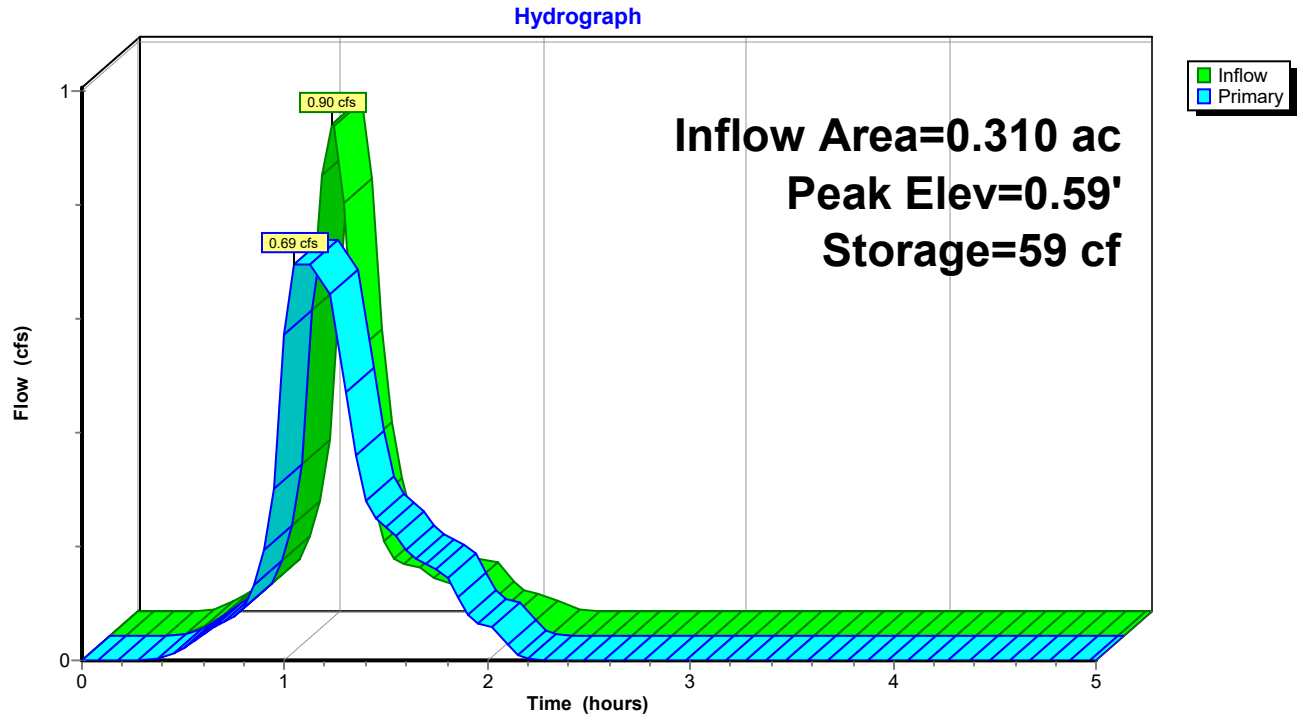
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (75.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 18P: Filterra 8x12.5



Summary for Subcatchment 19S: DA 19

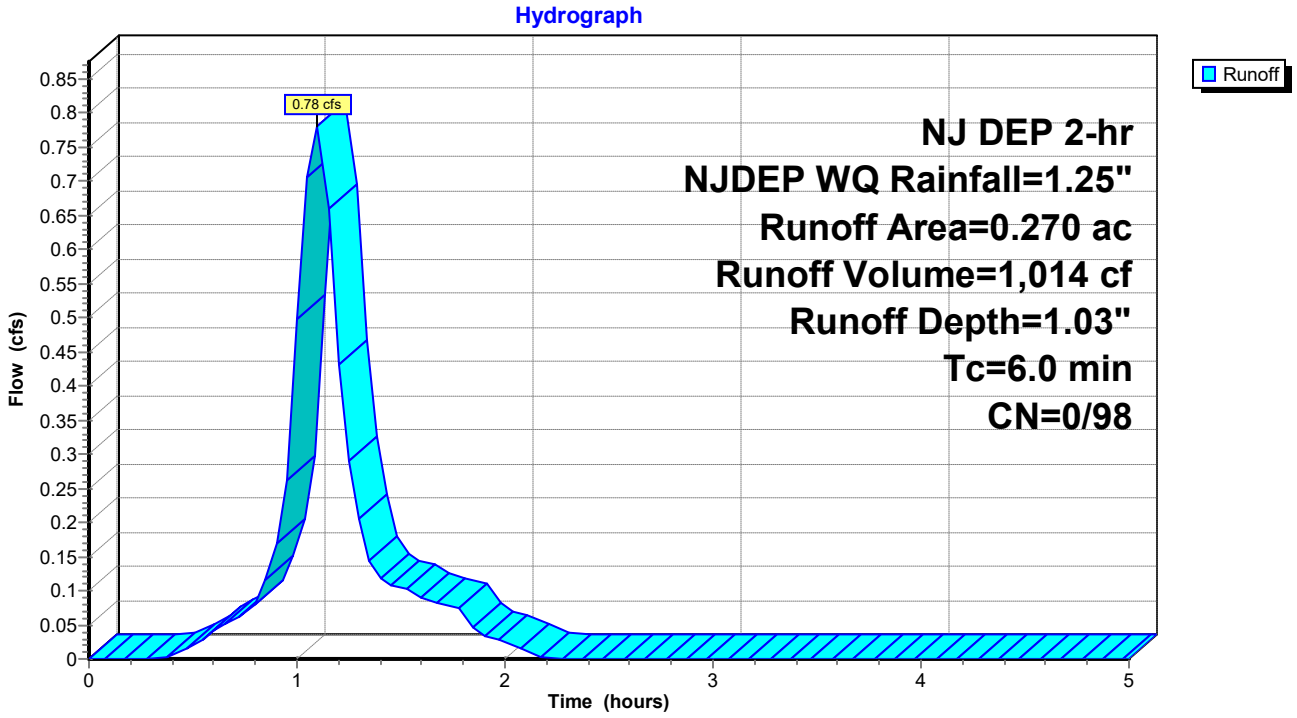
Runoff = 0.78 cfs @ 1.09 hrs, Volume= 1,014 cf, Depth= 1.03"
Routed to Pond 19P : Filterra 8x10.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.270	98	
	0.270	98	100.00% Impervious Area

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

Subcatchment 19S: DA 19



Summary for Pond 19P: Filterra 8x10.5

Inflow Area = 0.270 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.78 cfs @ 1.09 hrs, Volume= 1,014 cf
Outflow = 0.58 cfs @ 1.05 hrs, Volume= 992 cf, Atten= 25%, Lag= 0.0 min
Primary = 0.58 cfs @ 1.05 hrs, Volume= 992 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.74' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 62 cf

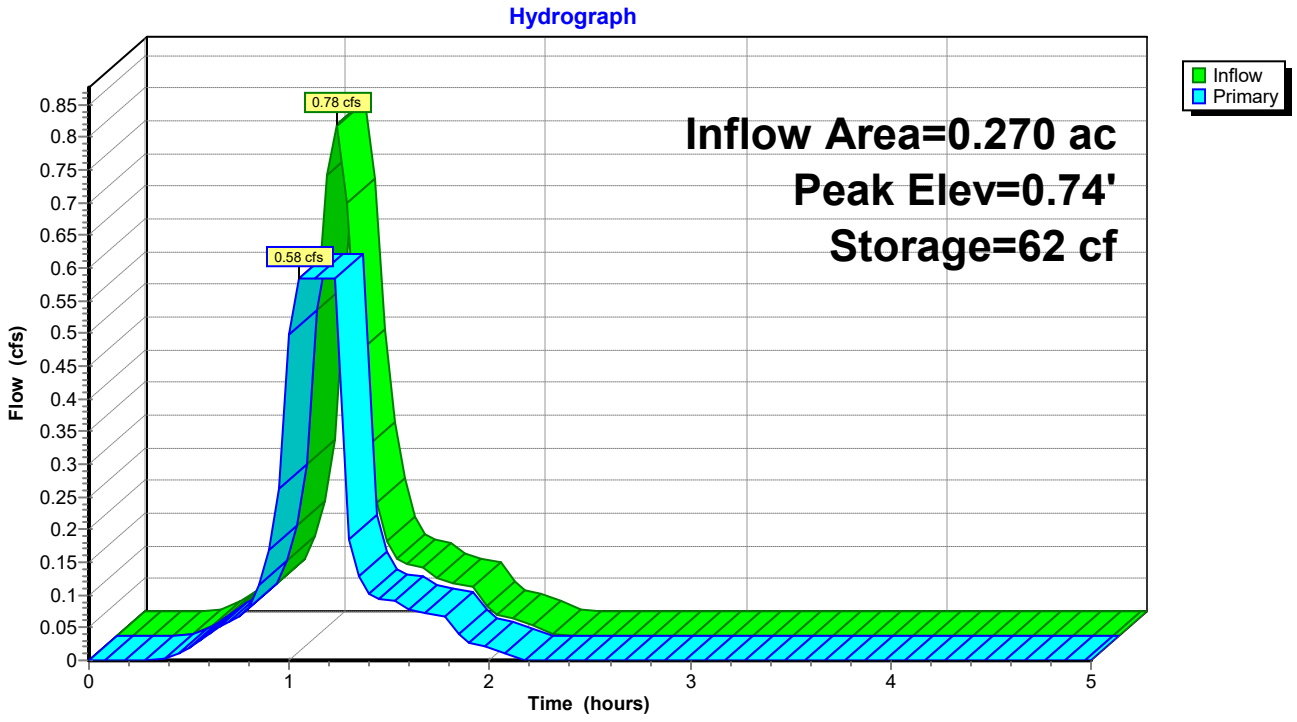
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	63 cf	**8.00'W x 10.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.58 cfs @ 1.05 hrs HW=0.09' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.58 cfs @ 0.01 fps)

Pond 19P: Filterra 8x10.5



Summary for Subcatchment 20S: DA 20

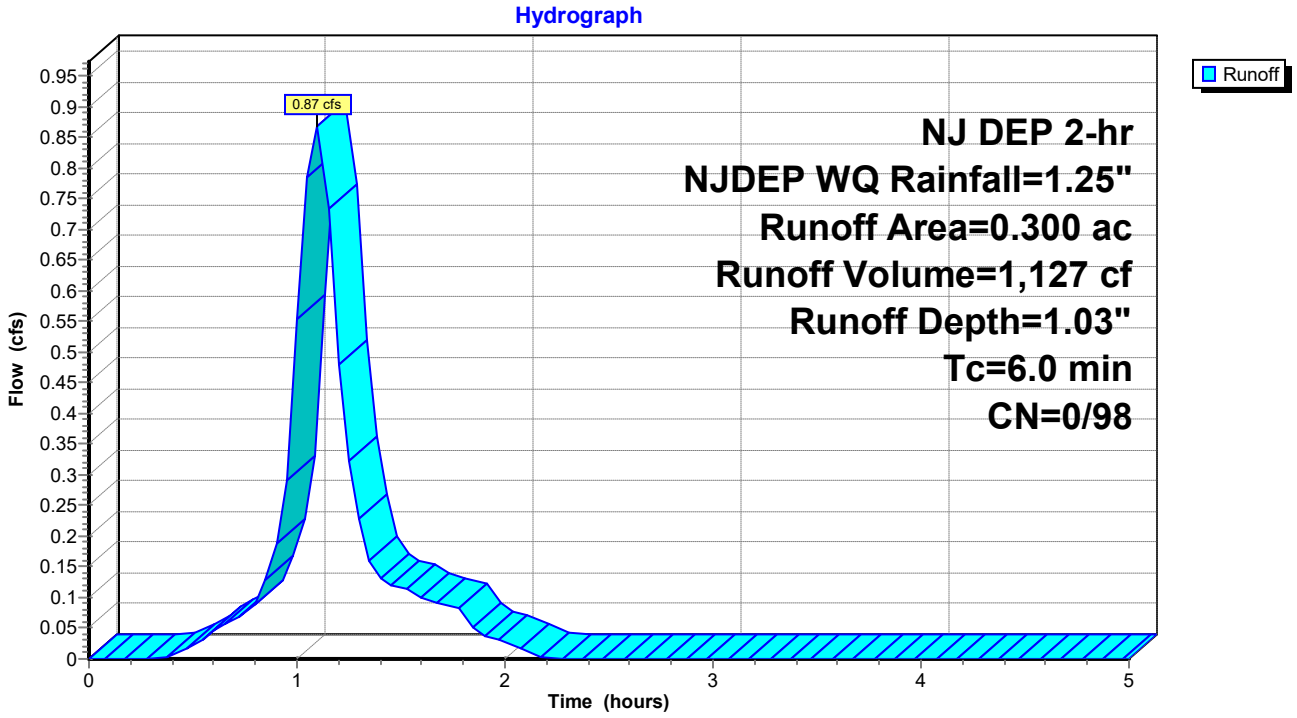
Runoff = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf, Depth= 1.03"
Routed to Pond 20P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.300	98	
	0.300	98	100.00% Impervious Area

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

Subcatchment 20S: DA 20



Summary for Pond 20P: Filterra 8x12.5

Inflow Area = 0.300 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 951 cf, Atten= 20%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 951 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.48' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 48 cf

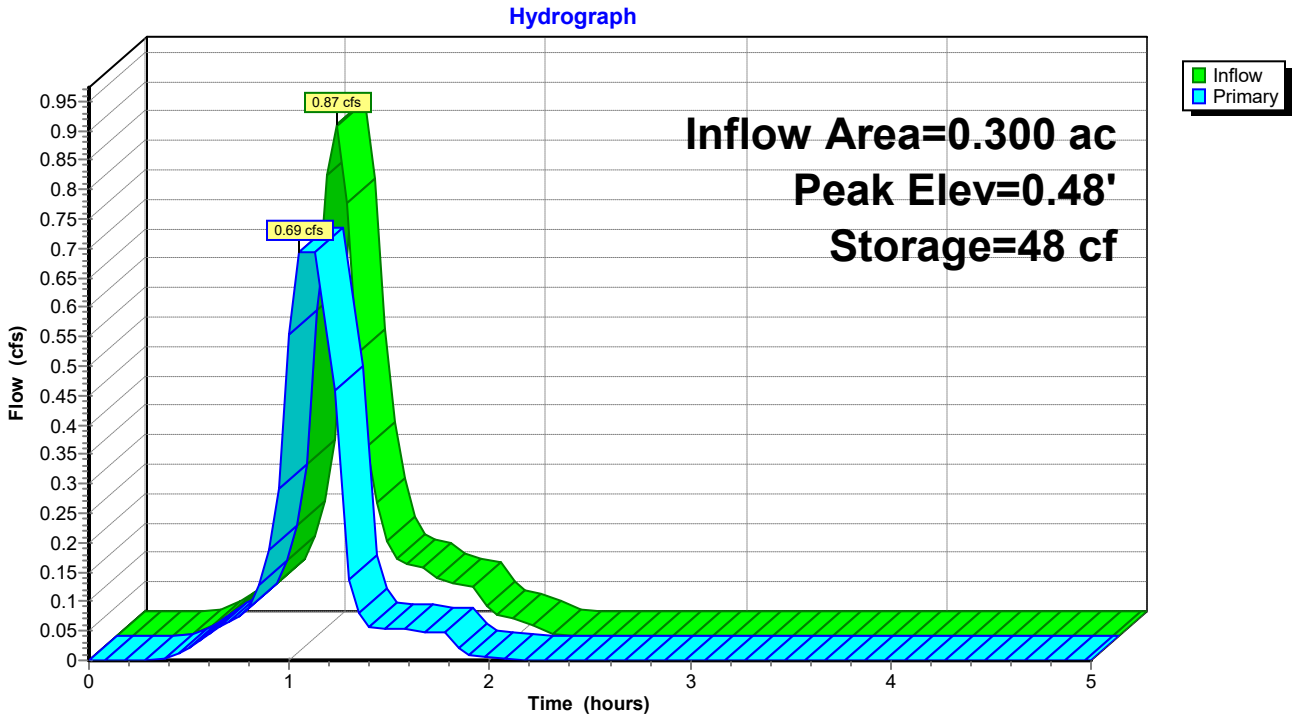
Plug-Flow detention time= 2.2 min calculated for 951 cf (84% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 20P: Filterra 8x12.5



Summary for Subcatchment 23S: DA 23

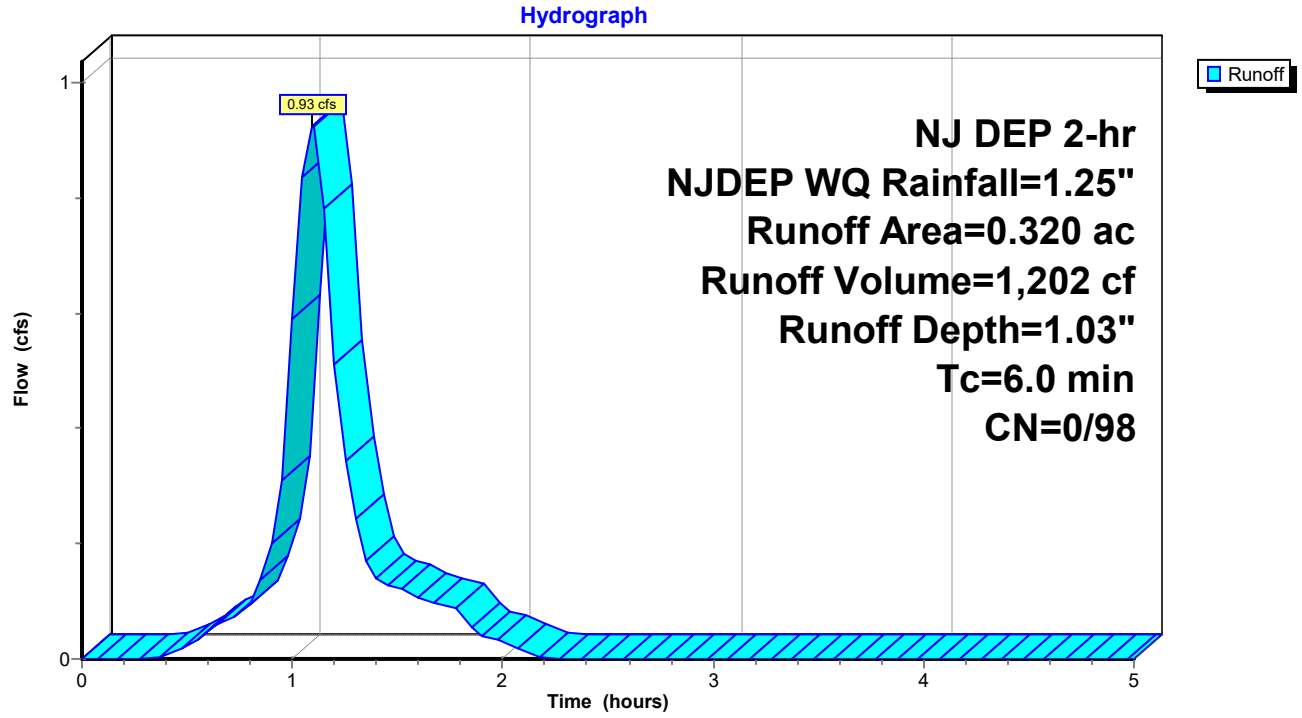
Runoff = 0.93 cfs @ 1.09 hrs, Volume= 1,202 cf, Depth= 1.03"
Routed to Pond 23P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.320	98	
	0.320	98	100.00% Impervious Area

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

Subcatchment 23S: DA 23



Summary for Pond 23P: Filterra 8x12.5

Inflow Area = 0.320 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.93 cfs @ 1.09 hrs, Volume= 1,202 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 1,272 cf, Atten= 25%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 1,272 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.72' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 72 cf

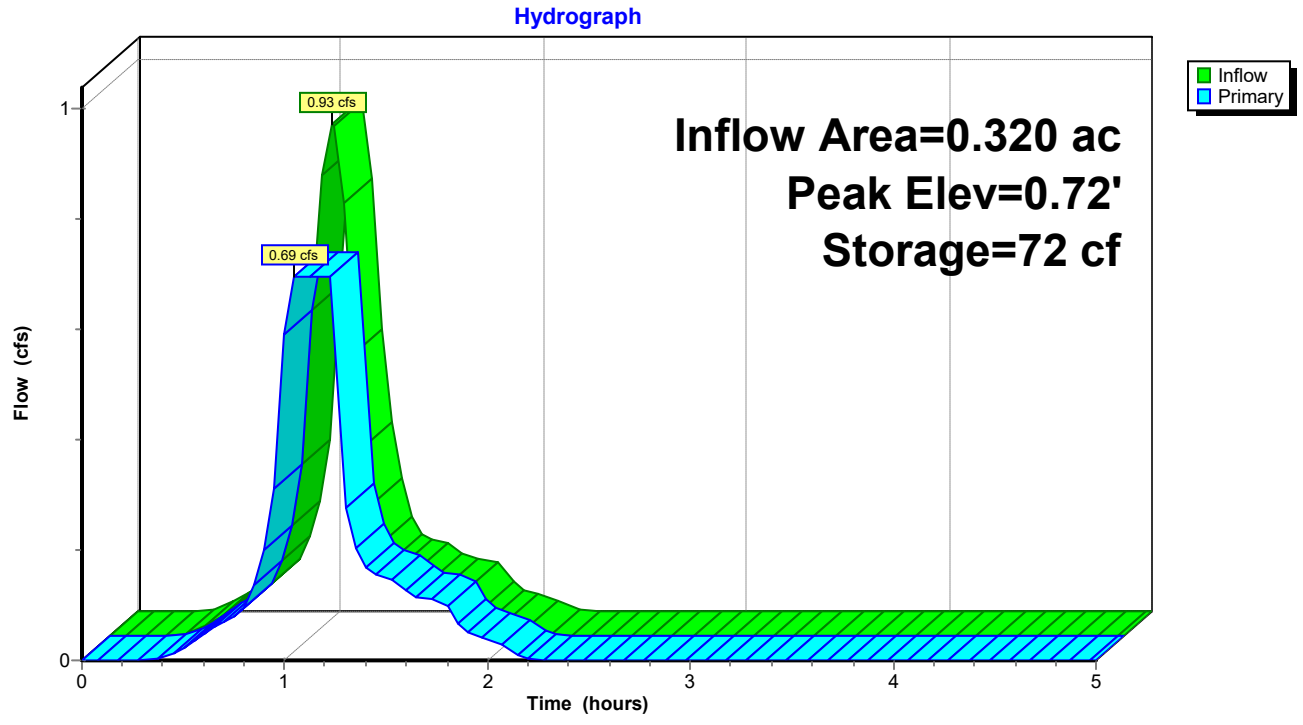
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.8 min (72.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.09' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 23P: Filterra 8x12.5



Summary for Subcatchment 26S: DA 26

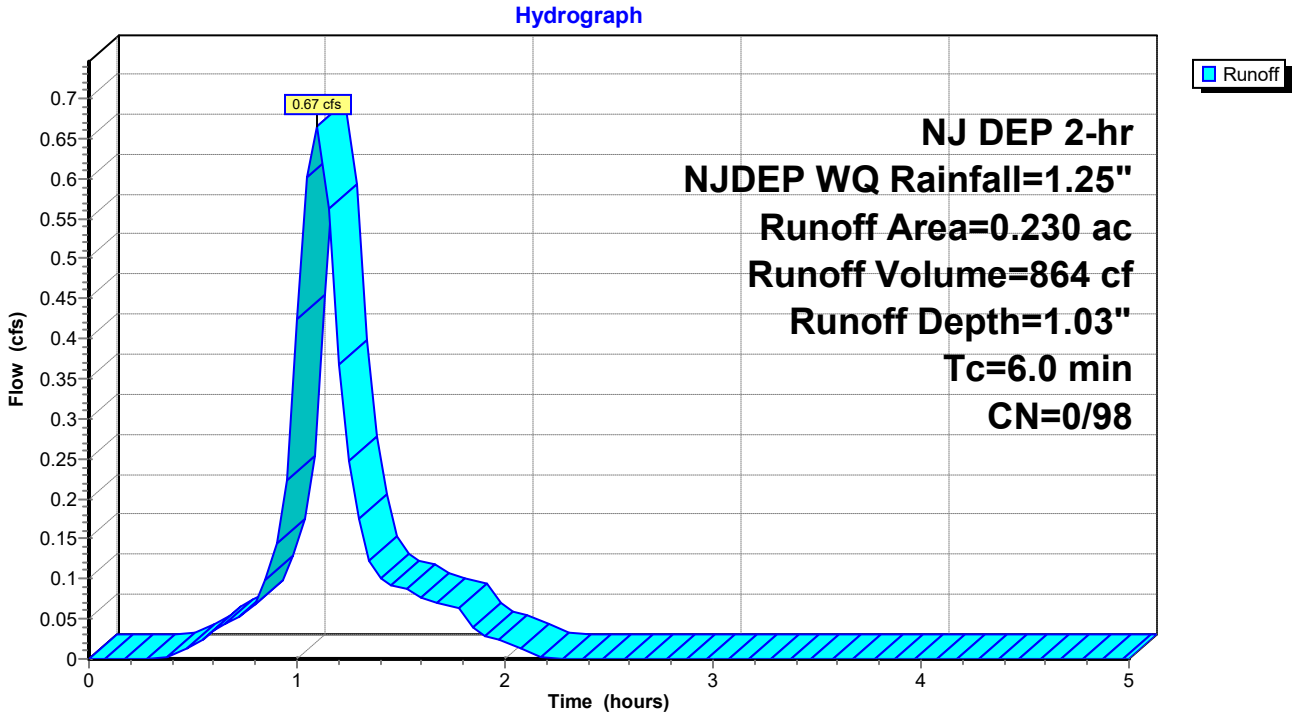
Runoff = 0.67 cfs @ 1.09 hrs, Volume= 864 cf, Depth= 1.03"
Routed to Pond 26P : Filterra 8x10.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.230	98	
	0.230	98	100.00% Impervious Area

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

Subcatchment 26S: DA 26



Summary for Pond 26P: Filterra 8x10.5

Inflow Area = 0.230 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.67 cfs @ 1.09 hrs, Volume= 864 cf
Outflow = 0.58 cfs @ 1.05 hrs, Volume= 990 cf, Atten= 12%, Lag= 0.0 min
Primary = 0.58 cfs @ 1.05 hrs, Volume= 990 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.20' @ 1.14 hrs Surf.Area= 0.002 ac Storage= 16 cf

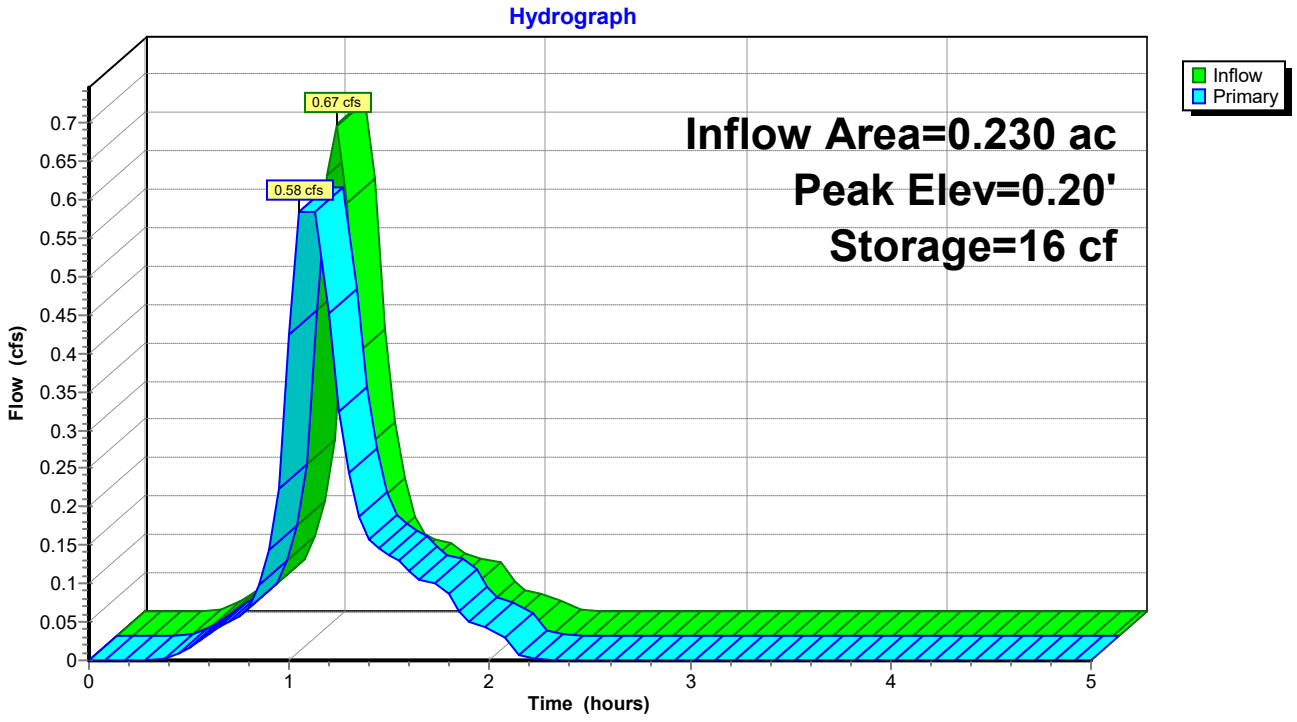
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 3.0 min (73.3 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	63 cf	**8.00'W x 10.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.58 cfs @ 1.05 hrs HW=0.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.58 cfs @ 0.01 fps)

Pond 26P: Filterra 8x10.5



Summary for Subcatchment 27S: DA 27

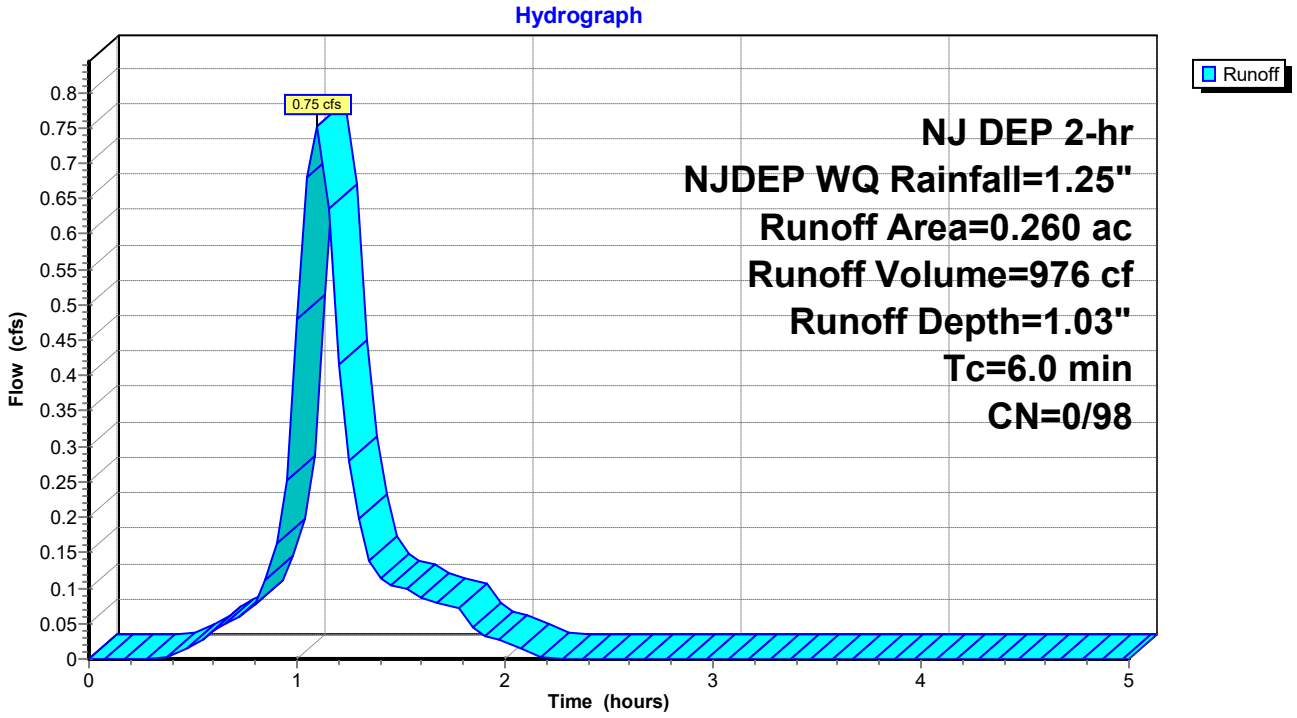
Runoff = 0.75 cfs @ 1.09 hrs, Volume= 976 cf, Depth= 1.03"
Routed to Pond 27P : Filterra 8x10.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.260	98	
	0.260	98	100.00% Impervious Area

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

Subcatchment 27S: DA 27



Summary for Pond 27P: Filterra 8x10.5

Inflow Area = 0.260 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.75 cfs @ 1.09 hrs, Volume= 976 cf
Outflow = 0.58 cfs @ 1.05 hrs, Volume= 1,212 cf, Atten= 23%, Lag= 0.0 min
Primary = 0.58 cfs @ 1.05 hrs, Volume= 1,212 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.58' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 49 cf

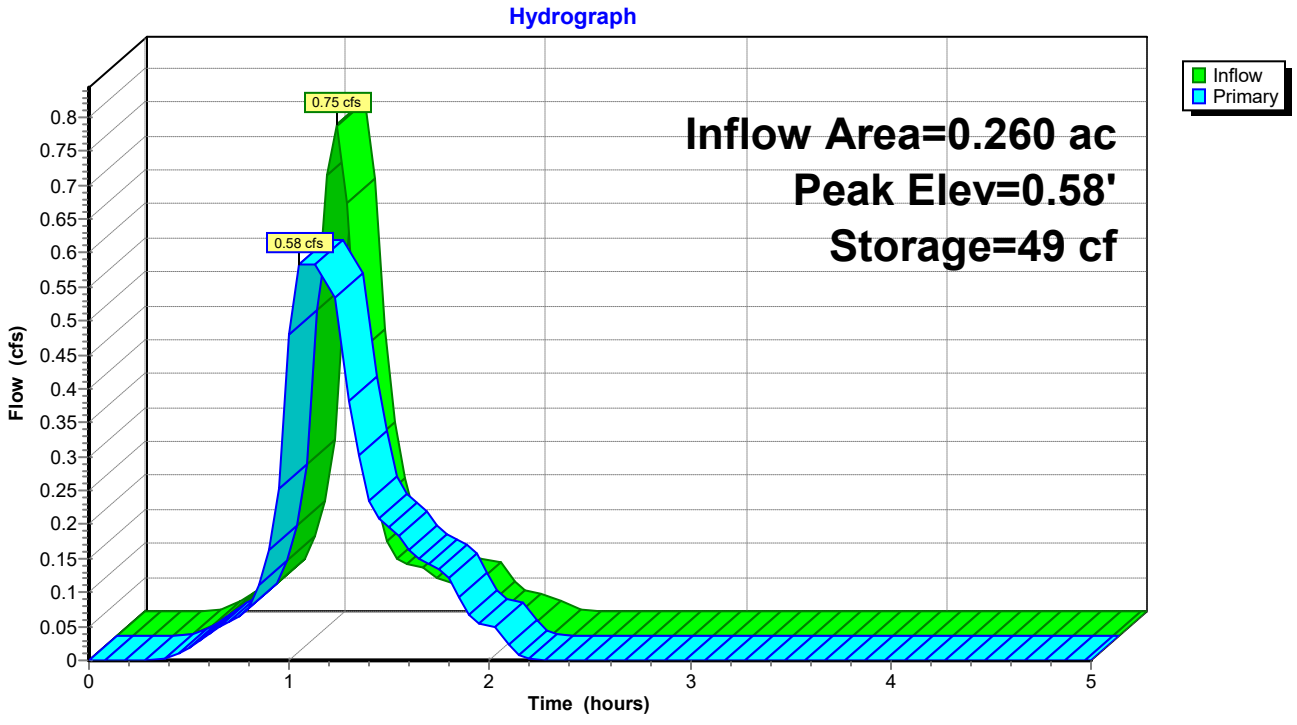
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (75.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	63 cf	**8.00'W x 10.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.58 cfs @ 1.05 hrs HW=0.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.58 cfs @ 0.01 fps)

Pond 27P: Filterra 8x10.5



Summary for Subcatchment 28S: DA 28

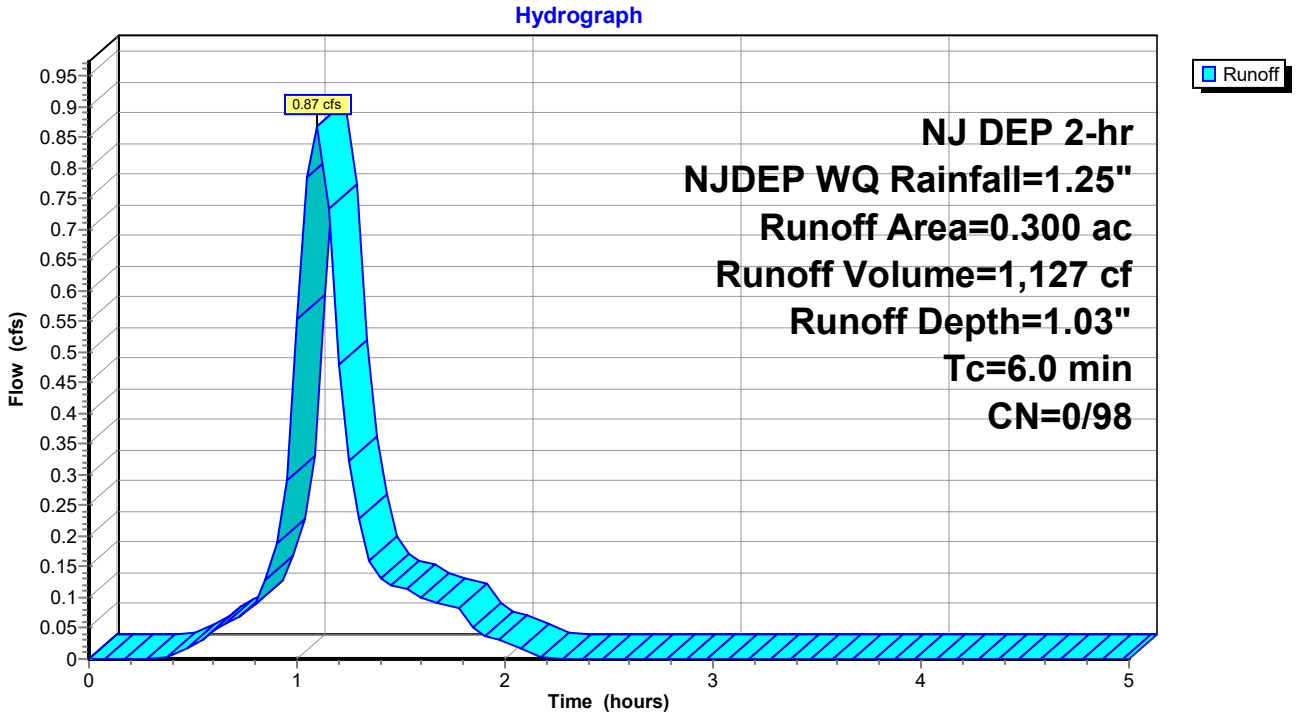
Runoff = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf, Depth= 1.03"
Routed to Pond 28P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.300	98	
	0.300	98	100.00% Impervious Area

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

Subcatchment 28S: DA 28



Summary for Pond 28P: Filterra 8x12.5

Inflow Area = 0.300 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 951 cf, Atten= 20%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 951 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.48' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 48 cf

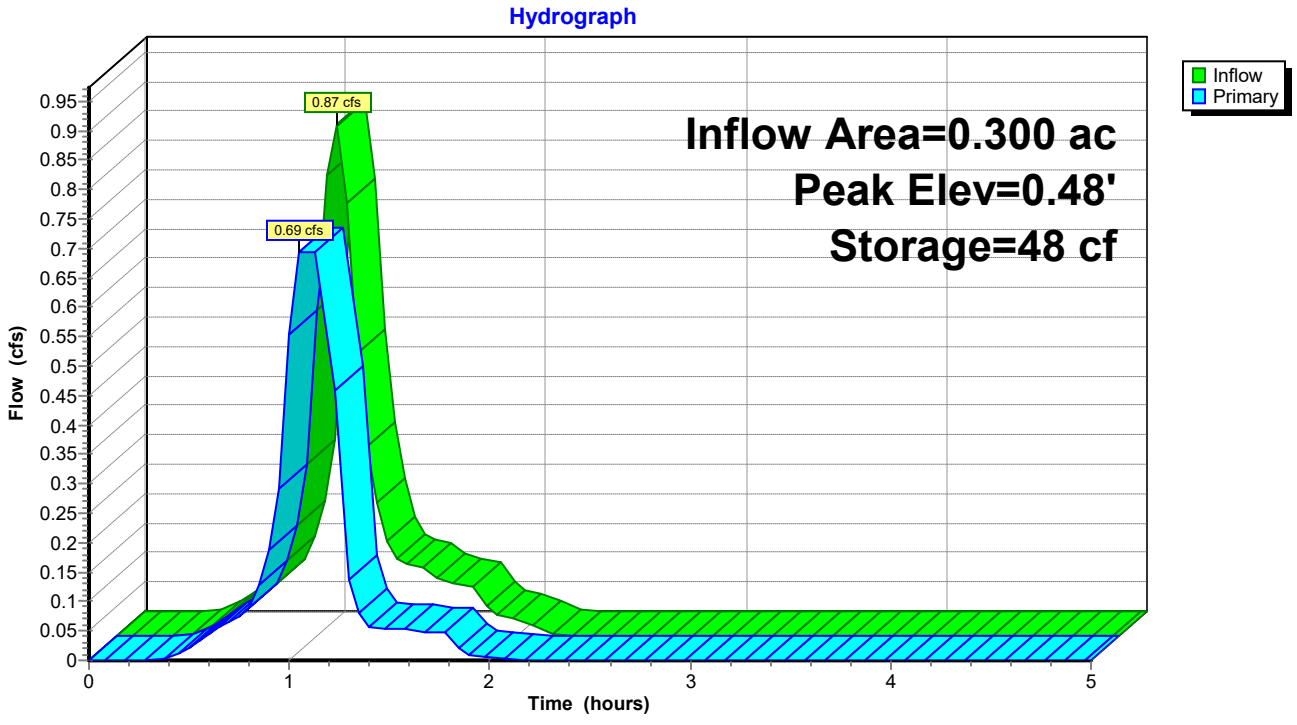
Plug-Flow detention time= 2.2 min calculated for 951 cf (84% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 28P: Filterra 8x12.5



Summary for Subcatchment 29S: DA 29

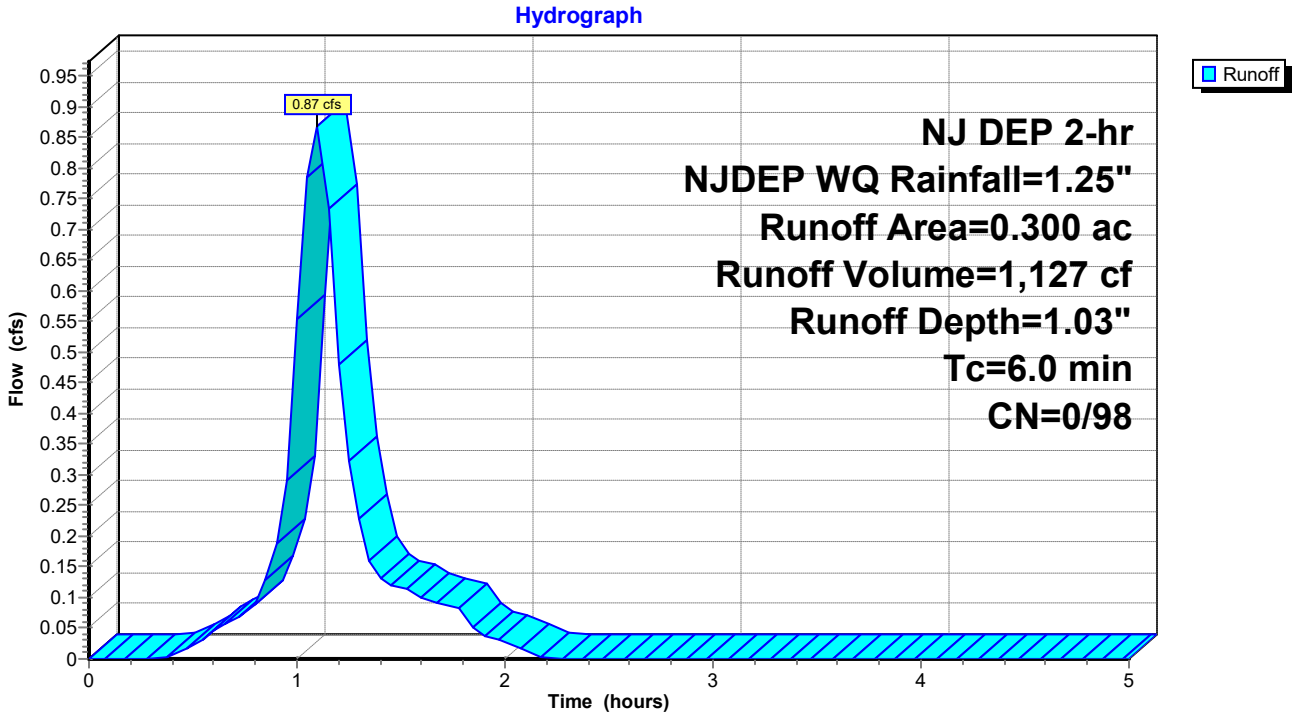
Runoff = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf, Depth= 1.03"
Routed to Pond 29P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.300	98	
	0.300	98	100.00% Impervious Area

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

Subcatchment 29S: DA 29



Summary for Pond 29P: Filterra 8x12.5

Inflow Area = 0.300 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.87 cfs @ 1.09 hrs, Volume= 1,127 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 951 cf, Atten= 20%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 951 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.48' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 48 cf

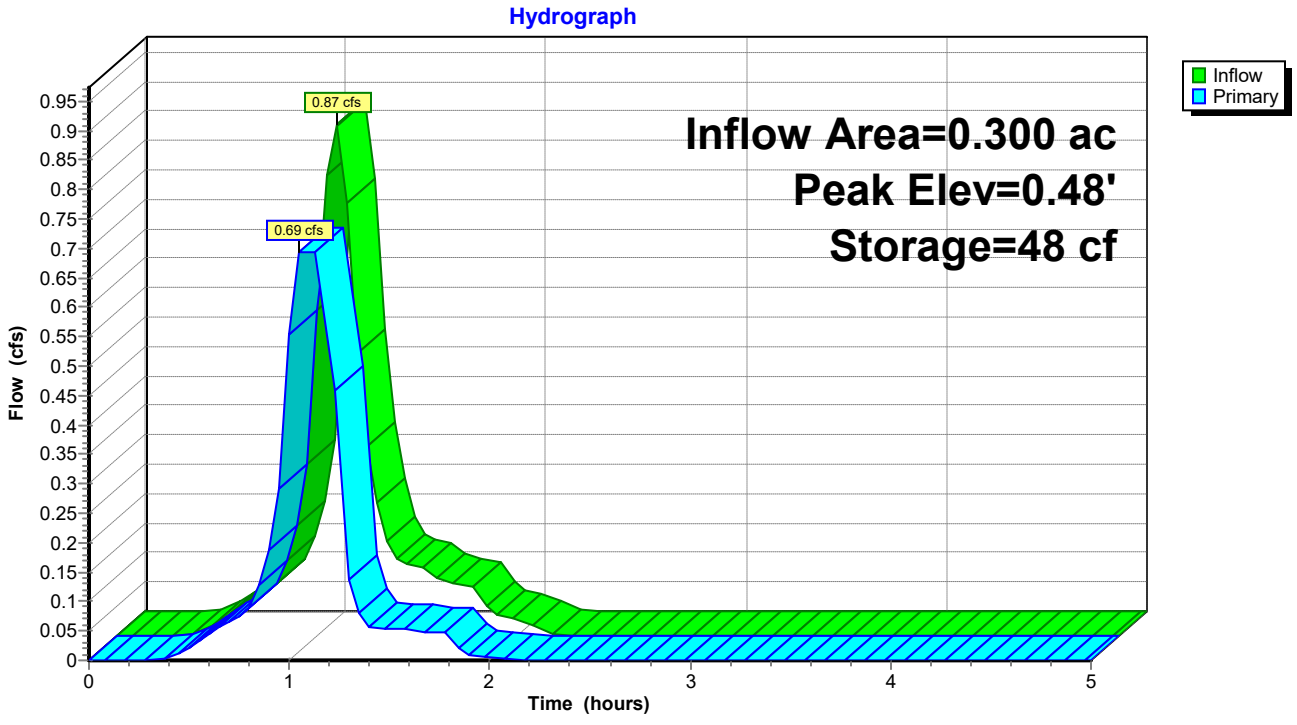
Plug-Flow detention time= 2.2 min calculated for 951 cf (84% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 29P: Filterra 8x12.5



Summary for Subcatchment 54S: DA 54

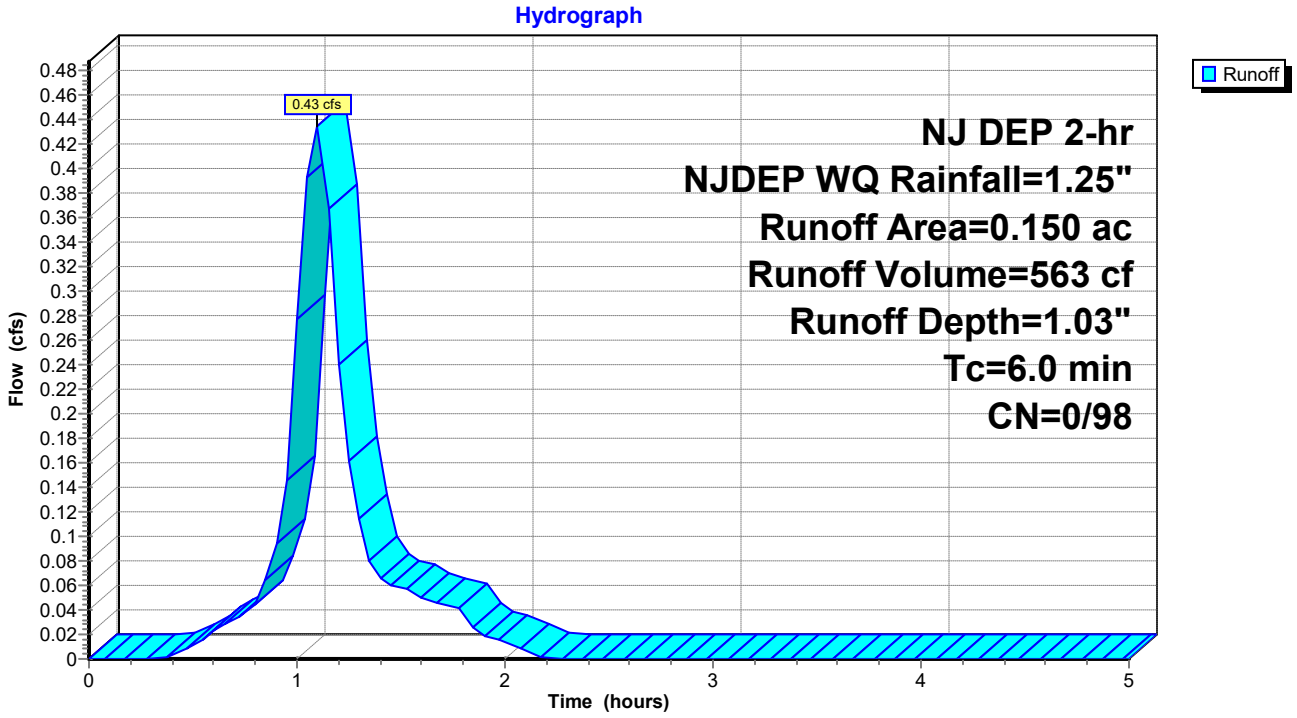
Runoff = 0.43 cfs @ 1.09 hrs, Volume= 563 cf, Depth= 1.03"
Routed to Pond 54P : Filterra 14x8

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.150	98	
	0.150	98	100.00% Impervious Area

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

Subcatchment 54S: DA 54



Summary for Subcatchment 55S: DA 55

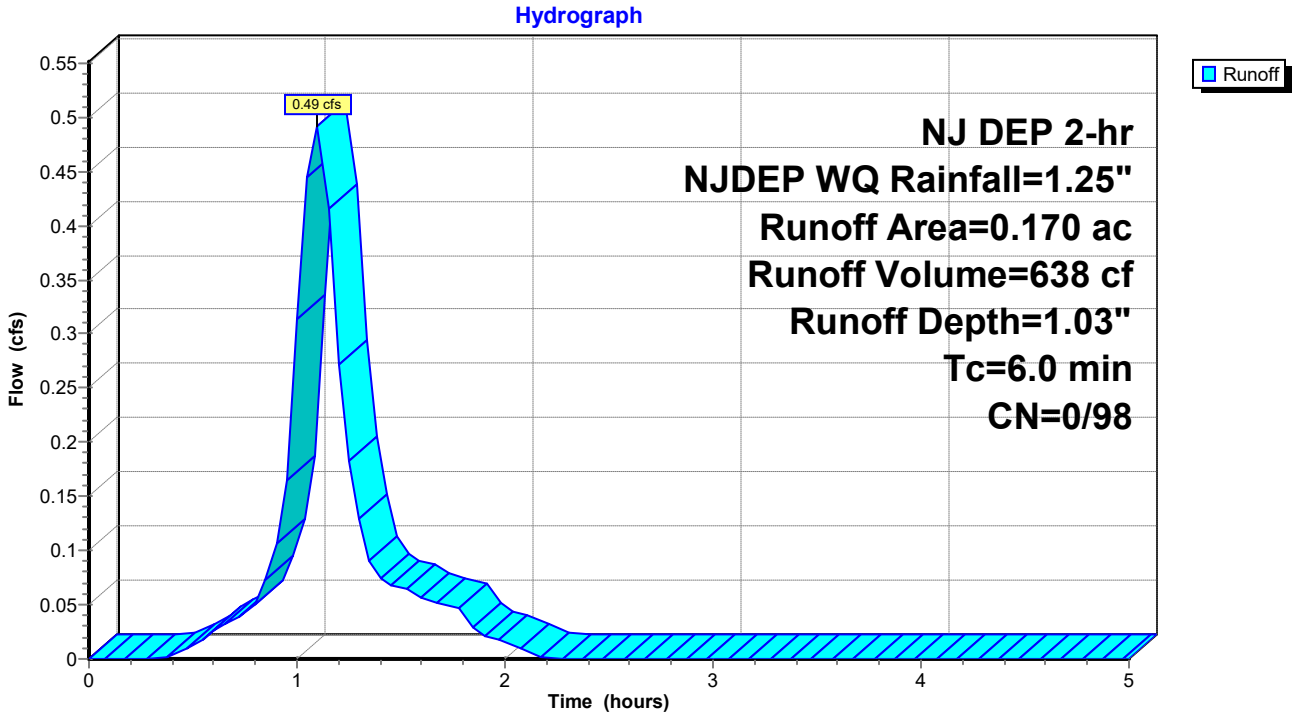
Runoff = 0.49 cfs @ 1.09 hrs, Volume= 638 cf, Depth= 1.03"
Routed to Pond 54P : Filterra 14x8

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.170	98	
	0.170	98	100.00% Impervious Area

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

Subcatchment 55S: DA 55



Summary for Pond 54P: Filterra 14x8

Inflow Area = 0.320 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.93 cfs @ 1.09 hrs, Volume= 1,202 cf
Outflow = 0.78 cfs @ 1.05 hrs, Volume= 1,220 cf, Atten= 16%, Lag= 0.0 min
Primary = 0.78 cfs @ 1.05 hrs, Volume= 1,220 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.32' @ 1.14 hrs Surf.Area= 0.003 ac Storage= 36 cf

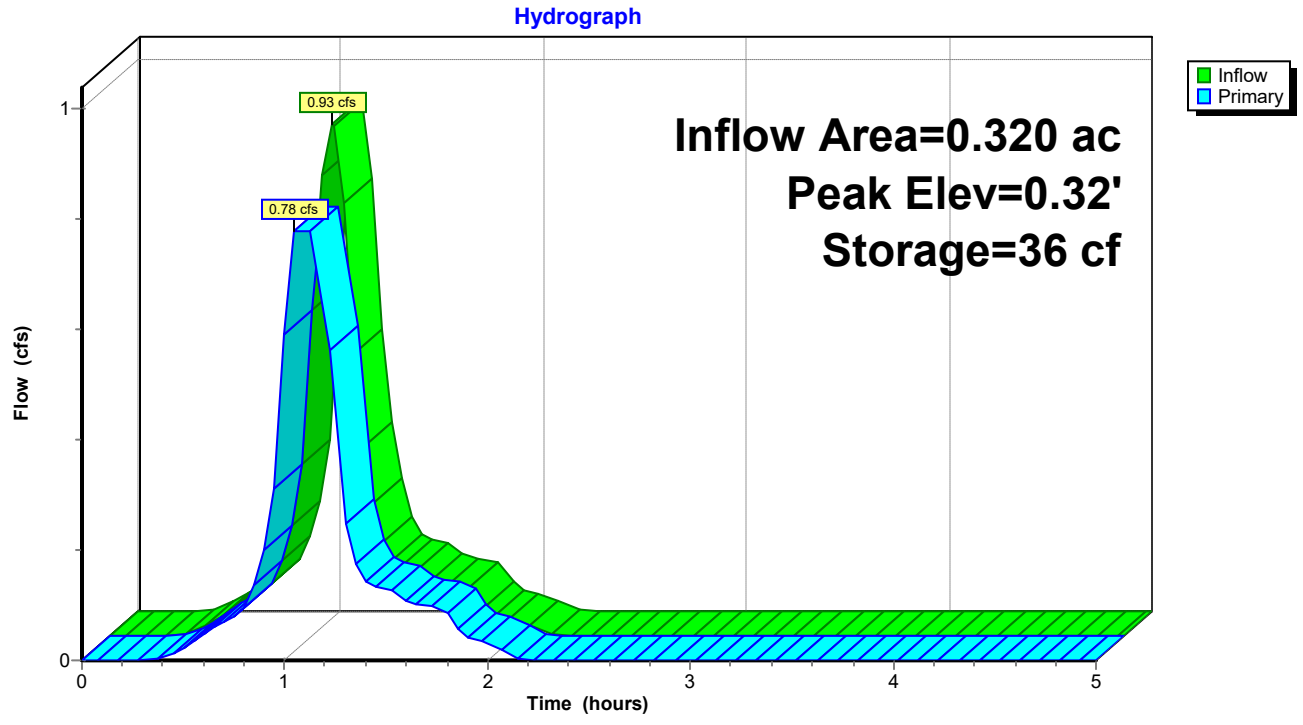
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.4 min (70.7 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	84 cf	**14.00'W x 8.00'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.78 cfs @ 1.05 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.78 cfs @ 0.01 fps)

Pond 54P: Filterra 14x8



Summary for Subcatchment 56S: DA 56

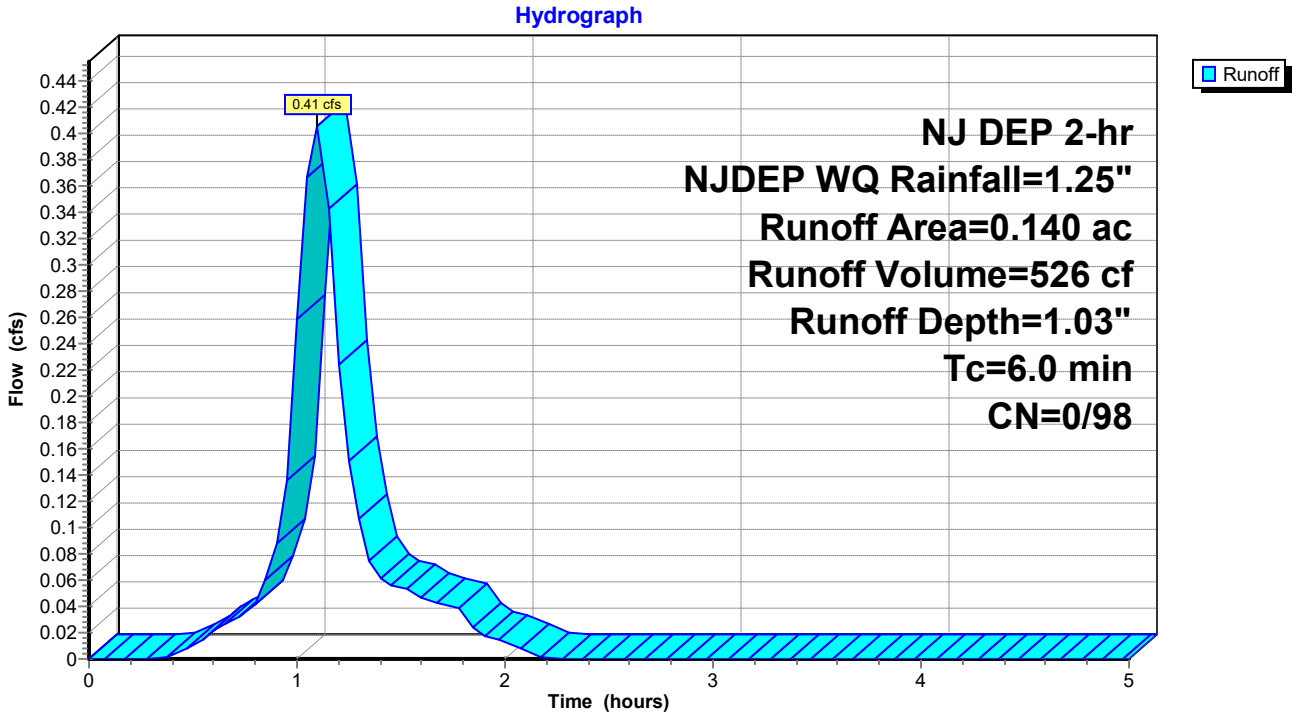
Runoff = 0.41 cfs @ 1.09 hrs, Volume= 526 cf, Depth= 1.03"
Routed to Pond 56P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.140	98	
	0.140	98	100.00% Impervious Area

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

Subcatchment 56S: DA 56



Summary for Subcatchment 57S: DA 57

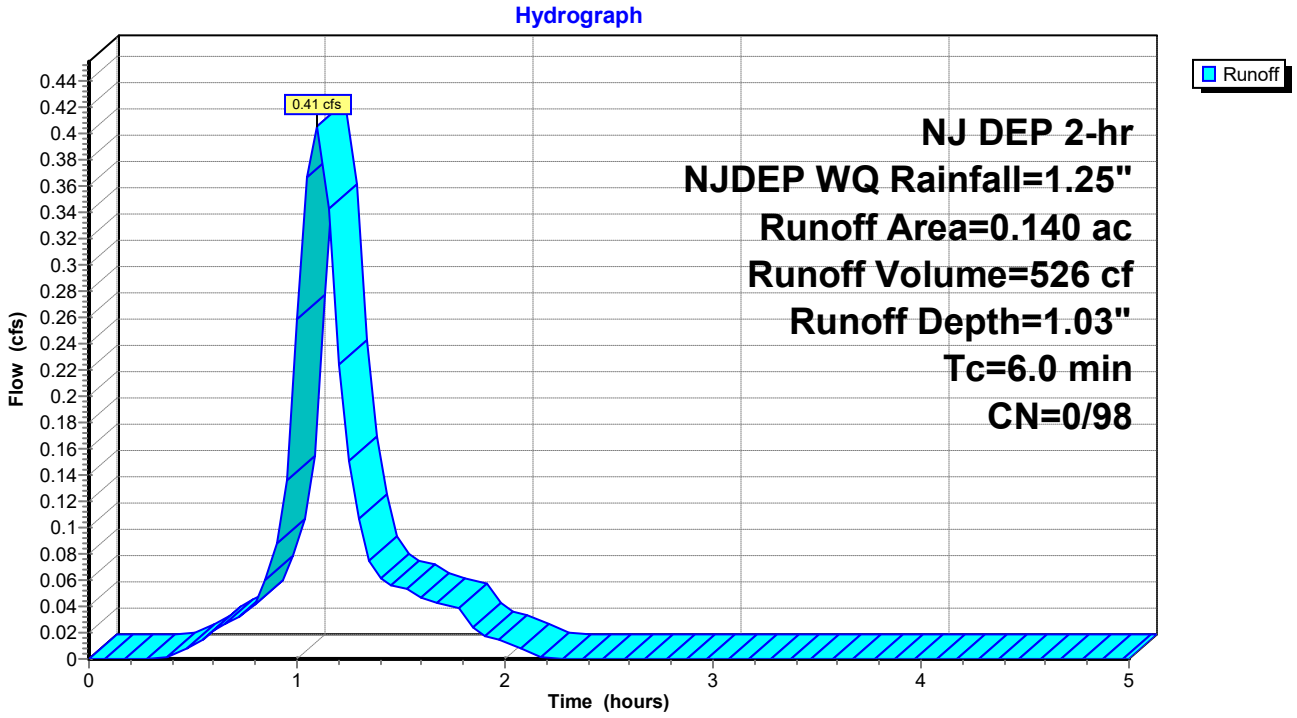
Runoff = 0.41 cfs @ 1.09 hrs, Volume= 526 cf, Depth= 1.03"
Routed to Pond 56P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.140	98	
	0.140	98	100.00% Impervious Area

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

Subcatchment 57S: DA 57



Summary for Pond 56P: Filterra 8x12.5

Inflow Area = 0.280 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.81 cfs @ 1.09 hrs, Volume= 1,052 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 1,338 cf, Atten= 14%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 1,338 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.26' @ 1.14 hrs Surf.Area= 0.002 ac Storage= 26 cf

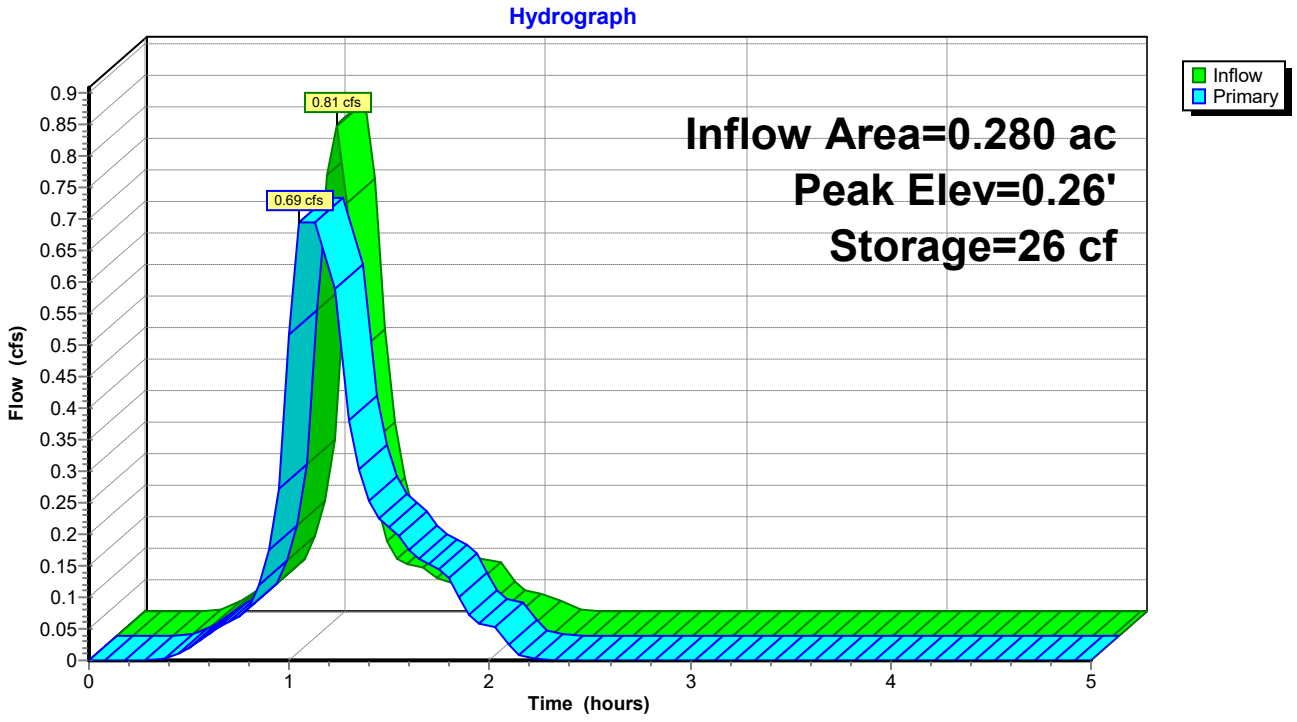
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.4 min (74.7 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 56P: Filterra 8x12.5



Summary for Subcatchment 58S: DA 58

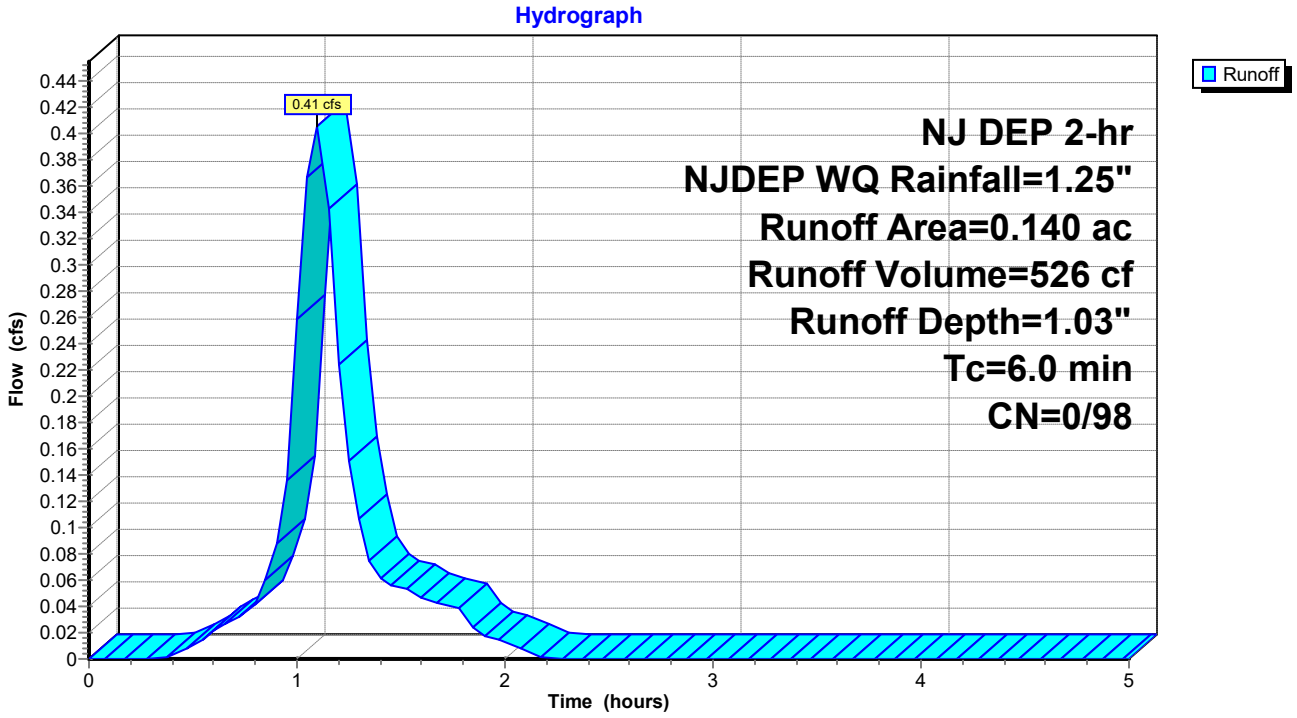
Runoff = 0.41 cfs @ 1.09 hrs, Volume= 526 cf, Depth= 1.03"
Routed to Pond 58P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.140	98	
	0.140	98	100.00% Impervious Area

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

Subcatchment 58S: DA 58



Summary for Subcatchment 59S: DA 59

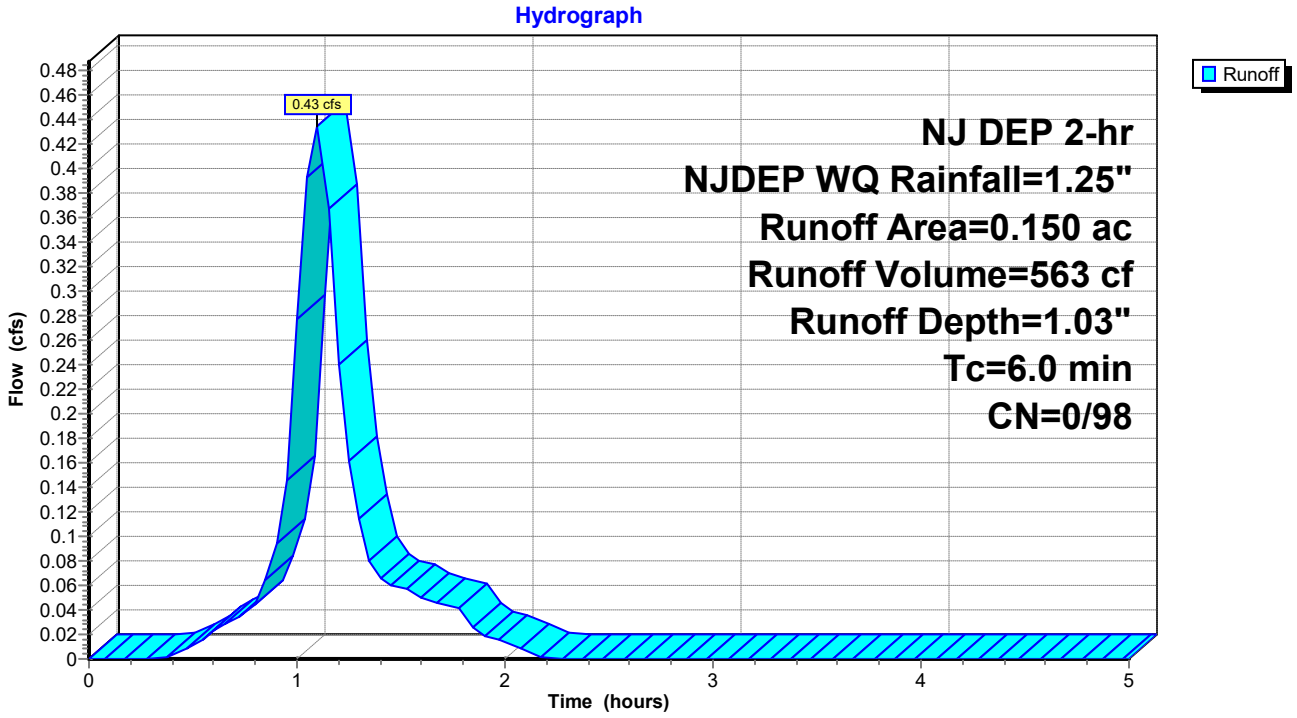
Runoff = 0.43 cfs @ 1.09 hrs, Volume= 563 cf, Depth= 1.03"
Routed to Pond 58P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.150	98	
	0.150	98	100.00% Impervious Area

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

Subcatchment 59S: DA 59



Summary for Pond 58P: Filterra 8x12.5

Inflow Area = 0.290 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.84 cfs @ 1.09 hrs, Volume= 1,089 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 883 cf, Atten= 17%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 883 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.37' @ 1.15 hrs Surf.Area= 0.002 ac Storage= 37 cf

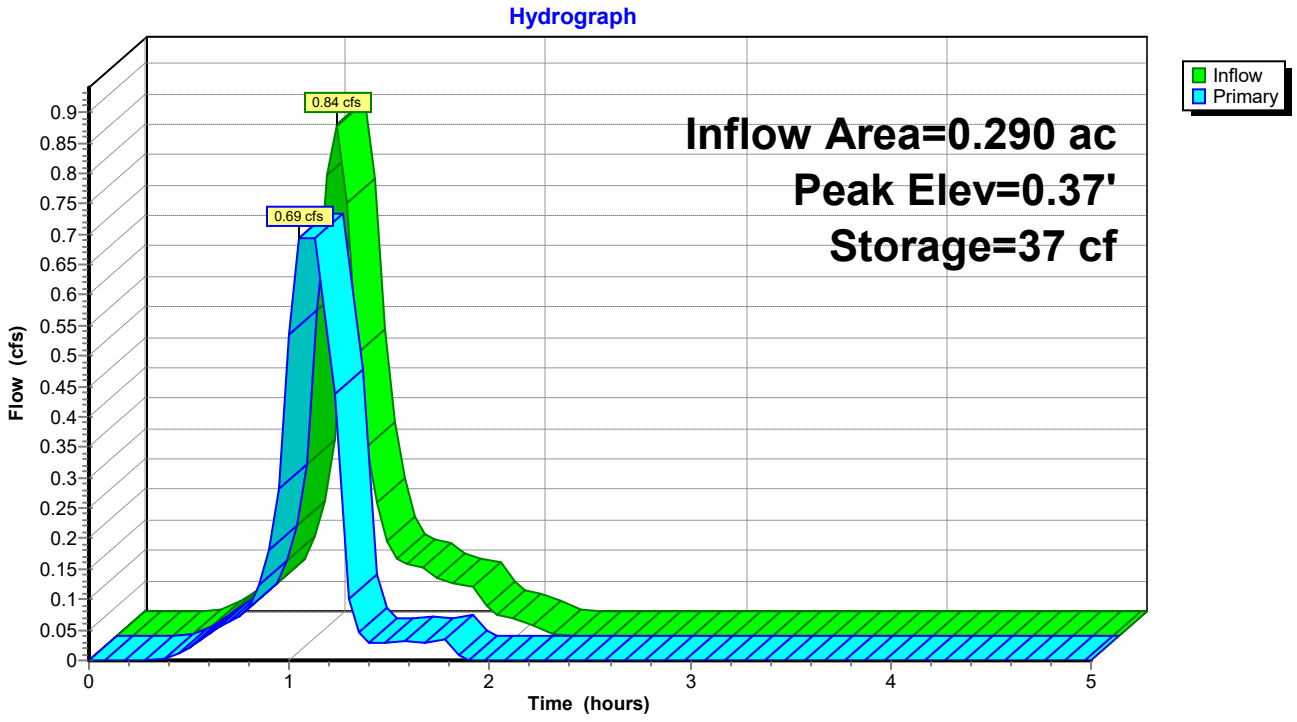
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 58P: Filterra 8x12.5



Summary for Subcatchment 60S: DA 60

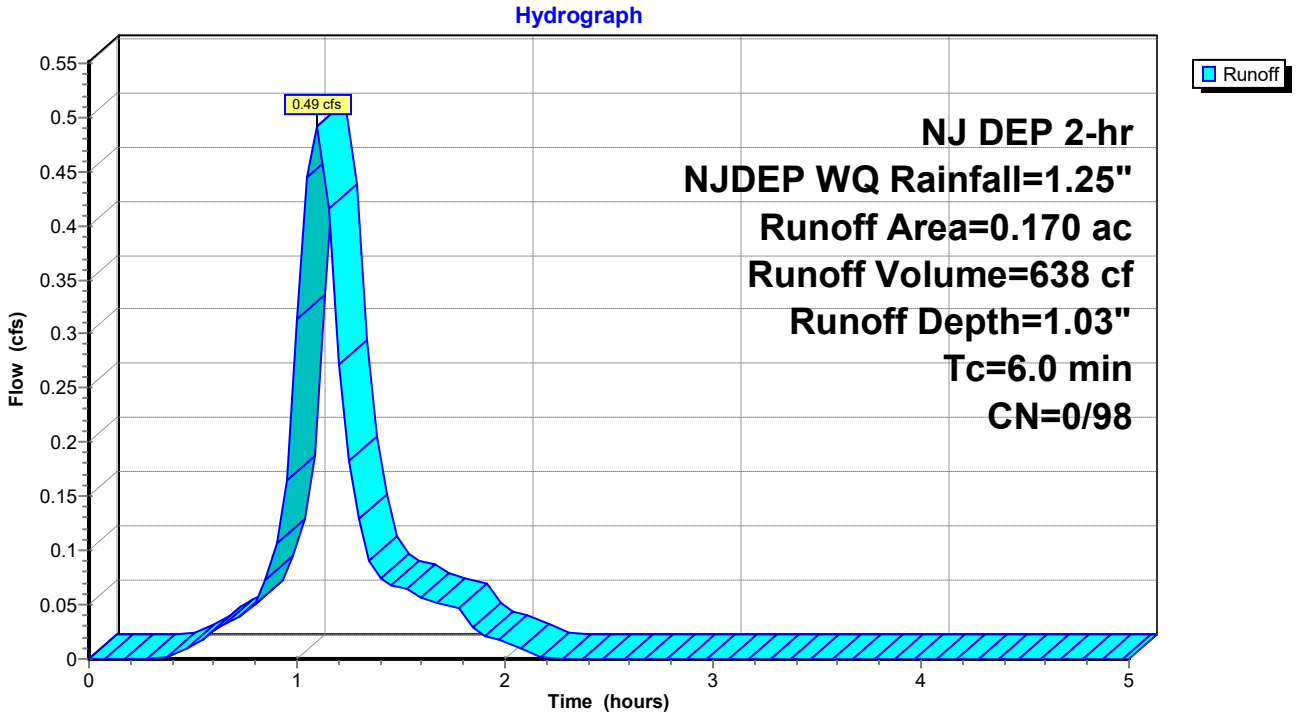
Runoff = 0.49 cfs @ 1.09 hrs, Volume= 638 cf, Depth= 1.03"
Routed to Pond 60P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.170	98	
	0.170	98	100.00% Impervious Area

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

Subcatchment 60S: DA 60



Summary for Subcatchment 61S: DA 61

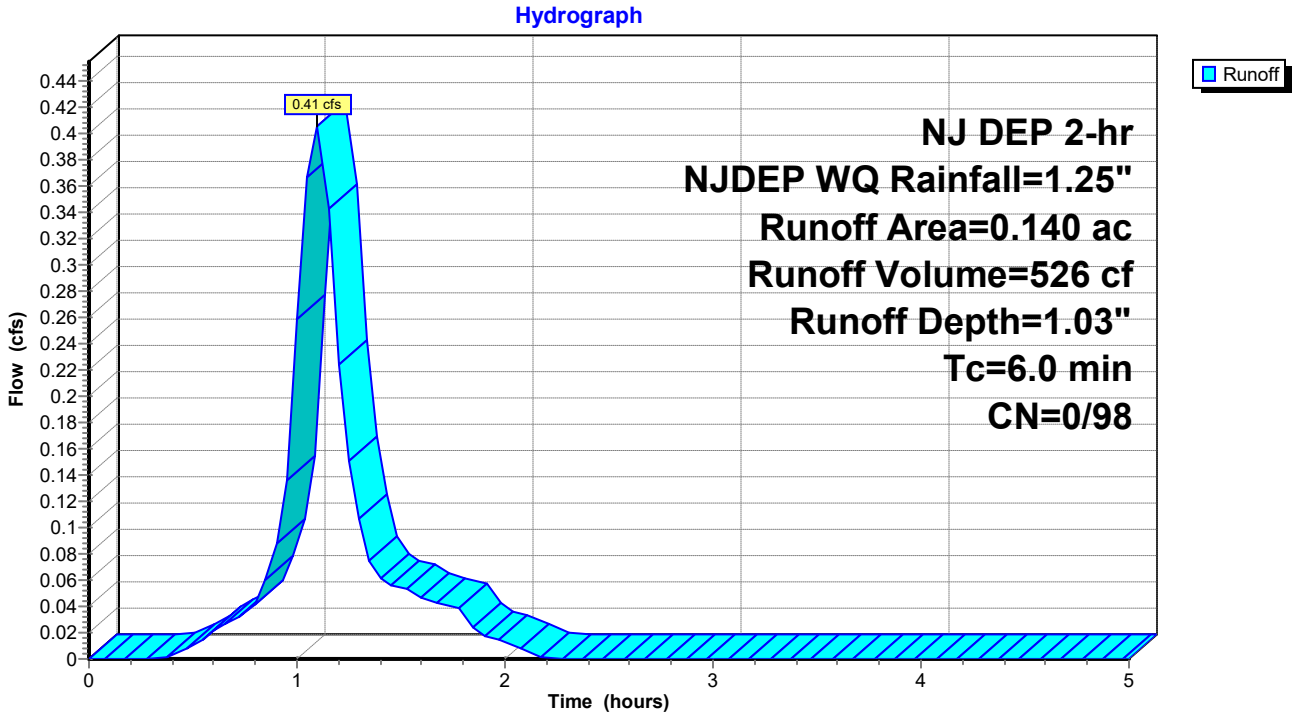
Runoff = 0.41 cfs @ 1.09 hrs, Volume= 526 cf, Depth= 1.03"
Routed to Pond 60P : Filterra 8x12.5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.140	98	
	0.140	98	100.00% Impervious Area

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

Subcatchment 61S: DA 61



Summary for Pond 60P: Filterra 8x12.5

Inflow Area = 0.310 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.90 cfs @ 1.09 hrs, Volume= 1,164 cf
Outflow = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf, Atten= 23%, Lag= 0.0 min
Primary = 0.69 cfs @ 1.05 hrs, Volume= 1,451 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.59' @ 1.16 hrs Surf.Area= 0.002 ac Storage= 59 cf

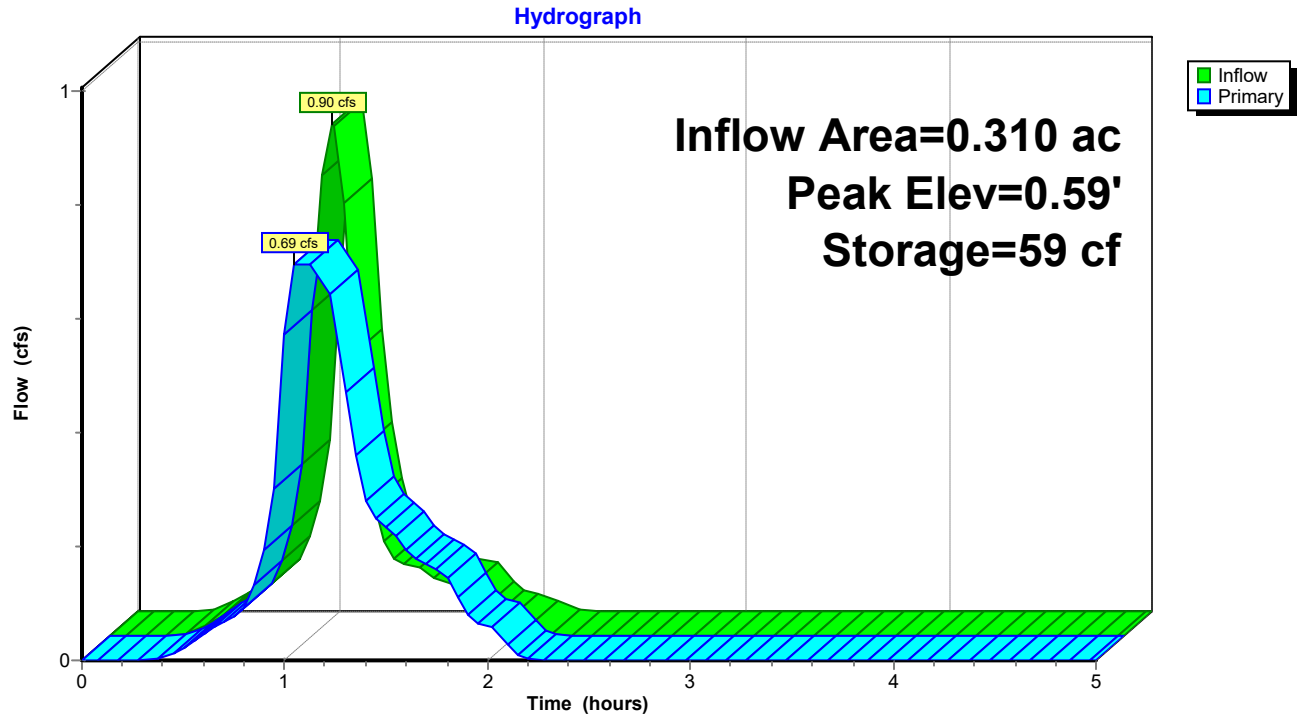
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (75.0 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	75 cf	**8.00'W x 12.50'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.69 cfs @ 1.05 hrs HW=0.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.69 cfs @ 0.01 fps)

Pond 60P: Filterra 8x12.5



Summary for Subcatchment 62S: DA 62

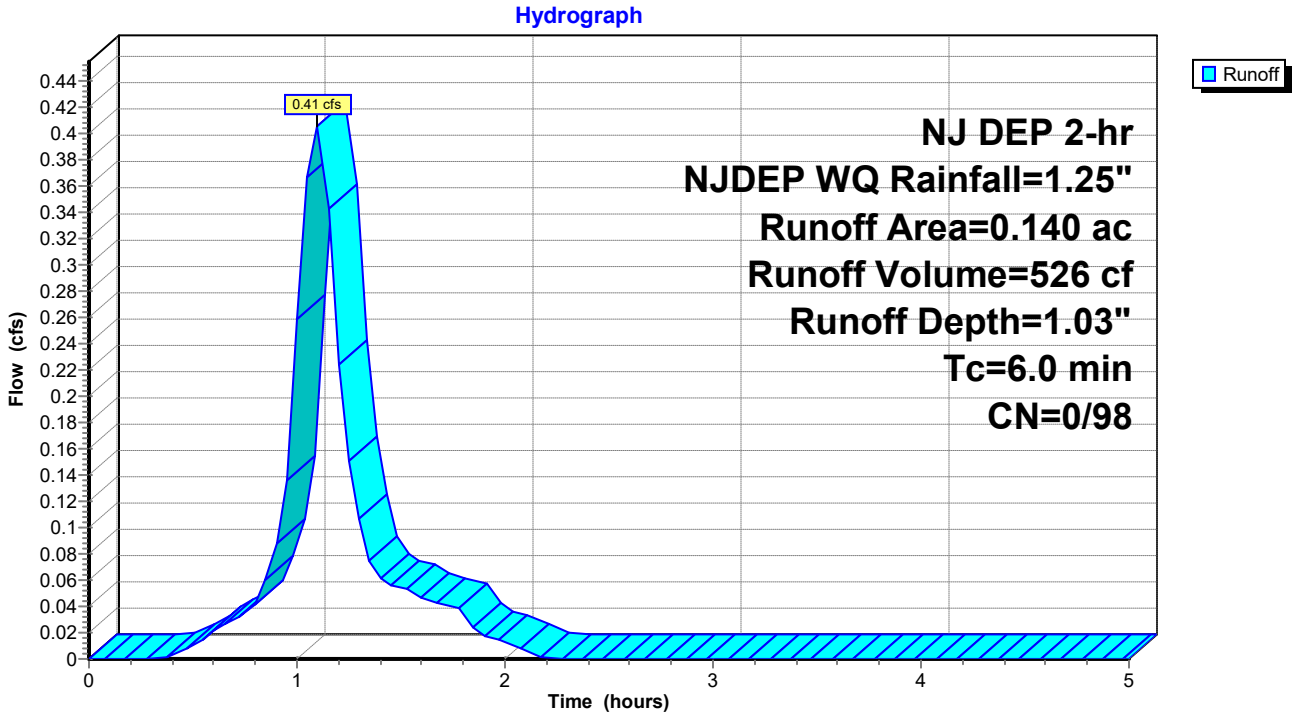
Runoff = 0.41 cfs @ 1.09 hrs, Volume= 526 cf, Depth= 1.03"
Routed to Pond 62P : Filterra 6x8

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.140	98	
	0.140	98	100.00% Impervious Area

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

Subcatchment 62S: DA 62



Summary for Pond 62P: Filterra 6x8

Inflow Area = 0.140 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.41 cfs @ 1.09 hrs, Volume= 526 cf
Outflow = 0.33 cfs @ 1.05 hrs, Volume= 396 cf, Atten= 18%, Lag= 0.0 min
Primary = 0.33 cfs @ 1.05 hrs, Volume= 396 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.38' @ 1.15 hrs Surf.Area= 0.001 ac Storage= 18 cf

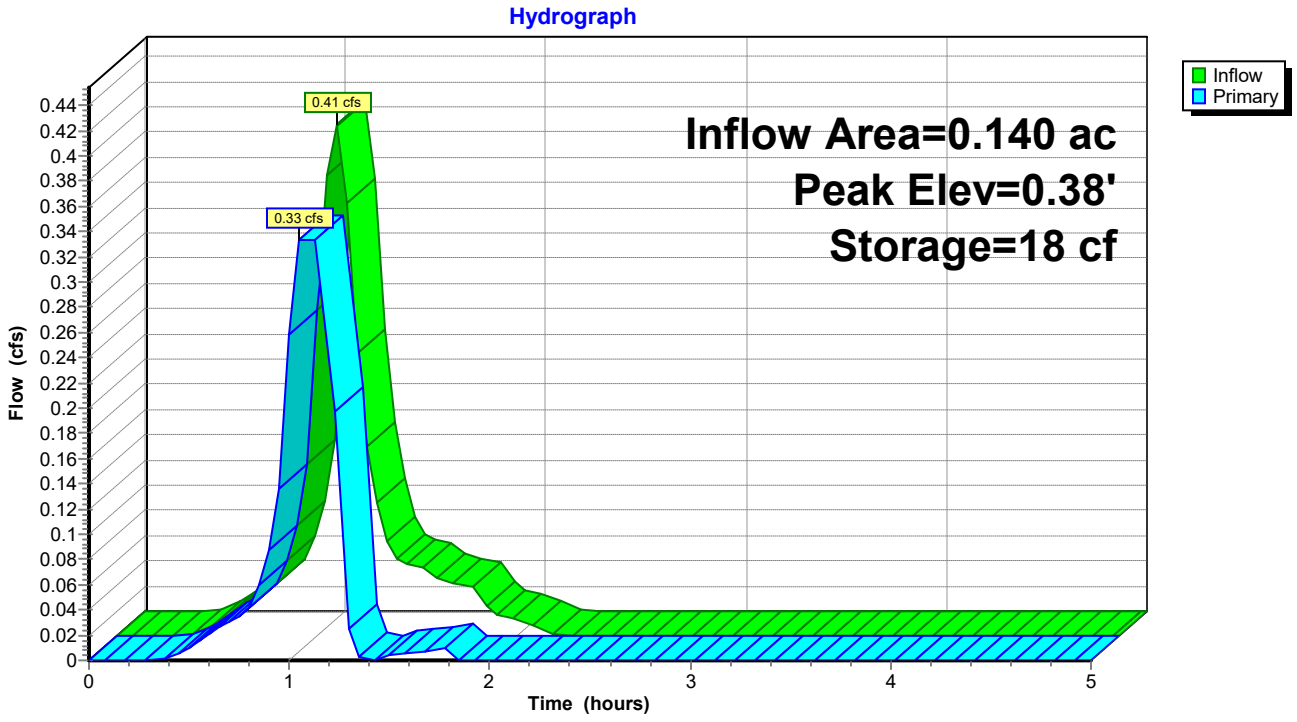
Plug-Flow detention time= 1.1 min calculated for 396 cf (75% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	36 cf	**6.00'W x 8.00'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.33 cfs @ 1.05 hrs HW=0.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.33 cfs @ 0.01 fps)

Pond 62P: Filterra 6x8



Summary for Subcatchment 63S: DA 63

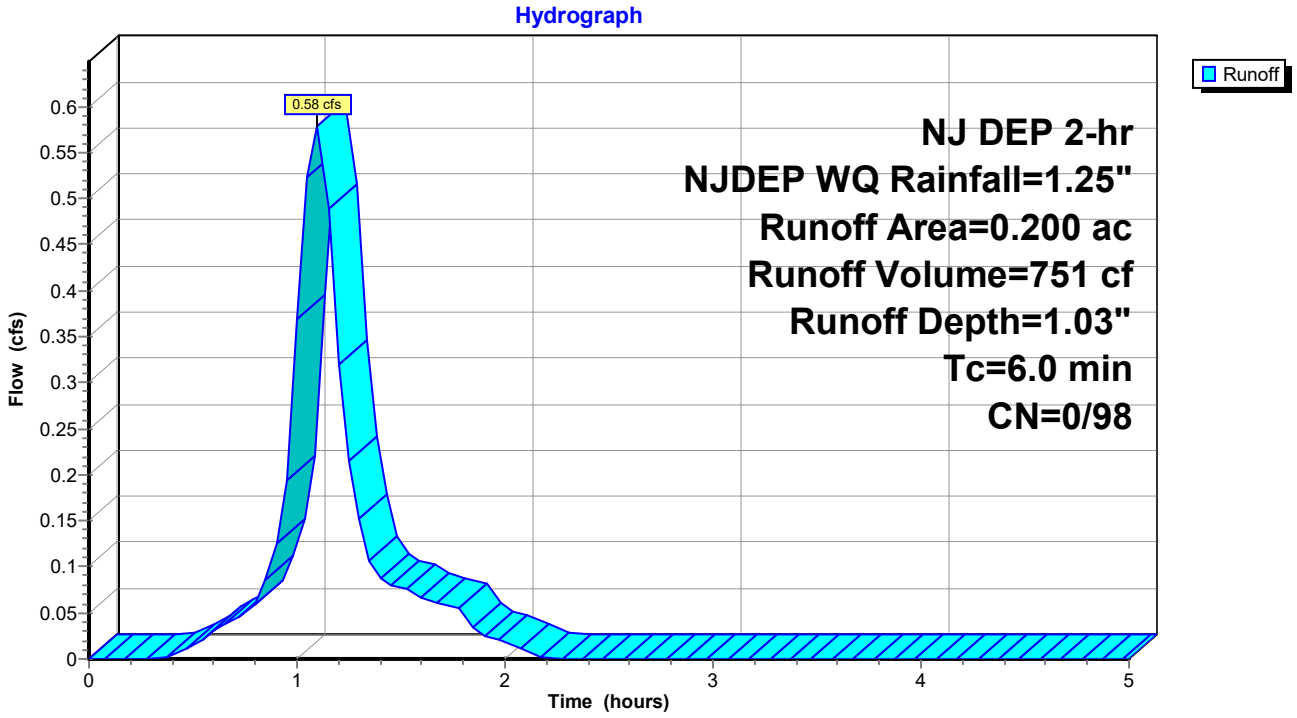
Runoff = 0.58 cfs @ 1.09 hrs, Volume= 751 cf, Depth= 1.03"
Routed to Pond 63P : Filterra 7x10

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.200	98	
	0.200	98	100.00% Impervious Area

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

Subcatchment 63S: DA 63



Summary for Pond 63P: Filterra 7x10

Inflow Area = 0.200 ac,100.00% Impervious, Inflow Depth = 1.03" for NJDEP WQ event
Inflow = 0.58 cfs @ 1.09 hrs, Volume= 751 cf
Outflow = 0.49 cfs @ 1.05 hrs, Volume= 762 cf, Atten= 16%, Lag= 0.0 min
Primary = 0.49 cfs @ 1.05 hrs, Volume= 762 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.32' @ 1.14 hrs Surf.Area= 0.002 ac Storage= 23 cf

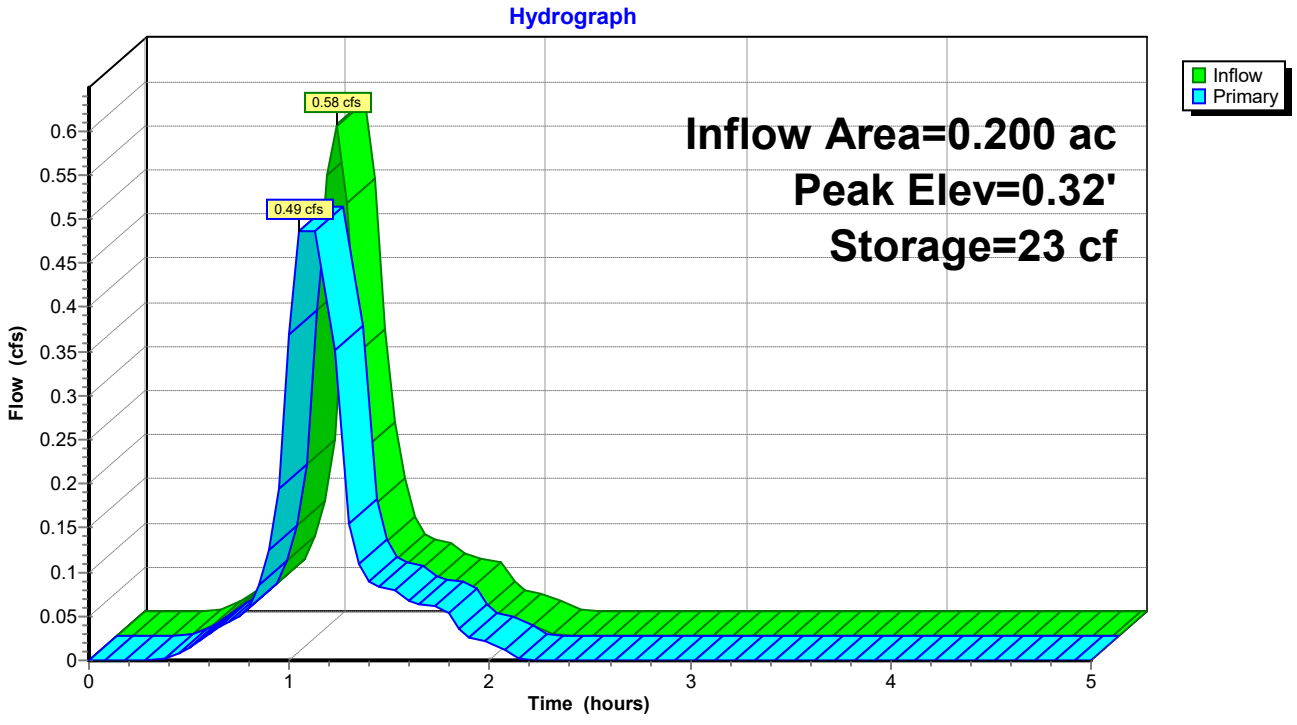
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.4 min (70.7 - 70.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	53 cf	**7.00'W x 10.00'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.49 cfs @ 1.05 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.49 cfs @ 0.01 fps)

Pond 63P: Filterra 7x10



Summary for Subcatchment 64S: substation DA

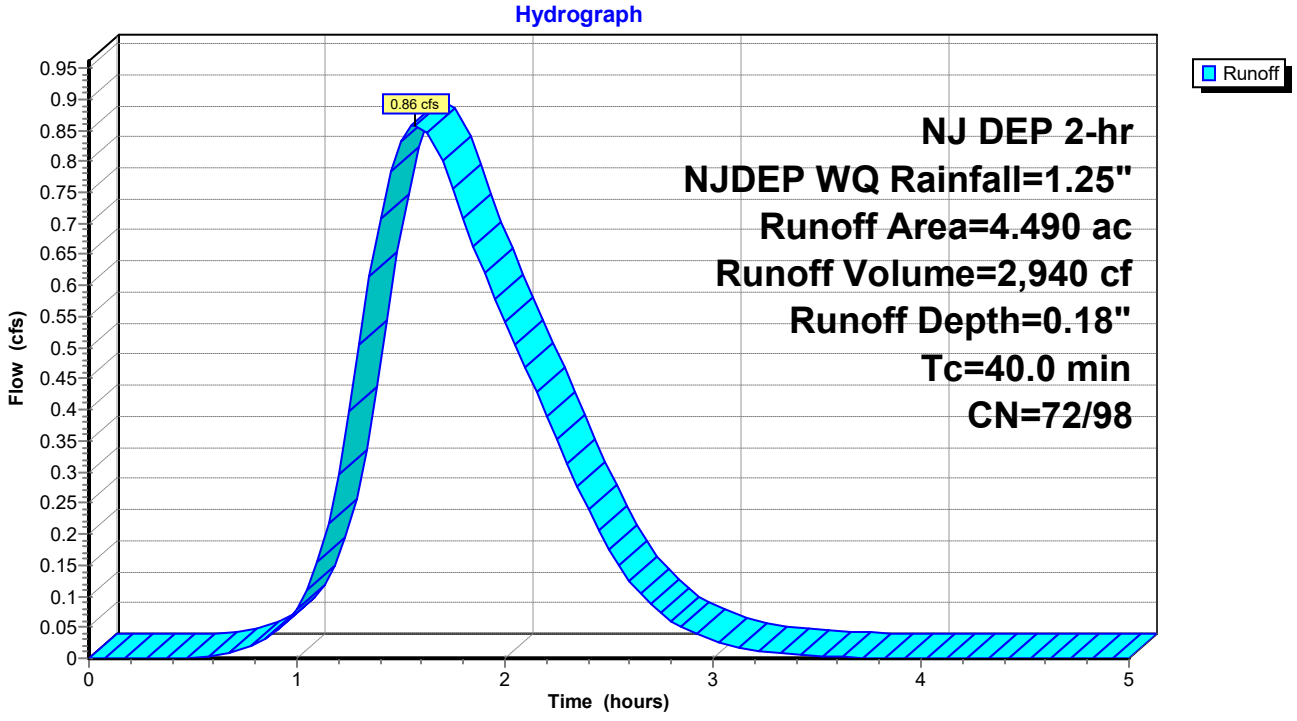
Runoff = 0.86 cfs @ 1.57 hrs, Volume= 2,940 cf, Depth= 0.18"
Routed to Pond 64P : Filterra 14x8

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.590	98	
*	3.900	72	
	4.490	75	Weighted Average
	3.900	72	86.86% Pervious Area
	0.590	98	13.14% Impervious Area

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

Subcatchment 64S: substation DA



Summary for Pond 64P: Filterra 14x8

Inflow Area = 4.490 ac, 13.14% Impervious, Inflow Depth = 0.18" for NJDEP WQ event
Inflow = 0.86 cfs @ 1.57 hrs, Volume= 2,940 cf
Outflow = 0.78 cfs @ 1.45 hrs, Volume= 3,173 cf, Atten= 9%, Lag= 0.0 min
Primary = 0.78 cfs @ 1.45 hrs, Volume= 3,173 cf

Routing by Stor-Ind method, Time Span= 0.00-5.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.47' @ 1.73 hrs Surf.Area= 0.003 ac Storage= 53 cf

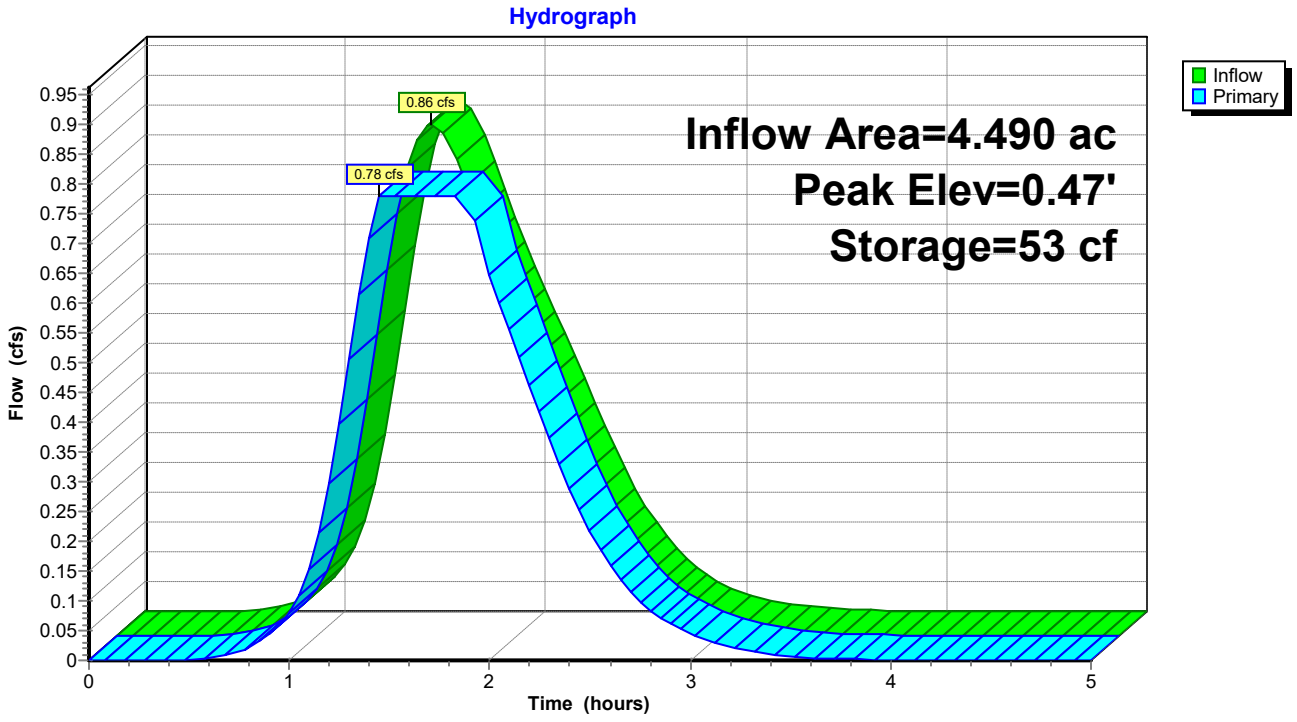
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2.8 min (109.5 - 106.7)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	84 cf	**14.00'W x 8.00'L x 0.75'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**300.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.78 cfs @ 1.45 hrs HW=0.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.78 cfs @ 0.01 fps)

Pond 64P: Filterra 14x8



Appendix D –Manufacturer's Recommended Maintenance Procedures

Filterra HC
Owner's Manual



filterra®

Bioretention Systems

CONTECH®
ENGINEERED SOLUTIONS







filterra®
Bioretention Systems

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CONTECH®
ENGINEERED SOLUTIONS

Introduction

Thank you for your purchase of the Filterra® HC Bioretention System. Filterra HC is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra HC system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra HC system.

Included with your purchase is Activation of the Filterra HC system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra HC systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra HC box sizing (per local regulations) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra HC units as shown in approved plans. A comprehensive installation manual covering all Filterra configurations is available at www.ContechES.com.

Activation Overview

Activation of the Filterra HC system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

- Removal of construction runoff protection devices
- Planting of the system's vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra HC systems.

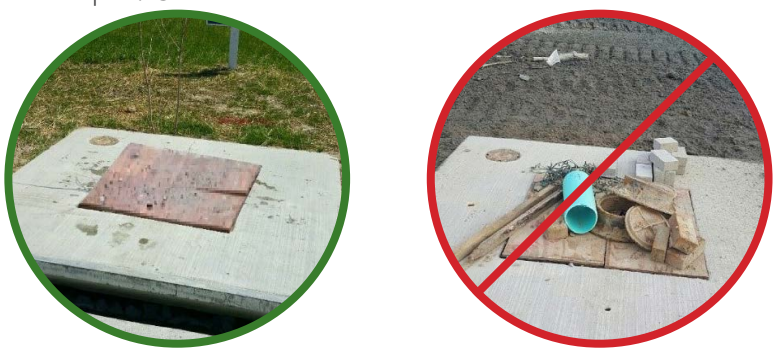
Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch certified for use in Filterra HC systems.



Minimum Requirements

The minimum requirements for Filterra HC Activation are as follows:

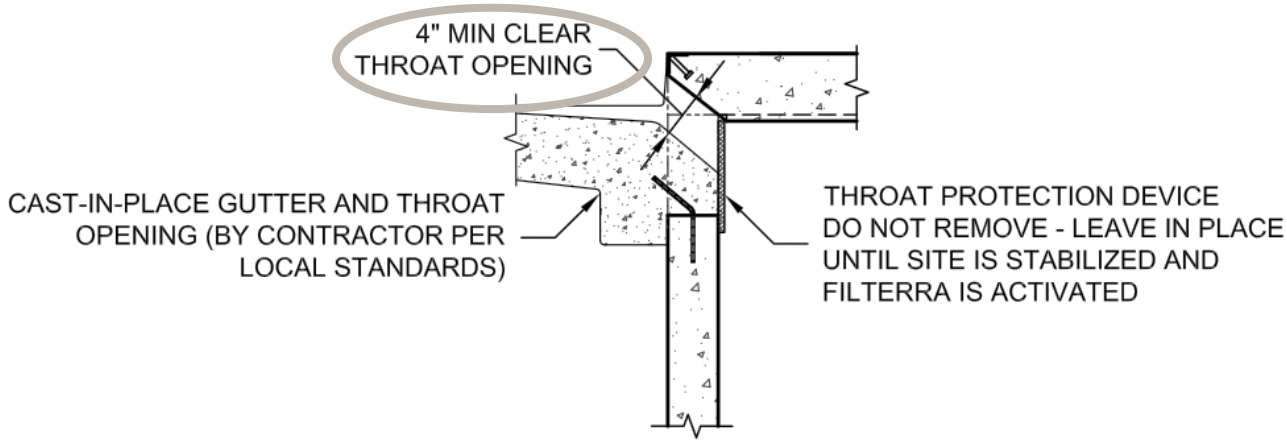
1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



2. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra HC system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra HC system.



3. Filterra HC throat opening (if applicable) should be at least 4" in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra HC Plant Selection Overview

Plant Lists are available on the Contech website highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra HC system. Plants installed in the Filterra HC system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra HC system.

The "Planting Requirements for Filterra HC Systems" document is included as an appendix and discusses proper selection and care of the plants within Filterra HC systems.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra HC system's warranty and waive the manufacturer provided Activation and Maintenance services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra HC system or runoff protection devices
- Removal of any Filterra HC system components
- Failure to prevent construction related runoff from entering the Filterra HC system
- Failure to properly store and protect any Filterra HC components (including media and underdrain stone) that may be shipped separately from the vault

Routine Maintenance Guidelines

Routine maintenance is included by the manufacturer on all Filterra HC systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra HC systems also contain diversion bypass or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.



Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan the media in the Filterra HC system.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra HC is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The Filterra HC system is also subjected to various materials entering the inlet, including trash, silt, leaves, etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra HC system flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

If the system is not maintained on regular intervals, is subject to a catastrophic spill or other event, or subject to unusual pollutant loading, full media bed replacement could be required. Please contact Contech for further evaluation if you feel this may be necessary.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated.

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency;

e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing) during the first year.



Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra HC (where the cleaned runoff drains to, such as drop inlet) and block off the inlet of the Filterra HC. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra HC and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation & pruning or replacement as necessary
6. Clean area around Filterra HC
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working near traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media for the Filterra HC system, available from the Supplier.

	Available Filterra® HC Media Bay Sizes (feet)	Filter Surface Area (ft^2)	Mulch Volume at 3" Depth (ft^2)	# of 2 ft^2 Mulch Bags
Standard Configuration Filterra and Filterra Biosape Vaults	4x4	16	4	2
	4x6 or 6x4	24	6	3
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	9	5
	6x6	36	9	5
	6x8 or 8x6	48	12	6
	6x10 or 10x6	60	15	8
	6x12 or 12x6	72	18	9
	7x13 or 13x7	91	23	12
	14x8	112	28	14
	16x8	128	32	16
	18x8	144	36	18
	20x8	160	40	20
	22x8	176	44	22
Peak Diversion Filterra Vaults	4x4	16	4	2
	4.5x5.83 or 5.83x4.5 (Nominal 4x6/6x4)	26.24	7	4
	6x6	36	9	5
	6x8	48	12	6
	6x10 or 10x6	60	15	8
	7x10	70	18	9
	8x10.5	84	21	11
	8x12.5	100	25	13
	Custom and/or Filterra Bioscape	Media Area in ft^2	0.25 x (Media Area in ft^2)	0.125 x (Media Area in ft^2)

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.



1. Inspection of Filterra HC and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Damage to Box Structure	yes | no
Damage to Grate	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).



2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra HC box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
Buckets Removed	_____



- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____



4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra HC inlet to allow for entry of trash during a storm event.
- Replace Filterra HC grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.



5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if necessary.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	_____ (ft)
Width at Widest Point	_____ (ft)
Health	healthy | unhealthy
Damage to Plant	yes | no
Plant Replaced	yes | no



6. Clean area around Filterra HC

- Clean area around unit and remove all refuse to be disposed of appropriately.



7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra HC.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra HC HC.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra HC.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.
Maintenance is ideally to be performed twice annually.				

Filterra HC Inspection & Maintenance Log

Filterra HC System Size/Model: _____ **Location:** _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate	Vegetation Species	Issues with System	Comments
1/1/17	*5 – 5 gal Buckets*	*3″*	*Lowe's Premium Brown Mulch*	*4′*	*Galaxy Magnolia*	*- Standing water in downstream structure*	*- Removed blockage in downstream structure*

Appendix 1 – Filterra® Activation Checklist

CONTECH® ENGINEERED SOLUTIONS

Project Name: _____ Company: _____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name: _____ Site Owner/End User Phone/Email: _____

Preferred Activation Date: _____ (provide 2 weeks minimum from date this form is submitted)

Site Designation	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

Attach additional sheets as necessary.

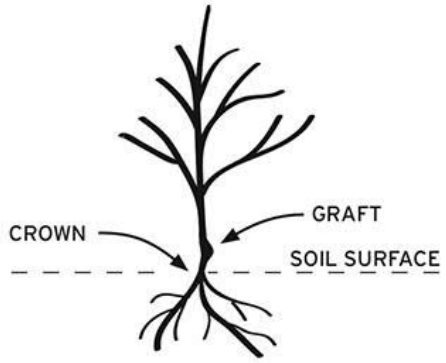
NOTE: A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra HC systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

_____ _____

Signature Date

Appendix 2 – Planting Requirements for Filterra® HC Systems

Plant Material Selection



- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra HC systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra HC systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25-30 feet.
- A 7-15 gallon container size shall be used.
- For precast Filterra HC systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some of the faster growing species, or species known to produce basal sprouts

Plant Installation

- During transport protect the plant leaves from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively, the pot can be cut away to minimize root ball disturbance.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
- To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
- Plant staking may be required.

Mulch Installation

- Only mulch that has been meeting Contech Engineered Solutions' mulch specifications can be used in the Filterra HC system.
- Mulch must be applied to a depth of 3" evenly over the surface of the media.

Irrigation Requirements

- Each Filterra HC system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra HC plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore, irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore, if dry periods exceed 3 weeks, irrigation may be required. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water. Therefore, for a 6' by 6' Filterra HC approximately 20-60 gallons of water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five-gallon bucket to estimate the applied water flow rate then calculate the time needed to irrigate the Filterra HC system. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6' by 6' filter.



Notes

filterra®
Bioretention Systems

CONTECH®
ENGINEERED SOLUTIONS

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CONTECH®
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StormFilter Inspection and Maintenance Procedures



The Stormwater Management StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.



In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..



Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to weather or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.



Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

   Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.



Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.



Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.





Inspection Report

Date: Personnel:

Location: System Size:

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: Date:

Sediment Depth on Vault Floor:

Structural Damage:

Estimated Flow from Drainage Pipes (if available):

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water:

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal:

☐ Minor Structural Repairs:

☐ Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source:

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source:

Erosion of Landscaped Areas: Yes ☐ No ☐ Source:

Items Needing Further Work:

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service:

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

_____

_____

_____

_____

_____

RECYCLED PAPER

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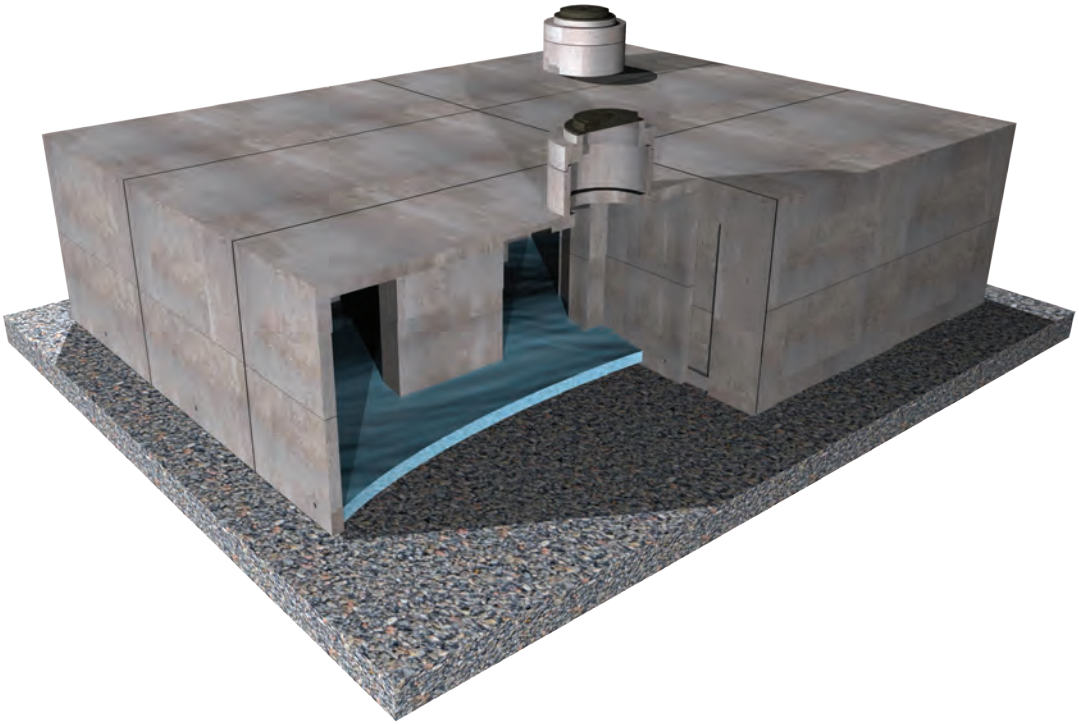
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STORMCAPTURE®

Inspection and Maintenance Guide



Water

Description

The StormCapture® system is an underground, modular, structural precast concrete storage system for stormwater detention, retention, infiltration, harvesting and reuse, and water quality volume storage. The system's modular design utilizes multiple standard precast concrete units with inside dimensions of 7 feet by 15 feet (outside dimensions of 8 feet by 16 feet) to form an underground storage system. The inside height of the StormCapture system can range from 2 feet to 14 feet. This modular design provides limitless configuration options for site-specific layouts.

StormCapture components can be provided as either open-bottom modules to promote infiltration or closed-bottom modules for detention. In some cases, StormCapture modules can be placed in a checkerboard configuration for an even more efficient design. A Link Slab, with a footprint of 9 feet by 17 feet, is then used to bridge each space without a module.

The standard StormCapture design incorporates lateral and longitudinal passageways between modules to accommodate internal stormwater conveyance throughout the system. These passageways may be classified as either a "window configuration" with standard 12-inch tall sediment baffles extending up from the floor of the module to the bottom of the window, or a "doorway configuration" without the sediment baffles. The function and drainage rate of a StormCapture system depends on site-specific conditions and requirements.

Stormwater typically enters the StormCapture system through an inlet pipe. Grated inlets can also be used for direct discharge into the system. The StormCapture system is rated for H-20 traffic loading with limited cover. Higher load requirements can also be accommodated. In addition, StormCapture systems are typically equipped with a limited number of maintenance modules that provide access to the system for ongoing inspection and maintenance.

Function

The StormCapture system is primarily used to manage water quantity by temporarily storing stormwater runoff from impervious surfaces to prevent flooding, slow down the rate at which stormwater leaves the site, and reduce receiving stream erosion. In addition, the StormCapture system can be used to capture stormwater runoff for water quality treatment. Regardless of how the StormCapture system is used, some sedimentation may occur in the modules during the time water is stored.

Configurations

The configuration of the StormCapture systems may vary, depending on the water quality and/or quantity requirements of the site. StormCapture configurations for detention, retention/infiltration, and retention/harvesting are described below.

Detention

StormCapture Detention systems are designed with a closed bottom to detain stormwater runoff for controlled discharge from the site. This design may incorporate a dead storage sump and a permanent pool of water if the outlet pipe is higher than the floor elevation. Discharge from the system is typically controlled by an outlet orifice and/or outlet weir to regulate the rate of stormwater leaving the system. StormCapture Detention systems are typically designed with silt-tight joints, however when conditions exist that require a StormCapture system to be watertight, the system may be wrapped in a continuous, impermeable geomembrane liner. If the StormCapture Detention system includes Link Slabs, a liner must be used to detain water since the chambers under each Link Slab have no floor slab. In this case, care must be taken by maintenance personnel not to damage the exposed liner beneath each Link Slab.

Retention/Infiltration

StormCapture Retention/Infiltration systems are designed with an open bottom to allow for the retention of stormwater onsite through infiltration into the base rock and surrounding soils. For infiltration systems, the configuration of the base of the StormCapture system may vary, depending on the needs of the site and the height of the system. Some systems may use modules that have fully open bottoms with no concrete floor, while other systems may use modules that incorporate floor openings in the base of each module. These are typically 24-inch by 24-inch openings. For open-bottom systems, concrete splash pads may be installed below inlet grate openings and pipe inlets to prevent erosion of base rock. A StormCapture Infiltration system may have an elevated discharge pipe for peak overflow.

Retention/Harvesting

StormCapture Retention/Harvesting systems are similar to detention systems using closed-bottom modules, but stormwater is typically retained onsite for an extended period of time and later reused for non-potable applications or irrigation. For rainwater harvesting systems, an impermeable geomembrane liner is typically installed around the modules to provide a water-tight system.

Inspection and Maintenance Overview

State and local regulations typically require all stormwater management systems to be inspected on a regular basis and maintained as necessary to ensure performance and protect downstream receiving waters. Inspections should be used to evaluate the conditions of the system. Based on these inspections, maintenance needs can be determined. Maintenance needs vary by site and system. Using this Inspection & Maintenance Guide, qualified maintenance personnel should be able to provide a recommendation for maintenance needs. Requirements may range from minor activities such as removing trash, debris or pipe blockages to more substantial activities such as vacuuming and removal of sediment and/or non-draining water. Long-term maintenance is important to the operation of the system since it prevents excessive pollutant buildup that may limit system performance by reducing the operating capacity and increasing the potential for scouring of pollutants during periods of high flow.

Only authorized personnel shall inspect and/or enter a StormCapture system. Personnel must be properly trained and equipped before entering any underground or confined space structure. Training includes familiarity with and adherence to any and all local, state and federal regulations governing confined space access and the operation, inspection, and maintenance of underground structures.

Inspection and Maintenance Frequency

The StormCapture system should be inspected on a regular basis, typically twice per year, and maintained as required. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. Local jurisdictions may also dictate inspection and maintenance frequencies.

Inspection Equipment

The following equipment is helpful when conducting StormCapture inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)

Inspection Procedures

A typical StormCapture system provides strategically placed access points that may be used for inspection. StormCapture inspections are usually conducted visually from the ground surface, without entering the unit. This typically limits inspection to the assessment of sediment depth, water drain down, and general condition of the modules and components, but a more detailed assessment of structural condition may be conducted during a maintenance event.

To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be inspected and recorded (see form provided at the end of this document) to determine whether maintenance is required:

- Observe inlet and outlet pipe penetrations for blockage or obstruction.
- If possible, observe internal components like baffles, flow control weirs or orifices, and steps or ladders to determine whether they are broken, missing, or possibly obstructed.
- Observe, quantify, and record the sediment depths within the modules.
- Retrieve as much floating trash as possible with a long-handled net. If a significant amount of trash remains, make a note in the Inspection & Maintenance Log.
- For infiltration systems, local regulations may require monitoring of the system to ensure drain down is occurring within the required permit time period (typically 24 to 72 hours). If this is the case, refer to local regulations for proper inspection procedure.

Maintenance Indicators

Maintenance should be scheduled if any of the following conditions are identified during the inspection:

- Inlet or outlet piping is blocked or obstructed.
- Internal components are broken, missing, or obstructed.
- Accumulation of more than six inches of sediment on the system floor or in the sump, if applicable.
- Significant accumulation of floating trash and debris that cannot be retrieved with a net.
- The system has not drained completely after it hasn't rained for one to three days, or the drain down does not meet permit requirements.
- Any hazardous material is observed or reported.

Maintenance Equipment

The following equipment is helpful when conducting StormCapture maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- Vacuum truck

Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. Confined space entry is usually required to maintain the StormCapture. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Once safety measures such as traffic control have been deployed, the access covers may be removed and the following activities may be conducted to complete maintenance:

- Remove trash and debris using an extension on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely remove accumulated sediment. Some jetting may be necessary to fully evacuate sediment from the system floor or sump. Jetting is acceptable in systems with solid concrete floors or base slabs (referred to as closed-bottom systems). However, jetting is not recommended for open-bottom systems with a gravel foundation since it may cause bedding displacement, undermining of the foundation, or internal disturbance.
- All material removed from the system during maintenance must be disposed of in accordance with local regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
- Inspect inlet and outlet pipe penetrations for cracking and other signs of movement that may cause leakage.
- Inspect the concrete splash pads (applicable for open-bottom systems only) for proper function and placement.
- Inspect the system for movement of modules. There should be less than 3/4-inch spacing between modules.
- Inspect the general interior condition of modules for concrete cracking or deterioration. If the system consists of horizontal joints as part of the modules, inspect those joints for leakage, displacement or deterioration.

Be sure to securely replace all access covers, as appropriate, following inspection and/or maintenance. If the StormCapture modules or any of the system components show significant signs of cracking, spalling, or deterioration or if there is evidence of excessive differential settlement between modules, contact Oldcastle Infrastructure at **800-579-8819.**

StormCapture
Inspection & Maintenance Log

Refer to as-built records for details about system size and location onsite

Location _____

System Configuration:

Inspection Date _____

☐ Detention ☐ Infiltration ☐ Retention/Harvesting

Inlet or Outlet Blockage or Obstruction

Notes:

☐ Yes ☐ No

Condition of Internal Components

Notes:

☐ Good ☐ Damaged ☐ Missing

Sediment Depth Observed

Notes:

☐ Inches of Sediment: _____

Trash and Debris Accumulation

Notes:

☐ Significant ☐ Not Significant

Drain Down Observations

Notes:

☐ Appropriate Time Frame ☐ Inappropriate Time Frame

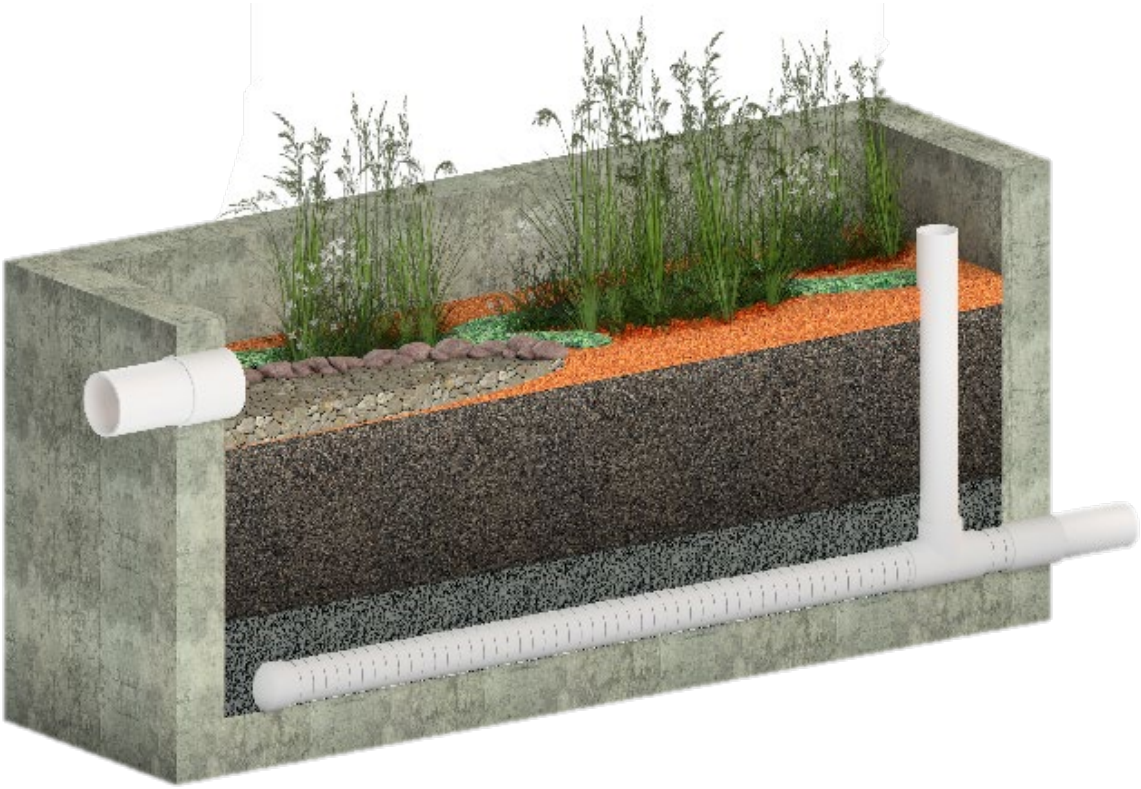
Maintenance Requirements

☐ **Yes - Schedule Maintenance** ☐ **No - Inspect Again in _____ Months**

StormVault Biofiltration

(SVBF)

OPERATION & MAINTENANCE MANUAL



Prepared For
Project Name:
Project Location:
Date:

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- APPENDIX B
  Site Location Plans
- APPENDIX C
  Plan & Profile Drawing

PROJECT INFORMATION
FOR
STORMVAULT BIOFILTRATION (SVBF) UNITS

Project:

Location:

Subject:

SWTU: **STORMVAULT BIOFILTRATION (SVBF) UNITS**

Model: **SVBFXX-XX**

INTRODUCTION

The ***StormVault BioFiltration*** (***SVBF***) stormwater treatment unit (SWTU), is a bioretention manufactured treatment device (MTD) designed for the treatment of stormwater runoff. Using the proprietary ***Sierra Blend*** engineered bio-soil media, the ***SVBF*** captures and removes pollutants from stormwater including total suspended solids, heavy metals, nutrients, gross solids, trash and debris, and petroleum hydrocarbons. Many of these pollutants are regulated by local, state, and/or federal government(s) who limit the allowable level of pollutants in stormwater runoff discharging from a site. Due to the high hydraulic surface loading rate capacity of the ***Sierra Blend*** bio-soil media, the ***SVBF*** system is able to treat more stormwater in a smaller footprint than conventional bioretention systems.

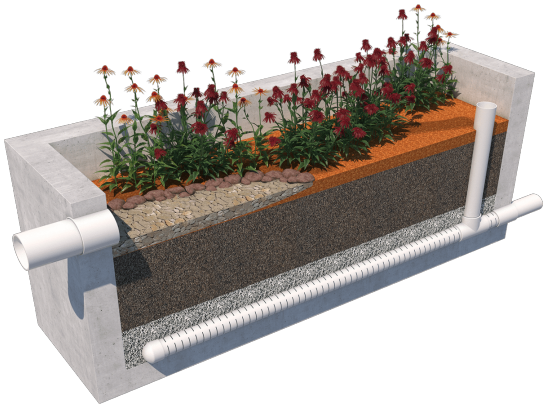
DEPLOYMENT CONFIGURATIONS

The ***SVBF*** comes in many standard sizes and is available in several different deployment configurations. Depending on the deployment configuration, units may have additional parts or chambers that will need to be inspected and maintained. In addition to the standard model featuring only the treatment chamber, other deployment configurations may include an inlet and outlet chamber separated by a high-flow bypass weir, as well as an underground vault model without vegetation. However, inspection and maintenance across all deployment configurations should remain consistent and generally follow the same procedures.

The ***SVBF*** unit consists of a precast concrete vault layered with 3-inches of plant stabilization mulch/media, 18-inches of the ***Sierra Blend*** bio-soil media, and 6-inches of bridging stone above

the underdrain piping, with an internal or external high-flow bypass. Different deployment configurations of the unit are available to better serve the requirements and needs of a specific site. Deployment configurations include a planter box with an open top more suited for shrubs and grasses to better mimic a natural swale, a tree box with or without a grated curb inlet, a tree well consisting of an adjacent tree well with open bottom to promote mature tree root growth, and an underground vault with a subsurface inlet pipe. All of these deployment configurations can be deployed with block-outs in the bottom of the vault to promote infiltration and groundwater recharge.

The following illustrations depict the various possible deployment configurations of the ***SVBF*** unit.



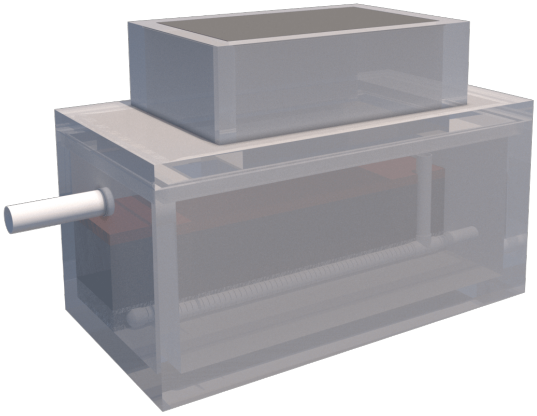
Planter Box Model



Tree Box Model



Tree Well Model



Underground Vault Model

OPERATIONS

The ***SVBF*** unit is a non-mechanical, self-operating system that will function anytime there is flow within the drainage system. The plant stabilization mulch/media, the ***Sierra Blend*** bio-soil media, and the bridging stone are arranged in layers within the chamber with stormwater gravity flowing downward through these layers. The plant stabilization mulch/media layer consists of hardwood mulch and/or large stone riprap and serves as pretreatment, removing the trash, debris, and large sediment while increasing moisture retention, erosion control, and flow dissipation across the treatment chamber. The ***Sierra Blend*** bio-soil media treats the stormwater, removing fine and suspended sediment, heavy metals, and nutrients. The bridging stone, the gravel base beneath the ***Sierra Blend*** bio-soil media bed ensures even drainage. Treated stormwater enters an underdrain pipe, infiltrates into the ground, or splits between both.

A system bypass allows the ***SVBF*** unit to continue to operate in high-flow situations without washing out or scouring the pollutants already trapped in the system. After the water quality treatment flow depth is reached, excess flow spills over a bypass weir or overflow pipe and is directly discharged along with treated flows. Flows greater than the water quality treatment flow rate of a unit will cause ponding within the unit.

An external bypass consists of a separate catch basin or other external bypass structure located further downstream from the unit.

INSPECTION

NEW INSTALLATIONS – Jensen recommends a visual inspection of the unit every 6-months or for every 10-inches of rainfall, whichever comes first, but regular inspections during the first two to three years of operation will help to establish a site-specific frequency for future inspections and maintenance. During these regular inspections, light maintenance procedures such as clearing out trash and debris caught in the plant stabilization mulch/media and inlet grates or tending to vegetation can be completed. Clearing out trash and debris will prevent obstructions to the inlets and ensure the unit is operating at its maximum capacity. It is recommended to inspect the system after each major storm event during the first several months of the rainy season.

ONGOING OPERATION – The system should be routinely inspected to ensure that all grates and drains are free of blockage. After several storm events, inspections should look for signs of erosion of or accumulation of sediment in the plant stabilization mulch/media layer. If the plant stabilization mulch/media has been displaced due to flows and the ***Sierra Blend*** bio-soil media layer is visible, or heavy accumulation of sediment is apparent in the plant stabilization mulch/media layer, the steps outlined in the maintenance section should be followed to ensure that the ***SVBF*** unit is able to continue to operate at maximum capacity.

Use the attached Inspection & Maintenance Log in Appendix A, to help determine whether maintenance is needed.

Inspection Equipment

The following is a list of equipment for the simple and effective inspection of ***SVBF*** systems:

- Appropriate clothing (pants and shoes, gloves, safety vest, hard hat, etc.)
- Traffic control equipment (Traffic cones, signage, etc.)
- Manhole hook or crowbar
- Inspection & Maintenance Log or other recording method
- Flashlight
- Tape measure
- Trash grabber
- Shovel, rake, and broom
- Pruners
- Trash can/bag.

Inspection Procedure

All necessary pre-inspection steps including traffic control or pedestrian detours must be carried out. Access to underground, closed top ***SVBF*** units can be reached through the access hatch, grate or manhole frame and cover. When access has been safely established the following inspection procedure should begin:

- Record the date, time, and inspector on the day of inspection as well as the job location and model designation
- Observe and record the level of the scum line if any
- Clean off a section of the scum line on the side wall
- Inspections of the internal components can, in most cases, be accomplished through observations from the ground surface
- Check the inlet structures for any unwanted objects or obstructions and remove them
- Record and photograph any observations in the provided inspection form

- Observe the inside of the ***SVBF*** for trash, debris, or displacement of the plant stabilization mulch/media and ***Sierra Blend*** bio-soil media layers

- Observe the SVBF for "light", "medium", or "heavy" sediment loading within the plant stabilization mulch/media layer

    - For "light" loading, the sediment is difficult to distinguish amongst the plant stabilization mulch/media with the plant stabilization mulch/media appearing new

    - For "medium" loading, the sediment is apparent and may be concentrated in some areas, but the probing of the plant stabilization mulch/media reveals lighter loads beneath the first inch of plant stabilization mulch/media

    - For "heavy" loads, sediment is apparent across the entire top layer as well as beneath the first inch of plant stabilization mulch/media

- Finalize the inspection report with the designated manager to determine required maintenance

- It must be noted that closed top ***SVBF*** units may be considered confined space environments and only properly trained personnel possessing the necessary safety equipment should enter the unit to perform maintenance and/or inspection in adherence with the requirements of a confined space entry permit.

MAINTENANCE

The schedule for the maintenance of the ***SVBF*** unit should be established based on the results of the routine inspections outlined in the previous section.

Maintenance Equipment

In addition to the equipment necessary for inspection, the following equipment is recommended for performing maintenance on the ***SVBF*** unit:

- Traffic control equipment (Traffic cones, signage, etc.)

- Vactor truck as necessary.

Maintenance Indicators

From observations noted during previous inspections, the following items may be indications that the ***SVBF*** unit needs maintenance:

- The visual presence of a scum line on the wall above the plant stabilization mulch/media layer that is higher than the crest of the bypass weir or overflow pipe is a general indicator that the filter bed has operated in bypass mode and the ***Sierra Blend*** bio-soil media may be plugged
- Damage to the concrete structure
- Damaged or missing grates
- Obstruction of the curb inlet or inlet rack
- Water stagnation in the biofiltration chamber more than a full day after a rainfall event
- Invasive vegetation growth
- Excessive trash and debris, especially plastics
- Heavy sediment load present in the plant stabilization mulch/media or top of ***Sierra Blend*** bio-soil media
- Excessive erosion of the plant stabilization mulch/media or ***Sierra Blend*** bio-soil media.

Maintenance Procedure

Cleanout of the ***SVBF*** unit at the end of a wet season is recommended to ensure captured trash, debris, sediment, and invasive vegetation do not compromise the unit's functionality or harm plant housed in it.

The following maintenance activities should be performed during each service:

- Inspection of treatment system and housing structure
- Removal of any material or debris blocking flow into and through the unit
- Removal of trash and debris from plant stabilization mulch/media and visible flow paths
- Raking or replacement of plant stabilization mulch/media layer
    - ***Sierra Blend*** bio-soil media replacement should only be necessary after an oil or chemical spill clean-up or when the filter has become totally occluded with fines or possibly biofouling
- If vegetation is planted:
    - Pruning of vegetation
    - Replacement with new vegetation if current vegetation is in poor health for aesthetic purposes

- Ensure irrigation system is functional
- Disposal of any trash or debris collected.

If the ***Sierra Blend*** bio-soil media appears plugged due to the presence of a prominent scum line on the vault wall above the crest of the bypass:

- Remove the plant stabilization mulch/media layer, which should be replaced if necessary
- Rake the top of the ***Sierra Blend*** bio-soil media in ¼ to ½-inch depth passes until the original ***Sierra Blend*** bio-soil media is observed and to break any cementitious crust that may have formed
- Again, remember to clean off a section of the scum line on the side wall as an operational reset for future indicator measurements

If operations continue to appear to be in bypass condition:

- Replace any ***Sierra Blend*** bio-soil media that was removed and replace plant stabilization mulch/media
- Again, remember to clean off a section of the scum line on the side wall

If bypass events still appear to continue:

- Remove ***Sierra Blend*** bio-soil media as necessary until no more incoming sediment is observed within this media, exposing the underdrain pipe if necessary and replace all ***Sierra Blend*** bio-soil media if necessary
- Wash or replace the underdrain bridging stone layer
- Clean and place new ***Sierra Blend*** bio-soil media and plant stabilization mulch/media.

Replacement of the ***Sierra Blend*** bio-soil media is done either with hand tools or a mini excavator.

CLEANOUT AND DISPOSAL

Cleanout of the unit primarily involves the removal of trash and sediment from the unit. Trash and debris can be removed from the curb inlet, inlet rack, and the biofiltration chamber manually with tools such as rakes, shovels, brooms or by Vactor trucks if required.

- Disposal of material from the ***SVBF*** unit should be in accordance with the local municipality's requirements. Typically, the removed solids can be disposed of in a similar fashion as those materials collected from sump catch basins or manholes

- If any of the unit's parts previously mentioned under the inspection section are damaged or missing, or ***Sierra Blend*** bio-soil media is needed for replacement, please contact Jensen Water Resources

  Jensen Water Resources
  521 Dunn Circle
  Sparks, NV 89431
  Toll Free: (877) 649-0095
  Fax: (775) 440-2013

RECORDS OF OPERATION AND MAINTANACE

The owner shall maintain annual records of the operation and maintenance of the ***SVBF*** unit to document the effective maintenance of this important component of a site's stormwater management program.

The attached Inspection & Maintenance Log in Appendix A, is suggested and should be retained for a minimum period of three years.

Appendix A

Inspection & Maintenance Log

StormVault BioFiltration (SVBF)
ANNUAL RECORD OF OPERATION AND MAINTENANCE

OWNER _____

ADDRESS _____

OWNER'S REPRESENTATIVE _____ **PHONE** _____

SVBF MODEL DESIGNATION _____ **DATE** _____

SITE LOCATION _____

INSPECTIONS:

DATE & INSPECTOR	SCUM LINE LEVEL	INLET AND OUTLET INTEGRITY	STANDING WATER/ TRASH AND DEBRIS	MULCH AND EROSION	CONDITION OF VEGETATION	OBSERVATIONS OF FUNCTION

CLEANOUT:

DATE	SCUM LINE LEVEL	TRASH AND DEBRIS REMOVAL	MULCH MEDIA REPLACED (Y/N)	VEGETATION PRUNED REPLACED (Y/N)	METHOD OF DISPOSAL OF MULCH, MEDIA, TRASH AND DEBRIS, AND VEGETATION	OBSERVATIONS OF FUNCTION

MAINTENANCE:

DATE OF INSPECTION AND OBSERVATIONS: _____

_____

CERTIFICATION: _____ **TITLE:** _____ **DATE:** _____

Appendix E – Storm Drain System Drainage Areas and Erosion and Sediment Control Plans for Sequence of Construction



SCALE: 1"=150'

STORM DRAIN DRAINAGE AREA TABLE			
DA ID	DA(AC)	C	Q_{25}(CFS)
1	0.7140	0.90	4.66
2	1.4670	0.90	9.57
3	0.8230	0.90	5.37
4	0.0750	0.90	0.49
5	0.9400	0.90	6.13
6	2.3720	0.90	15.48
7	2.3420	0.90	15.28
8	0.2730	0.90	1.78
9	0.4100	0.90	2.68
10	5.1580	0.90	33.66
11	0.5240	0.90	3.42
12	0.2670	0.90	1.74
13	2.2000	0.90	14.36
14	0.7510	0.90	4.90
15	0.2240	0.90	1.46
16	1.3250	0.90	8.65
17	0.6940	0.90	4.53
18	0.3970	0.90	2.59
19	1.4500	0.90	9.46
20	0.5800	0.90	3.78
22	0.4740	0.90	3.09
23	0.4400	0.90	2.87
24	0.9720	0.90	6.34
25	4.5490	0.90	29.68
26	0.5280	0.90	3.45
27	1.5570	0.90	10.16
28	18.8450	0.90	122.96
29	10.5260	0.90	68.68
30	7.0500	0.90	46.00
31	2.4210	0.90	15.80

PRELIMINARY DESIGN
ISSUED: FOR PERMITTING
ISSUED: NOVEMBER 04, 2022

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Mark	Description	Date	Appr

NEW JERSEY WIND PORT
PARCEL G - ENGINEERING FOR PERMITTING
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

DRAINAGE AREA MAP - EXISTING CONDITIONS

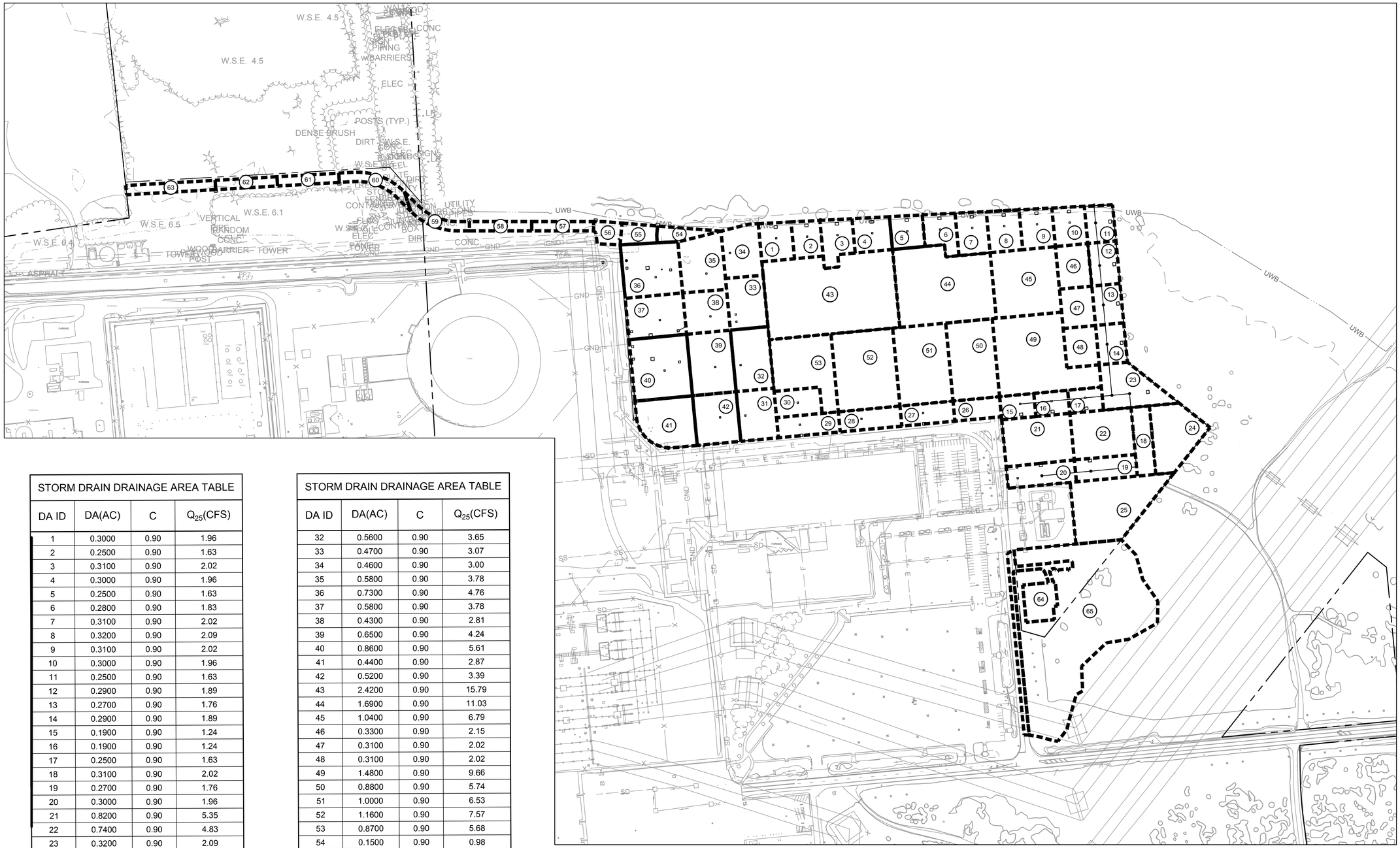
moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-298-7330

NEW JERSEY WIND PORT
NJEDA

Designed by:	DSGN
Drawn by:	DRFT
Checked by:	CHKR
Reviewed by:	REVR
Submitted by:	MOFFATT & NICHOL
Date:	2022-11-04
M&N Project No.	11102-06
Drawing scale:	
Drawing Scale:	
Plot scale:	1:1 (0 SHEET)
Rev.	0

Sheet Reference No.
C-601
INDEX: 65 OF 79

File: Q:\BOS\Projects\11102-06 NJ Wind G Eng Perm\500 CADD_ACTIVE_SheetSet - All\Phases\11102606C-601 - Plotted: 11/4/2022 6:57 PM by WILKINSON, MELISSA ; Saved: 11/1/2022 1:17 PM by HRIDOUANE



STORM DRAIN DRAINAGE AREA TABLE			
DA ID	DA(AC)	C	Q_{25}(CFS)
1	0.3000	0.90	1.96
2	0.2500	0.90	1.63
3	0.3100	0.90	2.02
4	0.3000	0.90	1.96
5	0.2500	0.90	1.63
6	0.2800	0.90	1.83
7	0.3100	0.90	2.02
8	0.3200	0.90	2.09
9	0.3100	0.90	2.02
10	0.3000	0.90	1.96
11	0.2500	0.90	1.63
12	0.2900	0.90	1.89
13	0.2700	0.90	1.76
14	0.2900	0.90	1.89
15	0.1900	0.90	1.24
16	0.1900	0.90	1.24
17	0.2500	0.90	1.63
18	0.3100	0.90	2.02
19	0.2700	0.90	1.76
20	0.3000	0.90	1.96
21	0.8200	0.90	5.35
22	0.7400	0.90	4.83
23	0.3200	0.90	2.09
24	0.8300	0.20	1.20
25	1.1200	0.20	1.62
26	0.2300	0.90	1.50
27	0.2600	0.90	1.70
28	0.3000	0.90	1.96
29	0.3000	0.90	1.96
30	0.2900	0.90	1.89
31	0.4500	0.90	2.94

STORM DRAIN DRAINAGE AREA TABLE			
DA ID	DA(AC)	C	Q_{25}(CFS)
32	0.5600	0.90	3.65
33	0.4700	0.90	3.07
34	0.4600	0.90	3.00
35	0.5800	0.90	3.78
36	0.7300	0.90	4.76
37	0.5800	0.90	3.78
38	0.4300	0.90	2.81
39	0.6500	0.90	4.24
40	0.8600	0.90	5.61
41	0.4400	0.90	2.87
42	0.5200	0.90	3.39
43	2.4200	0.90	15.79
44	1.6900	0.90	11.03
45	1.0400	0.90	6.79
46	0.3300	0.90	2.15
47	0.3100	0.90	2.02
48	0.3100	0.90	2.02
49	1.4800	0.90	9.66
50	0.8800	0.90	5.74
51	1.0000	0.90	6.53
52	1.1600	0.90	7.57
53	0.8700	0.90	5.68
54	0.1500	0.90	0.98
55	0.1700	0.90	1.11
56	0.1400	0.90	0.91
57	0.1400	0.90	0.91
58	0.1400	0.90	0.91
59	0.1500	0.90	0.98
60	0.1700	0.90	1.11
61	0.1400	0.90	0.91
62	0.1400	0.90	0.91
63	0.2000	0.90	1.31

160' 0' 160' 320'

SCALE: 1"=160'

PRELIMINARY DESIGN
ISSUED: FOR PERMITTING
ISSUED: NOVEMBER 04, 2022

Mark	Description	Date	Appr

NEW JERSEY WIND PORT
PARCEL G - ENGINEERING FOR PERMITTING
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

DRAINAGE AREA MAP - PROPOSED CONDITIONS

Rev. 0
Date: 2022-11-04
M&N Project No. 11102-06
Drawing code:
Drawing Scale: 1:1 (D SHEET)
Plot scale: 1:1 (D SHEET)
Designed by: DSGN
Drawn by: DRFT
Ckd by: CHKR
Reviewed by: REVR
Submitted by: MOFFATT & NICHOL

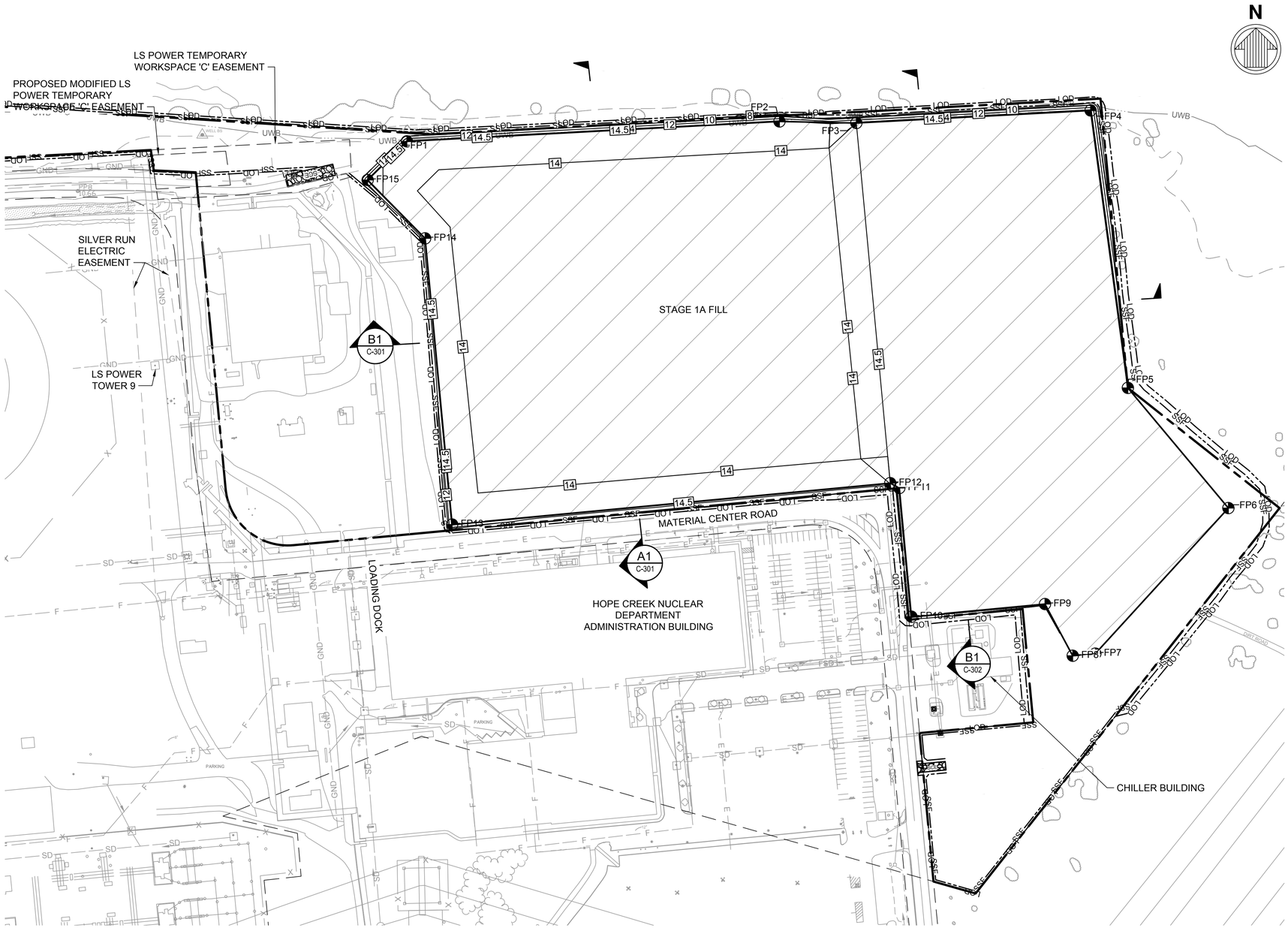
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

Sheet Reference No.
C-602
INDEX: 66 OF 79

File: Q:\BOS\Projects\11102-06 NJ Wind G Eng Permi\500 CADD_ACTIVE_SheetSet - AllPhases\11102606C-602 - Plotted: 11/4/2022 6:57 PM by WILKINSON, MELISSA ; Saved: 10/31/2022 12:49 PM by HRIDOUANE

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



N

NOTES

1. FOR GENERAL NOTES, SEE SHEET G-002.
2. FOR LEGEND AND ABBREVIATIONS, SEE SHEET G-003.

LEGEND

- FP1 — TOP OF INITIAL FILL WORKING POINT
- STAGE 1A INITIAL FILL
- LOD — LIMIT OF DISTURBANCE
- SSF — SUPER SILT FENCE
- SCE — STABILIZED CONSTRUCTION ENTRANCE
- SFP — SILT FENCE ON PAVEMENT
- INLET PROTECTION
- 14 — INITIAL FILL CONTOUR

INITIAL FILL WORKING POINTS		
POINT #	NORTHING	EASTING
FP1	234125.65	200834.64
FP2	234160.65	201489.79
FP3	234157.86	201624.96
FP4	234179.87	202036.98
FP5	233692.34	202102.45
FP6	233481.11	202279.20
FP7	233225.26	202045.26
FP8	233221.50	202005.44
FP9	233312.33	201956.69
FP10	233290.18	201721.87
FP11	233516.36	201700.54
FP12	233524.90	201684.66
FP13	233452.23	200914.22
FP14	233955.15	200866.77
FP15	234057.70	200765.70

100' 0' 100' 200'

SCALE: 1"=100'

PRELIMINARY DESIGN
ISSUED: FOR PERMITTING
ISSUED: NOVEMBER 04, 2022

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Mark	Description	Date	Appr

NEW JERSEY WIND PORT
PARCEL G - ENGINEERING FOR PERMITTING
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

PLAN - INITIAL FILL AND ESC STAGE 1A

Rev:
Date: 2022-11-04
Designed by: DC
Drawn by: HR
Cad by: LC
Reviewed by: TJS
Submitted by: MOFFATT & NICHOL
M&N Project No. 11102-06
Drawing code:
Drawing Scale:
Plot scale: 1:1 (0 SHEET)

180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

Sheet Reference No.
C-106
INDEX: 15 OF 79

File: Q:\BOS\Projects\11102-06 NJ Wind G Eng Permi\500 CADD_ACTIVE_ SheetSet - All\Phase1\11020BC-106 ; Plotted: 11/4/2022 7:17 PM by WILKINSON, MELISSA ; Saved: 10/28/2022 11:44 AM by HRIDOUANE

LS POWER TEMPORARY WORKSPACE 'C' EASEMENT

PROPOSED MODIFIED LS POWER TEMPORARY WORKSPACE 'C' EASEMENT

SILVER RUN ELECTRIC EASEMENT

STAGE 3 FILL

LS POWER TOWER 9

B1
C-307

A1
C-307

LOADING DOCK

HOPE CREEK NUCLEAR DEPARTMENT ADMINISTRATION BUILDING

MATERIAL CENTER ROAD

CHILLER BUILDING

PARKING

N

NOTES

1. FOR GENERAL NOTES, SEE SHEET G-002.
2. FOR LEGEND AND ABBREVIATIONS, SEE SHEET G-003.

LEGEND

- LOD — LIMIT OF DISTURBANCE
- SSF — SUPER SILT FENCE
- SCE — STABILIZED CONSTRUCTION ENTRANCE
- SFP — SILT FENCE ON PAVEMENT

100' 0' 100' 200'

SCALE: 1"=100'

PRELIMINARY DESIGN
ISSUED: FOR PERMITTING
ISSUED: NOVEMBER 04, 2022

Mark	Description	Date	Appr

NEW JERSEY WIND PORT
PARCEL G - ENGINEERING FOR PERMITTING
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

PLAN - INITIAL FILL AND ESC STAGE 3

180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330
moffatt & nichol

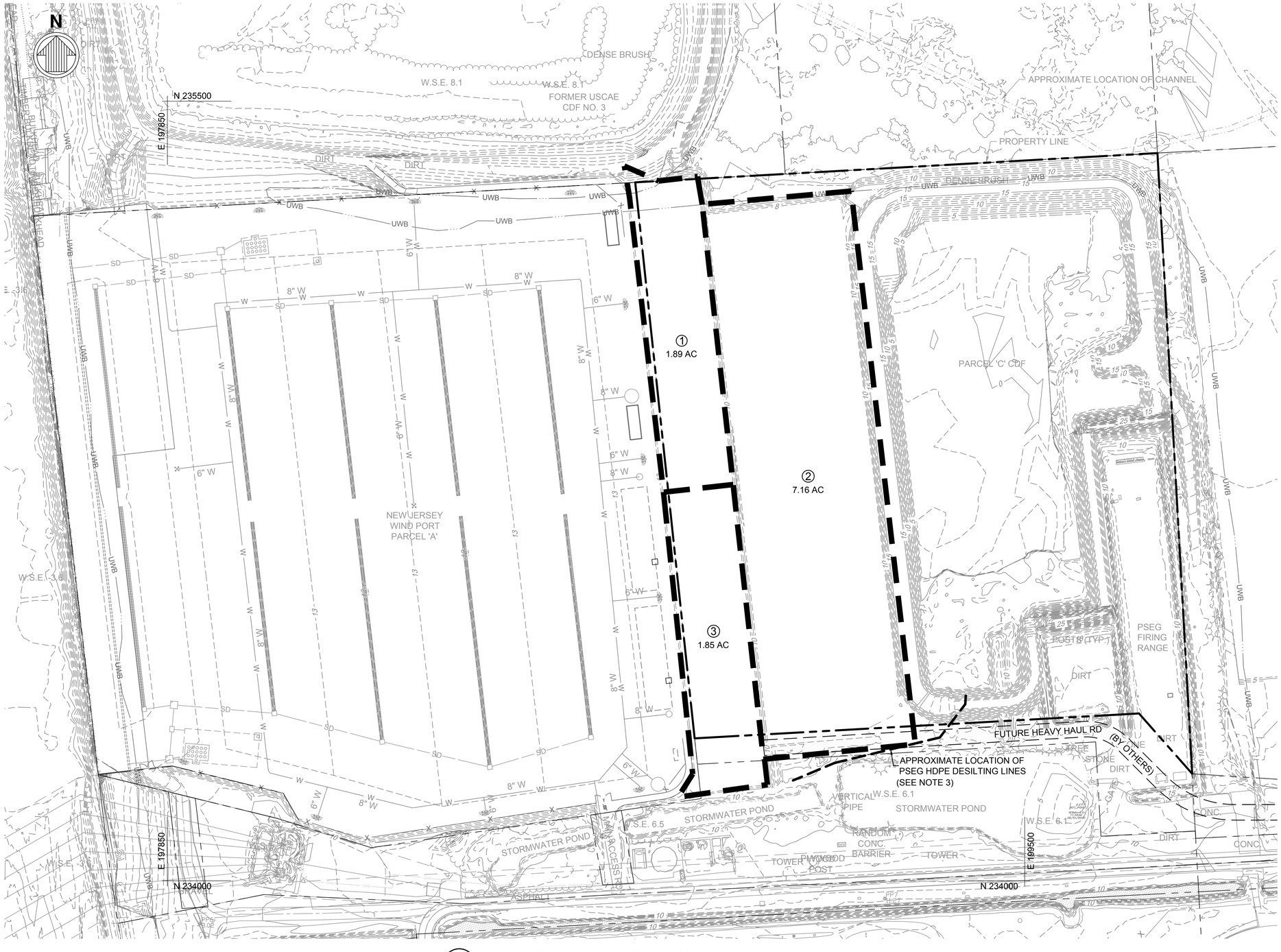
NEW JERSEY WIND PORT
NJ EDA

Designed by:	DC
Drawn by:	HR
Quality Control by:	LC
Reviewed by:	TJS
Submitted by:	MOFFATT & NICHOL
Date:	2022-11-04
M&N Project No.	11102.06
Drawing code:	
Drawing Scale:	
Plot scale:	1:1 (0 SHEET)
Rev.	

Sheet Reference No.
C-110
INDEX: 19 OF 79

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

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A1 / C-601 DRAINAGE AREA MAP - EXISTING CONDITIONS
SCALE: 1" = 100'

PERMIT SET
ISSUED: 2022-11-04
NOT TO BE USED FOR CONSTRUCTION

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

NEW JERSEY WIND PORT
PARCEL C ACCELERATION (C1)
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

DRAINAGE AREA MAP - EXISTING CONDITIONS

Mark	Description	Date	Appr

Rev.	Date:	M&N Project No.	Drawing code:	Drawing Scale:
	2022-11-04	11102-19		1:1 (D SHEET)

Designed by:	Cxd by:	Reviewed by:	Submitted by:	Plot scale:
TJS	LC	FCG	FERNANDO GONZALEZ CHANA MOFFATT & NICHOL	1:1

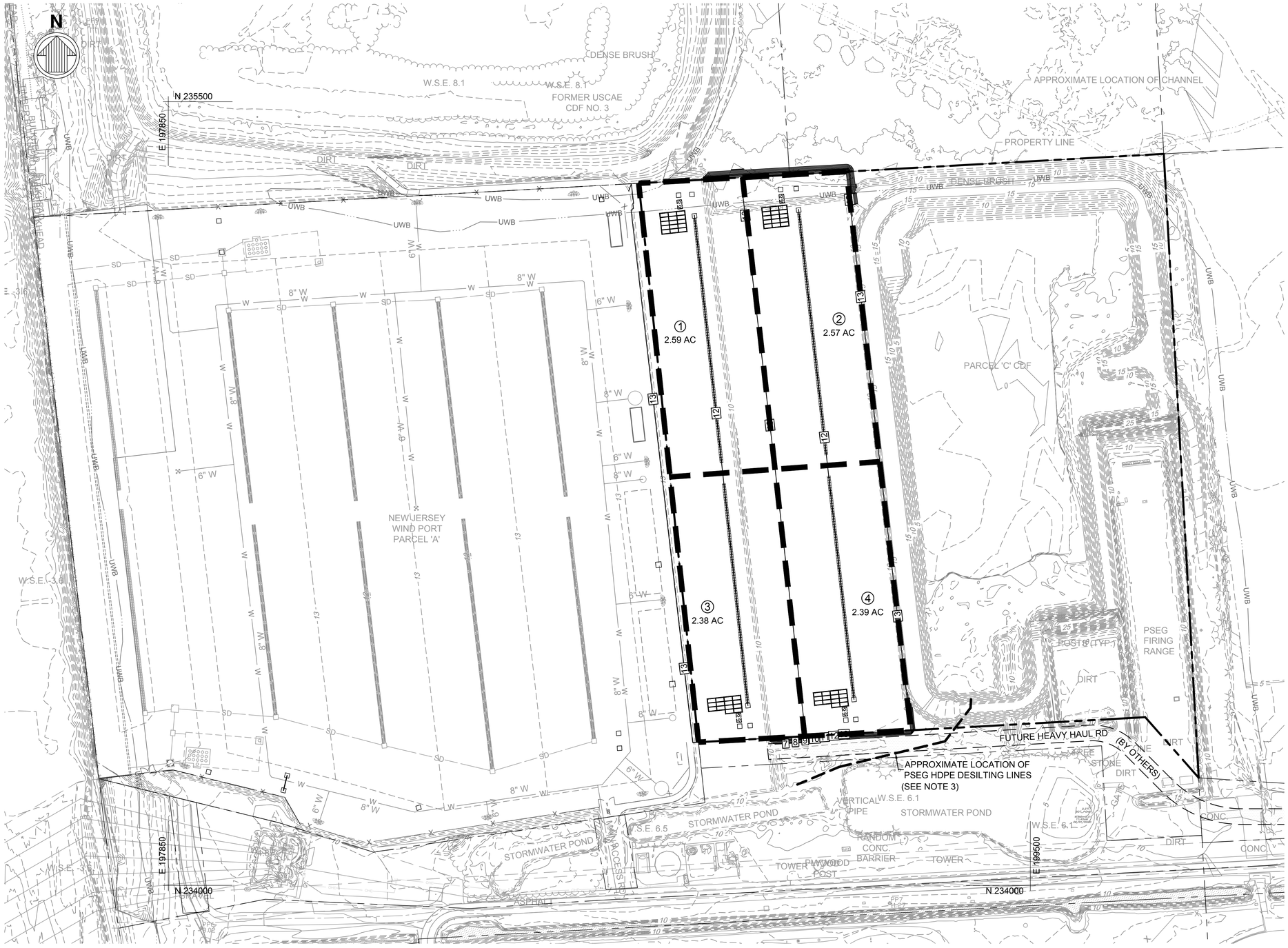
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7300
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

SEAL

Sheet Reference No.
C-601
INDEX: 24 OF 32

File: Q:\BOS\Projects\11102-19 Parcel C1 Feasibility Study\20 CADD_Active_Parcel C Acceleration\1110219P-C-601 - Plotted: 11/4/2022 1:40 PM by RIDOUANE, HICHAM - Saved: 11/2/2022 6:05 PM by HRIDOUANE



A1 / C-602 DRAINAGE AREA MAP - PROPOSED CONDITIONS
SCALE: 1" = 100'

NOTES:

1. FOR GENERAL NOTES AND SEQUENCE OF CONSTRUCTION, SEE SHEET G-002
2. FOR LEGEND AND ABBREVIATION, SEE SHEET G-003
3. APPROXIMATE LOCATION OF 8" AND 12" PSEG DESILTING LINES. THESE LINES SHALL NOT BE DAMAGED OR DISTURBED.

LEGEND

DRAINAGE AREA LIMITS

100' 0' 100' 200'
SCALE: 1"=100'

PERMIT SET
ISSUED: 2022-11-04
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr

NEW JERSEY WIND PORT
PARCEL C ACCELERATION (C1)
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

DRAINAGE AREA MAP - PROPOSED CONDITIONS

180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

Designed by:	TJS
Drawn by:	HR
Checked by:	LC
Reviewed by:	FCG
Submitted by:	FERNANDO GONZALEZ CHANA MOFFATT & NICHOL
Drawing code:	
Drawing Scale:	
Plot scale:	1:1 (D SHEET)
Date:	2022-11-04
Rev.	
M&N Project No.	11102-19

SEAL

Sheet
Reference No.
C-602
INDEX: 25 OF 32

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DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



A1 C-102 PLAN - INITIAL FILL AND ESC

SCALE: 1" = 100'

NOTES:

1. FOR GENERAL NOTES AND SEQUENCE OF CONSTRUCTION, SEE SHEET G-002
2. FOR LEGEND AND ABBREVIATION, SEE SHEET G-003
3. APPROXIMATE LOCATION OF 8" AND 12" PSEG DESILTING LINES. THESE LINES SHALL NOT BE DAMAGED OR DISTURBED.

LEGEND

	PARCEL 'C' ACCELERATED
SSF	SUPER SILT FENCE
SCE	STABILIZED CONSTRUCTION ENTRANCE
LOD	LIMIT OF DISTURBANCE
FP#	INITIAL FILL WORKING POINT
WP#	BASELINE WORKING POINT

INITIAL FILL WORKING POINT		
POINT #	NORTHING	EASTING
FP1	235350.54	198870.65
FP2	235343.84	198751.06
FP3	235468.92	198874.08
FP4	235483.48	199133.93
FP5	234270.30	199274.36
FP6	234247.72	199002.12

BASELINE OF CONSTRUCTION WORKING POINT		
POINT #	NORTHING	EASTING
WP1	234155.66	198830.11
WP2	235340.58	198692.74

100' 0' 100' 200'

SCALE: 1"=100'

PERMIT SET
ISSUED: 2022-11-04
NOT TO BE USED FOR CONSTRUCTION

NEW JERSEY WIND PORT
PARCEL C ACCELERATION (C1)
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

PLAN - INITIAL FILL AND ESC

Rev.	Date	Description	Appr
	2022-11-04		

Designed by: TJS
Drawn by: HR
Cked by: LC
Reviewed by: FCG
Submitted by: FERNANDO GONZALEZ CHANA MOFFATT & NICHOL
M&N Project No. 11102-19
Drawing code:
Drawing Scale:
Plot scale: 1:1 (D SHEET)

180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7300
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

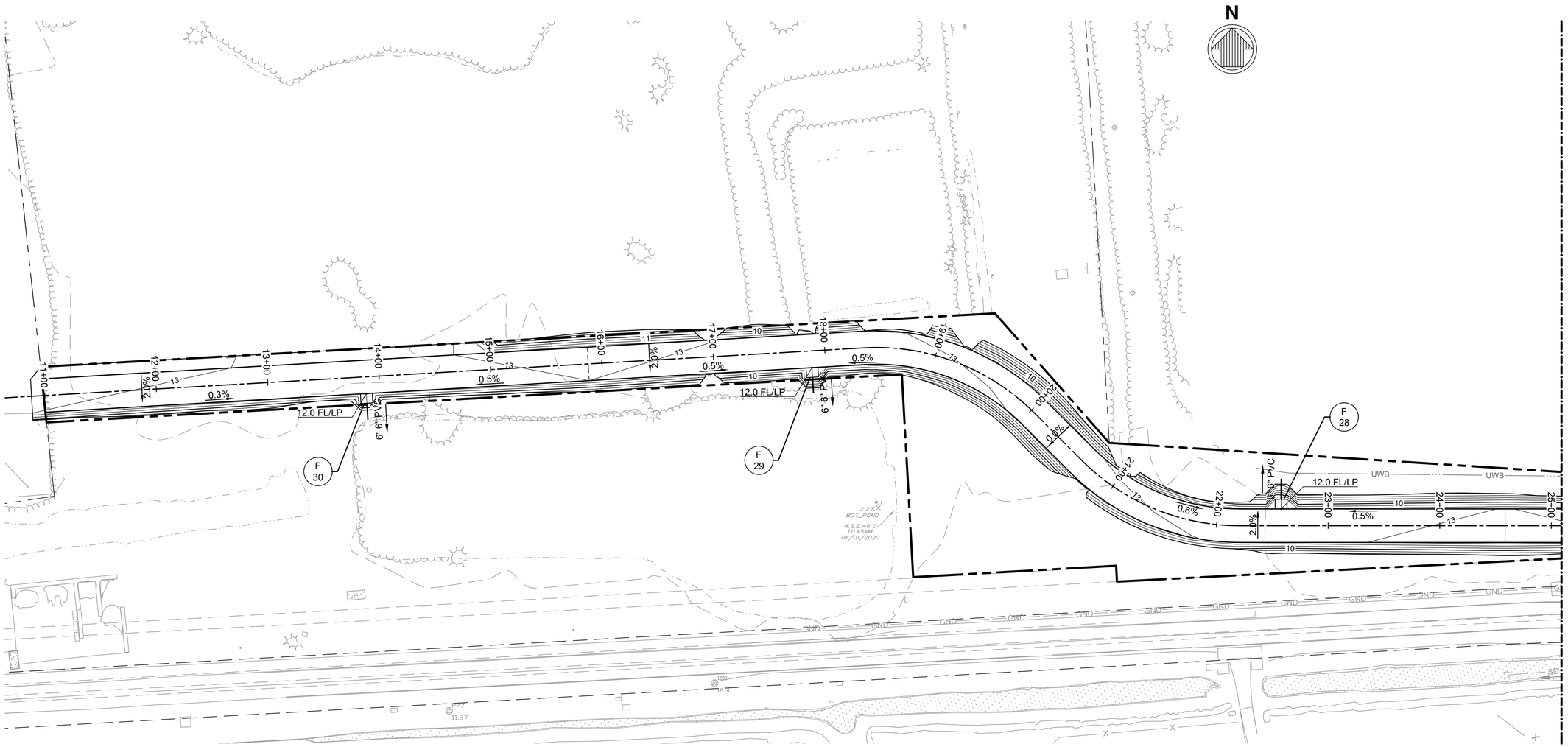
SEAL

Sheet Reference No.
C-102
INDEX: 7 OF 32

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DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Appendix F – Final Storm Drainage Site Layout



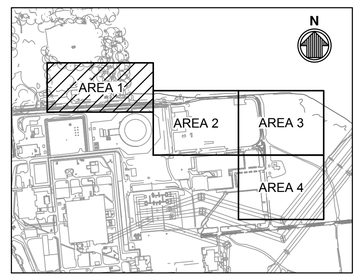
NOTES

1. FOR GENERAL NOTES, SEE SHEET G-002.
2. FOR LEGEND AND ABBREVIATIONS, SEE SHEET G-003.
3. FOR STORM DRAIN SIZE, MATERIAL, AND SLOPE, SEE STORM DRAIN PROFILES ON SHEETS C-202 THROUGH C-209.

LEGEND

F/# STRUCTURE TYPE / STRUCTURE NUMBER

F FILTERRA HC BIOFILTRATION UNIT (SEE SHEET C-509)



50' 0' 50' 100'

SCALE: 1"=50'

PRELIMINARY DESIGN
ISSUED: FOR PERMITTING
ISSUED: NOVEMBER 04, 2022

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Mark	Description	Date	Appr

NEW JERSEY WIND PORT
PARCEL G - ENGINEERING FOR PERMITTING
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

PLAN - SITE GRADING AND DRAINAGE (1 OF 4)

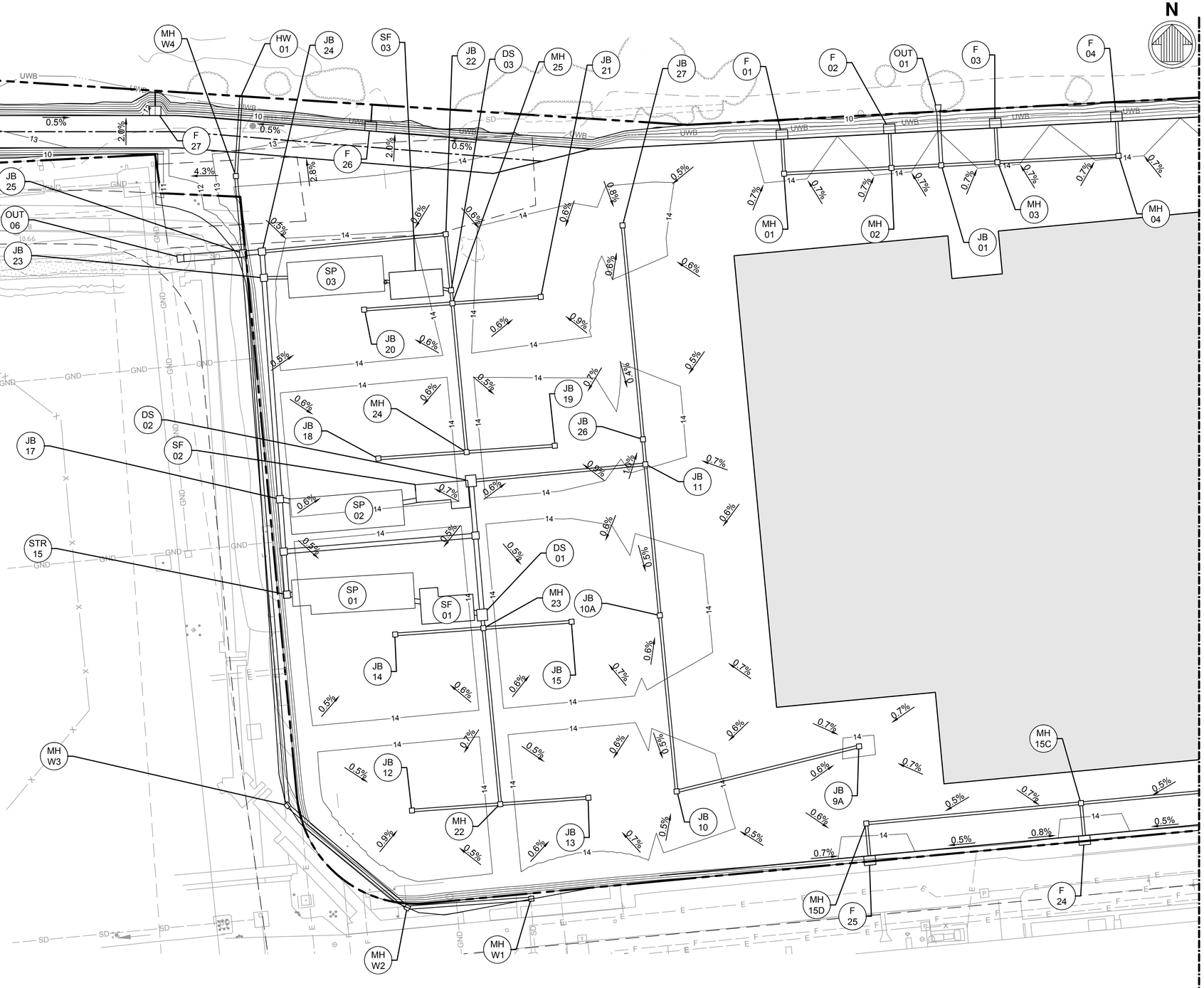
Designed by: DC
Drawn by: HR
Cad by: LC
Reviewed by: TJS
Submitted by: MOFFATT & NICHOL
Date: 2022-11-04
Rev.
M&N Project No. 11102-06
Drawing code:
Drawing Scale:
Plot scale: 1:1 (D SHEET)

180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

Sheet Reference No.
C-114
INDEX: 23 OF 79

File: Q:\BOS\Projects\11102-06 NJ Wind G Eng Permi\500 CADD_ACTIVE_SheetSet - AllPhases\111020\6C-114 - Plotted: 11/4/2022 7:23 PM by WILKINSON, MELISSA - Saved: 10/31/2022 3:36 PM by HRIDOUANE



NOTES

1. FOR GENERAL NOTES, SEE SHEET G-002.
2. FOR LEGEND AND ABBREVIATIONS, SEE SHEET G-003.
3. FOR STORM DRAIN SIZE, MATERIAL, AND SLOPE, SEE STORM DRAIN PROFILES ON SHEETS C-202 THROUGH C-209.

LEGEND

(F #) STRUCTURE TYPE / STRUCTURE NUMBER

F FILTERRA HC BIOFILTRATION UNIT (SEE SHEET C-509)

SF STORMFILTER PRETREATMENT UNIT (SEE SHEETS C-506-C-508)

SP STORMPOD INFILTRATION VAULT (SEE SHEETS C-506-C-508)

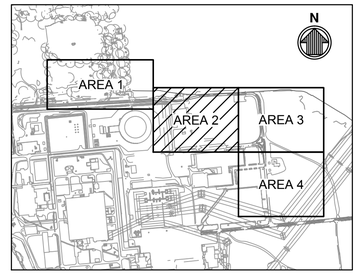
MH STORMWATER MANHOLE (SEE SHEET C-504)

JB JUNCTION BOX (SEE SHEET C-502)

DS DIVERSION STRUCTURE (SEE SHEET C-503)

OUT OUTFALL STRUCTURE

HW HEADWALL STRUCTURE



50' 0' 50' 100'

SCALE: 1"=50'

PRELIMINARY DESIGN
ISSUED: FOR PERMITTING
ISSUED: NOVEMBER 04, 2022

Mark	Description	Date	Appr

NEW JERSEY WIND PORT
PARCEL G - ENGINEERING FOR PERMITTING
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

PLAN - SITE GRADING AND DRAINAGE (2 OF 4)

Designed by:	DC
Drawn by:	HR
Checked by:	LC
Reviewed by:	TJS
Submitted by:	MOFFATT & NICHOL
Rev.	
Date:	2022-11-04
M&N Project No.	11102.06
Drawing code:	
Drawing Scale:	
Plot scale:	1:1 (D SHEET)

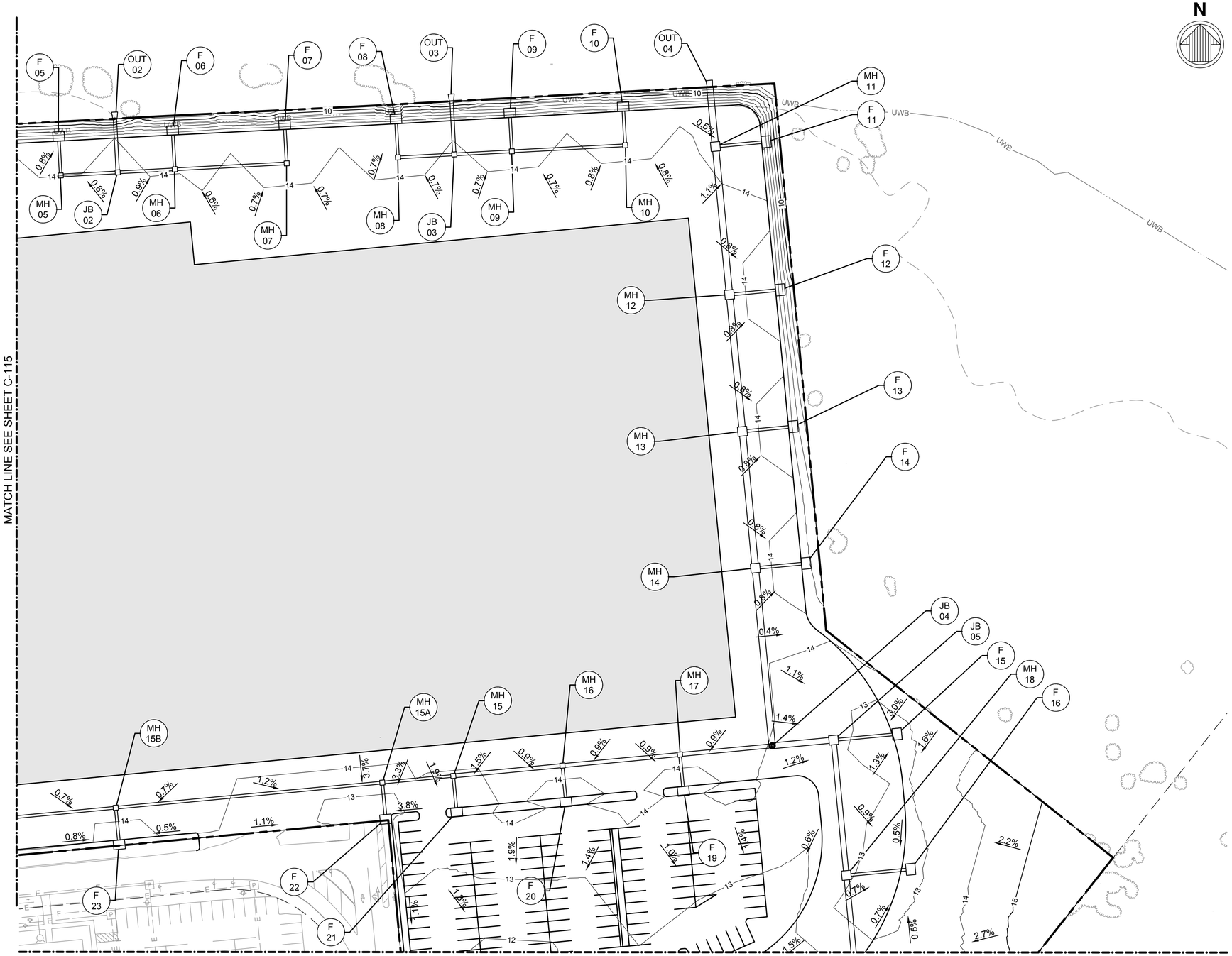
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

Sheet Reference No.
C-115
INDEX: 24 OF 79

File: Q:\BOS\Projects\11102-06 NJ Wind G Eng Permi\500 CADD_ACTIVE_SheetSet - All\Phases\111020C-115 - Plotted: 11/4/2022 7:24 PM by WILKINSON, MELISSA ; Saved: 10/31/2022 3:52 PM by HRIDOUANE

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



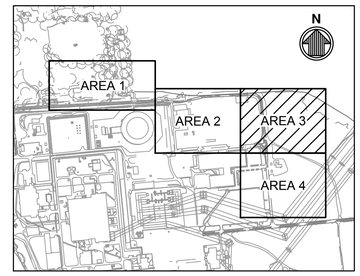
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NOTES

1. FOR GENERAL NOTES, SEE SHEET G-002.
2. FOR LEGEND AND ABBREVIATIONS, SEE SHEET G-003.
3. FOR STORM DRAIN SIZE, MATERIAL, AND SLOPE, SEE STORM DRAIN PROFILES ON SHEETS C-202 THROUGH C-209.

LEGEND

- (F / #) STRUCTURE TYPE / STRUCTURE NUMBER
- F FILTERRA HC BIOFILTRATION UNIT (SEE SHEET C-509)
- SF STORMFILTER PRETREATMENT UNIT (SEE SHEETS C-506-C-508)
- SP STORMPOD INFILTRATION VAULT (SEE SHEETS C-506-C-508)
- MH STORMWATER MANHOLE (SEE SHEET C-504)
- JB JUNCTION BOX (SEE SHEET C-502)
- DS DIVERSION STRUCTURE (SEE SHEET C-503)
- OUT OUTFALL STRUCTURE
- HW HEADWALL STRUCTURE



50' 0' 50' 100'

SCALE: 1"=50'

PRELIMINARY DESIGN
ISSUED: FOR PERMITTING
ISSUED: NOVEMBER 04, 2022

Mark	Description	Date	Appr

NEW JERSEY WIND PORT
PARCEL G - ENGINEERING FOR PERMITTING
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

PLAN - SITE GRADING AND DRAINAGE (3 OF 4)

Designed by: DC
Drawn by: HR
Cad by: LC
Reviewed by: TJS
Submitted by: MOFFATT & NICHOL
Date: 2022-11-04
Rev:
M&N Project No. 11102-06
Drawing code:
Drawing Scale: Plot scale: 1:1 (D SHEET)

180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

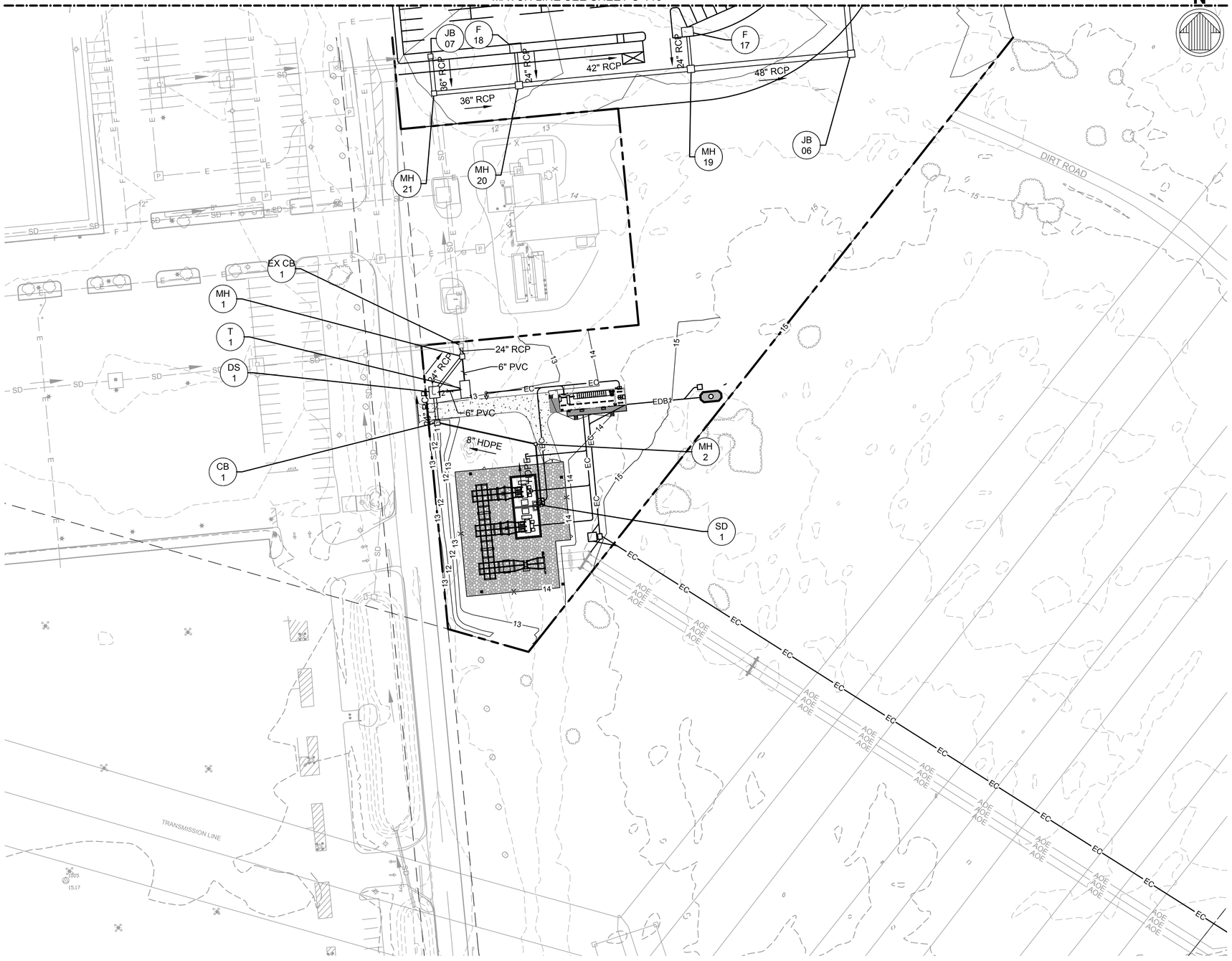
Sheet Reference No.
C-116
INDEX: 25 OF 79

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DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

MATCH LINE SEE SHEET C-116

N

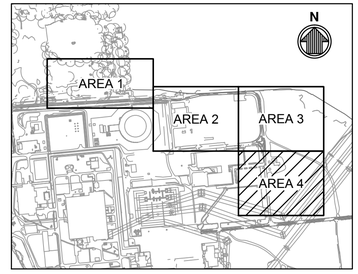


NOTES

1. FOR GENERAL NOTES, SEE SHEET G-002.
2. FOR LEGEND AND ABBREVIATIONS, SEE SHEET G-003.
3. FOR STORM DRAIN SIZE, MATERIAL, AND SLOPE, SEE STORM DRAIN PROFILES ON SHEETS C-202 THROUGH C-209.

LEGEND

F #	STRUCTURE TYPE STRUCTURE NUMBER
F	FILTERRA HC BIOFILTRATION UNIT (SEE SHEET C-509)
SF	STORMFILTER PRETREATMENT UNIT (SEE SHEETS C-506-C-508)
SP	STORMPOD INFILTRATION VAULT (SEE SHEETS C-506-C-508)
MH	STORMWATER MANHOLE (SEE SHEET C-504)
JB	JUNCTION BOX (SEE SHEET C-502)
DS	DIVERSION STRUCTURE (SEE SHEET C-503)
OUT	OUTFALL STRUCTURE
HW	HEADWALL STRUCTURE



50' 0' 50' 100'

SCALE: 1"=50'

PRELIMINARY DESIGN
ISSUED: FOR PERMITTING
ISSUED: NOVEMBER 04, 2022

Mark	Description	Date	Appr

NEW JERSEY WIND PORT
PARCEL G - ENGINEERING FOR PERMITTING
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

PLAN - SITE GRADING AND DRAINAGE (4 OF 4)

Date: 2022-11-04
Designed by: DC
Drawn by: HR
Cad by: LC
M&N Project No. 11102-06
Reviewed by: TJS
Submitted by: MOFFATT & NICHOL
Drawing scale:
Drawing Scale:
Plot scale: 1:1 (D SHEET)

180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

Sheet Reference No.
C-117
INDEX: 26 OF 79

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DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



A1 C-106 PLAN - SITE GRADING AND DRAINAGE
SCALE: 1" = 100'

NOTES:

1. FOR GENERAL NOTES AND SEQUENCE OF CONSTRUCTION, SEE SHEET G-002
2. FOR LEGEND AND ABBREVIATION, SEE SHEET G-003
3. APPROXIMATE LOCATION OF 8" AND 12" PSEG DESILTING LINES. THESE LINES SHALL NOT BE DAMAGED OR DISTURBED.
4. CONVEYANCE OF TREATED STORMWATER FROM PARCEL 'C' ACCELERATED THROUGH PARCEL 'A' WILL NEED TO BE INCLUDED AS PART OF THE ONGOING PARCEL 'A' CONSTRUCTION.
5. BMP'S 1-4C SHALL BE THE STORMVAULT BIOFILTRATION 8X16' VAULT CONFIGURATIONS BY JENSEN WATER RESOURCES AS SPECIFIED IN DETAIL SHEET CG501 OR EQUIVALENT. SHALL BE CONFIRMED BY THE ENGINEER.
6. V-1C-4C SHALL BE THE STORMCAPTURE 8X16' MODULE BY OLDCASTLE AS SPECIFIED IN DETAIL SHEET CG502 OR EQUIVALENT. SHALL BE CONFIRMED BY THE ENGINEER. THE CONFIGURATION OF MODULES SHALL BE AS SHOWN IN THE DETAIL AND AS FOLLOWS:
   - V-1C: 15 MODULES
   - V-2C: 15 MODULES
   - V-3C: 14 MODULES
   - V-4C: 14 MODULES

LEGEND

- PARCEL 'C' ACCELERATED
- SSF — SUPER SILT FENCE
- SCE — STABILIZED CONSTRUCTION ENTRANCE
- LOD — LIMIT OF DISTURBANCE
- FG# — FINISHED GRADE WORKING POINT

FINISHED GRADE WORKING POINTS

POINT #	NORTHING	EASTING
FG1	235343.0	198736.3
FG2	235366.1	199147.5
FG3	234296.8	199271.3
FG4	234273.4	198853.8

100' 0' 100' 200'
SCALE: 1"=100'

PERMIT SET
ISSUED: 2022-11-04
NOT TO BE USED FOR CONSTRUCTION

Rev.	Date	Description	Appr

NEW JERSEY WIND PORT
PARCEL C ACCELERATION (C1)
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

PLAN - SITE GRADING AND DRAINAGE

Designed by: TJS | Date: 2022-11-04 | M&N Project No. 11102-19 | Drawing Scale: 1:1 (D SHEET)
Drawn by: HR | Cad by: LC | Drawing code:
Reviewed by: FCG | Submitted by: FERNANDO GONZALEZ CHANA MOFFATT & NICHOL | Plot scale:

180 WELLS AVENUE, SUITE 302
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moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

SEAL

Sheet Reference No.
C-106
INDEX: 11 OF 32

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DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Appendix G – Site Photos



Figure G-1 - Site Photo, Taken at Site G looking North



Figure G-2 - Site Photo, Taken at Site G looking South.



Figure G-3 - Site Photo, Taken at Site G Looking East.



Figure G-4 - Site Photo, Taken at Site G Looking West.

Appendix H – Pennoni Site Soils Investigation Report

Geotechnical Data Report

New Jersey Wind Port – Parcel G
Artificial Island – Hope Creek Site – Block 26, Lot 5
Lower Alloways Creek Township, Salem County, NJ

MOFNI 22003

PREPARED FOR:
Moffatt & Nichol
2929 Arch Street, Suite 1700
Philadelphia, PA 19104

PREPARED BY:
Pennoni Associates, Inc.
121 Continental Drive, Suite 207
Newark, DE 19713

August 12, 2022

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4.3 GROUNDWATER 7

5. INFILTRATION TESTING RESULTS 9

6. LIMITATIONS 10

ATTACHMENTS:

Site Location Sketch, SL-1 (1 page)
Geotechnical Field Testing Location Sketch, SK-1 (1 page)
Geotechnical Field Testing Location Sketch, SK-2 (1 page)
Geologic Map Sketch, SK-3 (1 page)
Geologic Cross-Section Sketch, SK-4 (1 page)
USDA Web Soil Survey (16 pages)
Summary of Laboratory Data – L-1 (1 pages)
Particle Size Distribution Charts – S-1 through S-22 (22 pages)
Liquid and Atterberg Limits Test Results – A-1 through A-3 (3 pages)

1. INTRODUCTION

Pennoni Associates Inc. (Pennoni) is pleased to submit this data report summarizing our geotechnical engineering services performed for the referenced project located within the area referred to as "Parcel G" for the New Jersey Wind Port project as indicated in the attached Site Location Sketch, SL-1. The general purpose of our services was to perform localized clearing, limited subsurface utility locating, test pit excavations, infiltration testing, geotechnical laboratory testing, and preparation of a geotechnical data report. These services were performed in general accordance with Pennoni's revised proposal dated April 14, 2022 and subsequent Moffatt & Nichol (M&N) Subconsultant Agreement dated May 27, 2022.

The field exploration consisted of subsurface utility location performed at each field-testing location, twenty-two (22) test pit excavations and infiltration testing performed at each test pit location, and one additional test pit excavation performed for groundwater observations.

To assist with the performance of our services, we were provided with the following documents:

- A geotechnical report titled, "Subsurface Evaluation: Area G & SPMT Corridor New Jersey Wind Port," prepared by Duffield Associate, LLC, dated January 2021;
- A subdivision plan containing block and lot numbering for the area of intertest titled, "Salem Hope Creek," prepared by PSEG Services Corporation, dated March 31, 2021;
- A test pit and infiltration testing location plan for Parcel G with topographic contour grading information titled, "Plan – Overall Site Grading and Drainage," Sheet Number CG101, prepared by Moffatt & Nichol, dated September 30, 2021 (stamped "Preliminary Design Issued for Permitting"); and
- A test pit and infiltration testing location plan for the proposed substation area with topographic contour grading information titled, "Plan – Proposed Geotechnical Exploration," Sheet Number FIG. 1, prepared by Moffatt & Nichol, dated March 11, 2022 (stamped 60% Submittal).

We understand that M&N is working with the New Jersey Economic Development Authority (NJEDA) within Parcel G for a proposed manufacturing building with associated stormwater management facilities and paved parking areas, a heavy haul road connecting parcels A and G, and a substation for the New Jersey Wind Port. As this project is in the conceptual phase, a preliminary site layout was available indicating building and stormwater management facilities footprints, but no invert elevations for the stormwater management facilities were available at the time of our field exploration. The work area for the geotechnical field exploration generally consists of a gravel graded lot with a structure in the northwestern and western portions of the site and phragmite covered open areas in the northeastern and eastern portion of the site. A paved bituminous concrete road separates the gravel lot area and the phragmite covered open area. The site is bordered by phragmite covered open areas to the north and east and PSE&G nuclear power plant to the south and west with the Delaware River further west. The general topography at the project site is relatively flat with downward western sloping direction towards Delaware River with elevations at the project site ranging from approximately 15 feet to 9 feet (NAVD88, project datum).

Work was performed in accordance with our M&N approved Geotechnical Field Exploration Site Specific Work Plan titled, "New Jersey Wind Port – Parcel G: Artificial Island – Hope Creek Site, Block 26, Lot 5" prepared by Pennoni, with a latest revision date of June 1, 2022. A PSE&G Excavation Permit was obtained by M&N for the performance of the test pit excavations.

2. FIELD EXPLORATION PROGRAM

The field exploration program was performed from June 8, 2022 to June 17, 2022 and consisted of localized clearing to facilitate subsurface utility locating efforts, limited subsurface utility locating, test pit excavations, and the performance of infiltration testing. Pennoni subcontracted the services of Bloodhound LLC to perform the subsurface utility locate and R.E. Pierson Construction Co., Inc. to perform the localized clearing and test pit excavation operations. Subsurface utility locate services were performed on June 8 and June 10, 2022. A total of 22 test pit excavations were performed from June 9, 2022 to June 17, 2022 to depths ranging from approximately 10 to 20 feet below existing grade (approximate existing grade elevations ranging from 9.0 to 15.0 feet) to observe subsurface soil conditions and facilitate infiltration testing within the proposed bioretention facilities at the project site. Test pit/infiltration testing locations were established by M&N. Existing surface elevations were estimated by Pennoni based on topographic contour grading lines provided on the above referenced drawing sheets provided by M&N.

The testing locations were established in the field by Pennoni utilizing a cellular phone with GPS capabilities based on the coordinates provided by M&N presented in the below table.

Table 1: Test Pit Excavation Coordinates

	New Jersey SPCS NAD83 Projected Coordinates (US Survey Feet)	
Test Pit Designation	**Northing**	**Easting**
TP-01	233069.43	201764.38
TP-02	233075.38	201824.11
TP-03	232978.63	201756.28
TP-04	232853.78	201768.06
TP-05	233696.26	200887.14
TP-06	233715.04	201086.26
TP-07	233526.68	200903.14
TP-08	233545.46	201102.26
TP-09	234148.71	201845.35
TP-10	233947.84	201765.83
TP-11	233969.93	201962.60
TP-12	233784.08	201782.10
TP-13	233801.74	201981.60
TP-14	233617.89	201798.61
TP-15	233635.40	201996.44
TP-16	233451.70	201815.13
TP-17	233481.04	202145.21
TP-18	233269.88	202028.85
TP-19	233997.07	200539.09
TP-20	234004.28	200638.83
TP-21	233677.48	200688.03
TP-22	233507.90	200704.03
TP-23 *	232920.24	201761.59
(*) – Test pit TP-23 was selected and established in the field by Pennoni as an additional test pit excavation to be performed for additional subsurface soil and groundwater observations.		

Prior to the infiltration testing, the test pits were extended a minimum of 8 feet below the anticipated infiltration testing elevation (as provided by M&N prior to field exploration and corresponding to two feet above encountered groundwater) to identify if potential limiting zones such as groundwater table (GWT), seasonal high-water table (SHWT), observed seepage, and/or hardpan were present, as well as confirm the uniformity of subsoil conditions. After establishing the subsurface conditions were suitable for testing and confirming infiltration testing elevations with M&N, the infiltration test locations were offset approximately 10 feet laterally and the infiltration tests were set at the respective test elevation. The infiltration tests were performed using a sing-ring infiltration device in general accordance with the New Jersey Stormwater Best Management Practices (BMP) Manual, Chapter 12: Soil Testing Criteria, Section 3: Soil Hydraulic Conductivity Testing, Subsection A5: Single Ring Infiltration Test (April 2022).

An additional test pit, labelled TP-23, was elected to be performed by Pennoni and approved by M&N for further observations of subsurface soil and groundwater observations. The test pit was left open for an approximate half working day duration (approximately 4-hours) to observe groundwater conditions over an elapsed period of time.

Upon completion of the test pits and infiltration testing, the excavated soils were placed in the excavation in lifts and "tamped" with the bucket of the excavator to generally match the existing grade. Photos of the project site prior to our departure from the site were distributed via electronic mail to M&N on June 17, 2022.

The test pit excavations were performed by our subcontractor, RE Pierson utilizing a tracked CAT-315 excavator. Our Theodore A. Thomson, PE directed the field work and Jacquie Kelley, EIT observed the field exploration operations. Testing locations are indicated the attached Field-Testing Location Sketches, SK-1 and SK-2. Test pit logs are attached herein.

3. GEOTECHNICAL LABORATORY TESTING PROGRAM

Following conclusion of the test pit excavation operations, the soil samples were returned to Pennoni's laboratory for visual classification and testing. The geotechnical laboratory program consisted of the following:

- Moisture Content (ASTM D2216) 22 tests
- Particle Size Distribution w/ Hydrometer (ASTM D6913/D7928) 22 tests
- Atterberg Limits (ASTM 4318) 12 tests
- USDA Soil Classification 22 tests

Samples for testing were selected by Pennoni and approved by M&N prior to the performance of the testing. Results of the laboratory testing are attached herein.

4. SUBSURFACE CHARACTERISTICS

4.1 GEOLOGY

The project site is located within the Atlantic Coastal Plain Physiographic Province of New Jersey, which is characterized by relatively loose and unconsolidated sedimentary materials. Based on review of a geologic map titled, "Geology of the Canton and Taylors Bridge Quadrangles – Salem and Cumberland Counties, New Jersey," Open File Map Series OFM 92, prepared by Scott D. Stanford in cooperation with the United States Geological Survey, dated 2011 the upper 200 feet of the general project site is estimated to comprise of the following soil types in descending order from the ground surface:

Table 3: Geology at Project Site[1]

Soil Map Unit	General Description	Thickness (feet)
Artificial Fill	Gray to brown sand, silt, gravel, clay with debris. Material deposited in this area from to form Artificial Island and surrounding areas.	Up to 15 – 30 feet thick
Dredge Soils (afd)	Gray to brown fine sand, silt, clay, some to little medium to coarse sand and gravel, with varied amounts of organics and mica. Material deposited in this area from dredging operations to form Artificial Island and surrounding areas.	Up to 40 feet thick
Salt-Marsh and Estuarine Deposits (Qm)	Peat, clay, silt, fine sand with some medium sand and fine gravel. Alluvial deposits in tidal areas (marshes, wetlands, flat, channels).	Up to 100 feet thick
Cape May Formation, Units 3 through 1 (Qcm3, Qcm2/2f, Qcm1)	Yellow to various shades of brown to light gray becoming reddish very fine to fine silty sand becoming coarser as the formation transitions from Units Qcm3 to Qcm2/2f to Qcm1 of the Cape May Formation due to weathering. The formations have varying quantities of gravel and cobbles. A fine-grained primary constituent of dark gray silt to sandy/clayey silt (Qcm2f) was observed locally at the Salem Nuclear Plant underlying Unit Qcm3.	Each unit up to 30 – 40 feet thick
Vincentown Formation (Tvt)	Olive to light gray to brown medium-sized quartz sand. Within the upper 20 to 30 feet of the formation silty clay may be present.	Up to 90 feet thick
Hornerstown Formation (Tht)	Olive to green to black clay (referred to as “marl”) with some fine to medium sand and mica.	Up to 20 – 25 feet thick
Navesink Formation (Kns)	Olive to green to black clay to sandy clay with shells and medium sand (referred to as “marl”).	Up to 20 – 25 feet thick
Mount Laurel Formation (Kml)	Olive to gray to black medium sand (referred to as “salt-and-pepper sand”). This formation is reportedly the stratum for most domestic water wells in this general area.	Up to 90 – 100 feet thick
NOTE: [1] A portion of the geologic map titled, “Geology of the Canton and Taylors Bridge Quadrangles – Salem and Cumberland Counties, New Jersey,” Open File Map Series OFM 92 and cross section contained within the map are attached herein (SK-3 and SK-4) within the general area of the project site.		

The field exploration was performed within the area referred to as “Parcel G” (referenced in the geologic cross-section provided in SK-4) where artificial fill and/or dredged materials appear to have been placed previously during initial construction of the area.

According to USDA Web Soil Survey mapping, the project site consists primarily of Udorthents, dredged fine material (UddfB), and Urban Land (UR). The Udorthents dredged fine material generally consists of fine-loamy dredge spoils transported by human activity. The Udorthents is noted to as hydrologic soil group C with moderately low to moderately high capacity to transmit water (0.06 to 0.20 inches per hour). The anticipated depth to water table is estimated at more than 80 inches below the ground surface and the depth to a restrictive feature generally exceeds 80 inches. Urban Land generally consists of

surface material covered by pavement, concrete, buildings, and other structures underlain by disturbed or natural soil material. The USDA report does not comment on the hydrologic soil group, the ability of the material to transmit water, and on the depth to groundwater or restrictive feature. Approximate ground surface elevations were not provided in the mapping report prepared by the USDA. The USDA report for this site is attached to this report. The subsurface soils and groundwater observations encountered during our field exploration are generally similar to those provided in the USDA Web Soil Survey.

4.2 SUBSURFACE STRATIGRAPHY

Subsurface stratigraphy encountered within Parcel G generally consists of either surficial layer of topsoil (Stratum T) or a surficial layer of graded aggregate base course (Stratum P). Strata T and P are typically underlain by apparent fill material generally consisting of silty loam gravel to gravelly sand to loamy sand with trace construction debris (Stratum F). Stratum F is typically underlain by interbedded stratums of loam to loamy sand to sand (Stratum A) and clay to clay loam (Stratum B). A layer of silt loam (Stratum C) was observed localized at test pit location TP-16 underlaying Stratum A and was not fully penetrated. Stratum A was not encountered at test pit locations TP-1, TP-2, TP-9 through TP-12, TP-18, and TP-21. Stratum B was not encountered at test pit locations TP-3 through TP-5, TP-7, TP-16, and TP-17. Test pit excavations were terminated at depths ranging from 10 to 20 feet below existing grades (approximate existing grade elevations ranging from 9.0 to 15.0 feet).

Historic subsurface information was also reviewed from the above-referenced Duffield Associates' report. The previously performed SPT locations were located in the northwest and northern potions of Parcel G and generally consisted of a surficial layer of fill consisting of sand with occasional construction debris. The fill was generally underlain by silts and clays with interlayered sands to depths of 40 to 70 feet below grade. Medium dense to dense sands and gravels were generally observed underlying these strata at approximate elevations of -30 to -60 feet (NAVD88) and the test borings appeared to terminate in this stratum. The near surface subsurface stratigraphy of the previously performed geotechnical field exploration performed adjacent to Parcel G generally appears similar to that of the current Pennoni field exploration.

4.3 GROUNDWATER

Groundwater observations were made in each test pit location. Evidence of groundwater was observed at depths ranging from 5 to 17.5 feet below existing grades (groundwater elevations corresponding to Elev. -4 to 8 feet). Apparent water seepage through the sidewalls of the excavations were observed during our field exploration in the following test pits: TP-1, TP-3, TP-4, TP-12, TP-13, and TP-21, potentially influenced by precipitation events and generally not interpreted as natural groundwater table. Other indicators of limiting zones, e.g., hardpan, bedrock, perched water, as defined by the NJ BMP Manual (April 2022) were not observed.

One test pit location, TP-23, was elected to be performed and left open over a half working day duration (approximately 4-hour period) to facilitate groundwater observations. Groundwater was encountered during the initial excavation at a depth of 7.5 feet below existing grade (Elev. 5.5 feet). Prior to backfilling, groundwater observations were observed to be at a depth of 7.5 feet below existing grade (Elev. 5.5 feet). Water seepage from the sidewalls of excavation was initially observed at 4 feet below existing grades, however prior to backfilling no seepage was generally observed.

Groundwater observations are for the times and locations noted and may not be indicative of seasonal and daily fluctuations in groundwater levels, as well as tidal fluctuations due to the project site's close proximity to the Delaware River.

Table 4: Estimated Groundwater Elevations Based on Test Pit Excavations

Test Pit Designation	Ex. Surface Elevation, ft [1,2,3]	GWT Depth, ft [4]	GWT Elevation, ft [1,2,3, 4]	Observed Seepage Depth, ft[5]	Observed Seepage Elevation, ft [1,2,3,5]
TP-01	12.0	6.5	5.5	4.5	7.5
TP-02	13.0	5.0	8.0	NE	NE
TP-03	13.0	6.5	6.5	3.0	10.0
TP-04	12.8	6.0	6.8	2.5	10.3
TP-05	12.5	5.0	7.5	NE	NE
TP-06	13.0	8.5	4.5	NE	NE
TP-07	11.0	13.0	-2.0	NE	NE
TP-08	13.0	15.0	-2.0	NE	NE
TP-09	9.0	4.0	5.0	NE	NE
TP-10	10.5	13.0	-2.5	NE	NE
TP-11	10.5	15.5	-5.0	NE	NE
TP-12	13.0	11.0	2.0	5.0	8.0
TP-13	14.0	15.0	-1.0	10.0	4.0
TP-14	14.0	17.5	-3.5	NE	NE
TP-15	15.0	15	0.0	NE	NE
TP-16	13.0	10.0	3.0	NE	NE
TP-17	16.0	16.0	0.0	NE	NE
TP-18	14.0	8.5	5.5	NE	NE
TP-19	9.5	4.0	5.5	NE	NE
TP-20	10.0	5.0	5.0	NE	NE
TP-21	11.0	15.0	-4.0	5.0	6.0
TP-22	10.0	14.0	-4.0	NE	NE
TP-23 (start of day)	13.0	7.5	5.5	4	9.0
TP-23 (end of day)	13.0	7.5	5.5	NE	NE

NOTES:
(1) SURFACE ELEVATIONS FOR TEST PIT LOCATIONS TP-1 THROUGH TP-4 AND TP-23 WERE APPROXIMATED BASED ON A DRAWING TITLED, "PLAN – PROPOSED GEOTECHNICAL EXPLORATION," SHEET NO. FIG.1, PREPARED BY M&N, DATED MARCH 11, 2022;
(2) SURFACE ELEVATIONS FOR TEST PIT LOCATIONS TP-5 THROUGH TP-22 WERE APPROXIMATED BASED ON A DRAWING TITLED, "PLAN – OVERALL SITE GRADING AND DRAINAGE," SHEET NO. CG101, PREPARED BY M&N, DATED SEPTEMBER 30, 2021;
(3) VERTICAL DATUM IS NAVD88;
(4) GWT – GROUNDWATER TABLE;
(5) NE - NOT ENCOUNTERED; AND
(6) DIMENSIONS AND MEASUREMENTS ARE APPROXIMATIONS.

Historic groundwater information was also reviewed from the above-referenced Duffield Associates' report. Groundwater was indicated to be encountered during drilling at depths ranging from 2 to 15 feet below existing ground surfaces (groundwater elevations corresponding to Elev. -4 to 11 feet). Historic groundwater readings generally appeared similar to that of our field exploration.

5. INFILTRATION TESTING RESULTS

Infiltration tests were performed using a sing-ring infiltration device in general accordance with the New Jersey Stormwater BMP Manual, Chapter 12: Soil Testing Criteria, Section 3: Soil Hydraulic Conductivity Testing, Subsection A5: Single Ring Infiltration Test (April 2022). Infiltration testing depths were established as directed by M&N. Detailed infiltration testing results for each respective test are attached to this report. A brief summary of our findings for the infiltration testing program is presented in Table 5 below.

Table 5: Summary of Findings

Test Pit Location/Infil. Number	Ex. Surface Elevation (Elev.)[1,2,3]	GWT Elevation (Elev.)[1,2,3,4]	Limiting Zone Type[4,5]	Limiting Zone Elevation (Elev.)[1,2,3]	Infiltration Test Elevation (Elev.)[1,2,3]	Stratum of Soil Tested	OFIR (in./hr)[6]	Calculated HC (in./hr)[7,8]
TP-1/INF-1	12.0	4.5	SP	7.5	9.5	F	16.0	5.50
TP-2/INF-2	13.0	8.0	GWT	8.0	10.0	F	0.88	0.30
TP-3/INF-3	13.0	10.0	SP	10.0	8.5	A	0.13	0.04
TP-4/INF-4	12.8	10.3	SP	10.3	8.8	A	0.25	0.10
TP-5/INF-5	12.5	7.5	GWT	7.5	9.5	A	0.63	0.20
TP-6/INF-6	13.0	4.5	GWT	4.5	8.0	A	0.13	0.04
TP-7/INF-7	11.0	-2.0	GWT	-2.0	9.0	A	15.2	5.20
TP-8/INF-8	13.0	-2.0	GWT	-2.0	8.0	A	0.13	0.04
TP-9/INF-9	9.0	5.0	GWT	5.0	8.0	F	0.38	0.10
TP-10/INF-10	10.5	-2.5	GWT	-2.5	8.0	F	0.13	0.04
TP-11/INF-11	10.5	-5.0	GWT	-5.0	9.0	F	0.25	0.10
TP-12/INF-12	13.0	8.0	SP	8.0	10.0	F	0.13	0.04
TP-13/INF-13	14.0	4.0	SP	4.0	6.0	A	0.88	0.30
TP-14/INF-14	14.0	-3.5	GWT	-3.5	8.0	A	0.50	0.20
TP-15/INF-15	15.0	0.0	GWT	0.0	8.0	A	0.13	0.04
TP-16/INF-16	13.0	3.0	GWT	3.0	5.0	C	0.25	0.10
TP-17/INF-17	16.0	0.0	GWT	0.0	6.0	A	0.13	0.04
TP-18/INF-18	14.0	5.5	GWT	5.5	7.5	F	4.50	1.50
TP-19/INF-19	9.5	5.5	GWT	5.5	8.0	F	15.30	5.20
TP-20/INF-20	10.0	5.0	GWT	5.0	8.0	F	7.20	2.40
TP-21/INF-21	11.0	6.0	SP	6.0	8.0	F	5.60	1.90
TP-22/INF-22	10.0	-4.0	GWT	-4.0	8.0	F	17.00	5.80

NOTES:
(1) SURFACE ELEVATIONS FOR TEST PIT LOCATIONS TP-1 THROUGH TP-4 AND TP-23 WERE APPROXIMATED BASED ON A DRAWING TITLED, "PLAN – PROPOSED GEOTECHNICAL EXPLORATION," SHEET NO. FIG.1, PREPARED BY M&N, DATED MARCH 11, 2022;
(2) SURFACE ELEVATIONS FOR TEST PIT LOCATIONS TP-5 THROUGH TP-22 WERE APPROXIMATED BASED ON A DRAWING TITLED, "PLAN – OVERALL SITE GRADING AND DRAINAGE," SHEET NO. CG101, PREPARED BY M&N, DATED SEPTEMBER 30, 2021;
(3) VERTICAL DATUM IS NAVD88;
(4) GWT – GROUNDWATER TABLE;
(5) SP – SEEPAGE;
(6) OFIR – OBSERVED FIELD INFILTRATION RATE;
(7) HC – HYDRAULIC CONDUCTIVTY;
(8) CALCULATED HC IS EQUAL TO 0.34239 MULTIPLIED BY THE OFIR PER THE NJ BMP MANUAL (APRIL 2022); AND
(9) DIMENSIONS AND MEASUREMENTS ARE APPROXIMATIONS.

6. LIMITATIONS

This work has been done in accordance with our authorized scope of work and in accordance with generally accepted professional practice in the fields of geotechnical and foundation engineering. This warranty is in lieu of all other warranties either expressed or implied. Our conclusions and recommendations are based on the data revealed by this exploration. We are not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications. This report is intended for use with regard to the specific project described herein; any changes in loads, structures, or locations should be brought to our attention so that we may determine how they may affect our conclusions. An attempt has been made to provide for normal contingencies but the possibility remains that unexpected conditions may be encountered during construction. If this should occur, or if additional or contradictory data are revealed in the future, we should be notified so that modifications to this report can be made, if necessary. If we do not review relevant construction documents and witness the relevant construction operations, then we cannot be responsible for any problems that may result from misinterpretation or misunderstanding of this report or failure to comply with our recommendations.

We trust that the information presented in this report is what you require at this time and we thank you for the opportunity to assist you with this project. If you have any questions, or if you need any further assistance with this project, please contact this office at your earliest convenience.

Sincerely,

PENNONI ASSOCIATES INC.

Steven J. Corcoran, PE (DE)
Project Geotechnical Engineer

Theodore A. Thomson, Jr., PhD, PE, DGE, LEED AP
Geotechnical Division Manager/Associate Vice President

Site Location Sketch



NOTES:
(1) THIS SKETCH WAS ADAPTED BY PENNONI FROM A GOOGLE EARTH AERIAL IMAGE DATED OCTOBER 16, 2020.
(2) APPROXIMATE SITE LOCATION OUTLINED IN RED.

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121 Continental Drive, Suite 207
Newark, DE 19713

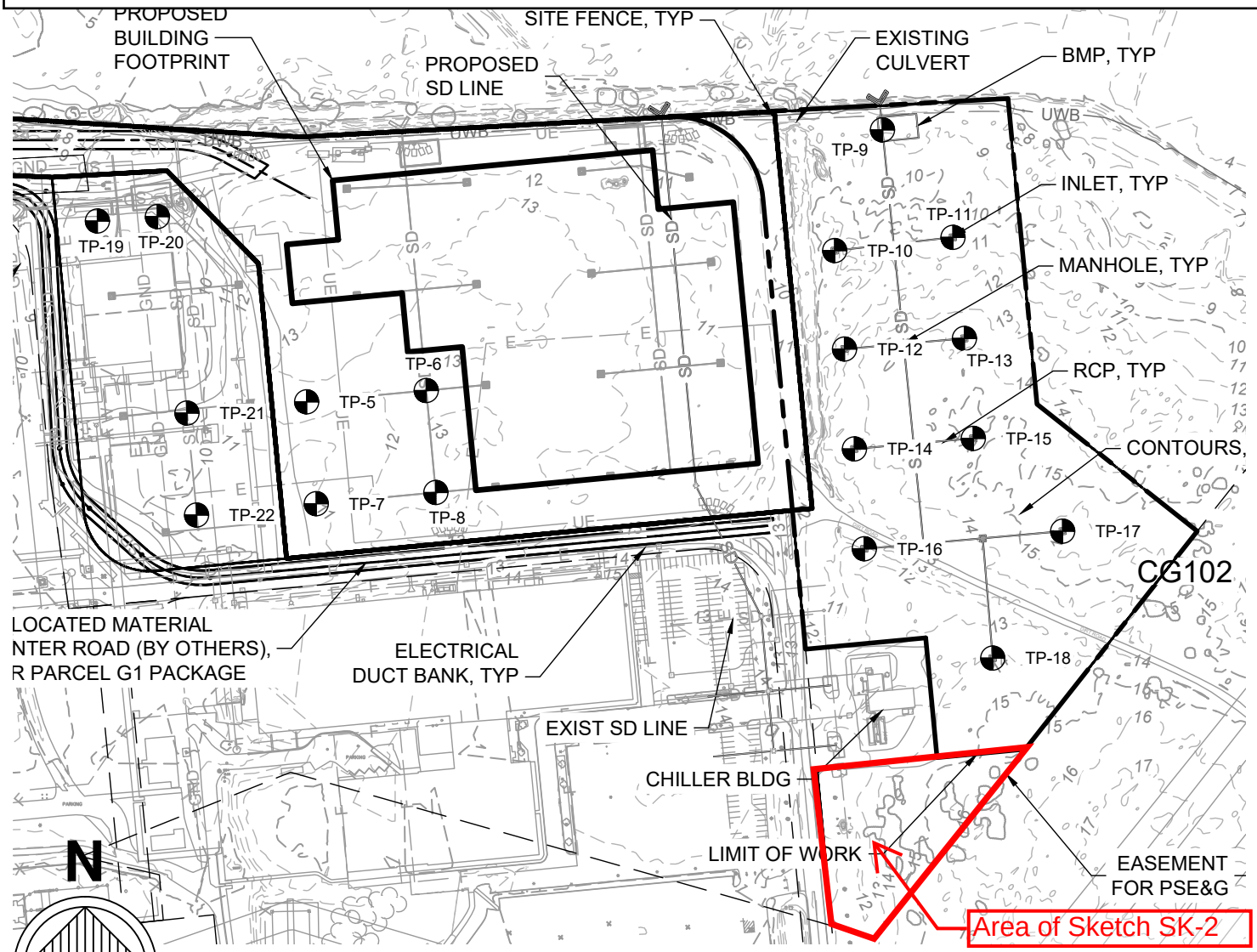
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DRAWN BY:	SCALE:	DATE:
SJC	AS SHOWN	08/12/2022
CHECKED BY: TAT	FIGURE No. SL-1	
PROJECT No: MOFNI22003		

NJ WIND PORT - PARCEL G - LOWER ALLOWAYS CREEK TWP, SALEM COUNTY, NJ

Field Testing Location Sketch

Note: This figure is adapted from a revised drawing titled "Plan - Overall Site Grading and Drainage," developed by Moffatt & Nichol and stamped "Issued for Permitting," dated September 30, 2021, distributed to Pennoni on June 1, 2022.



LEGEND

TP-# - APPROX. TEST PIT LOCATION AND IDENTIFYING NUMBER

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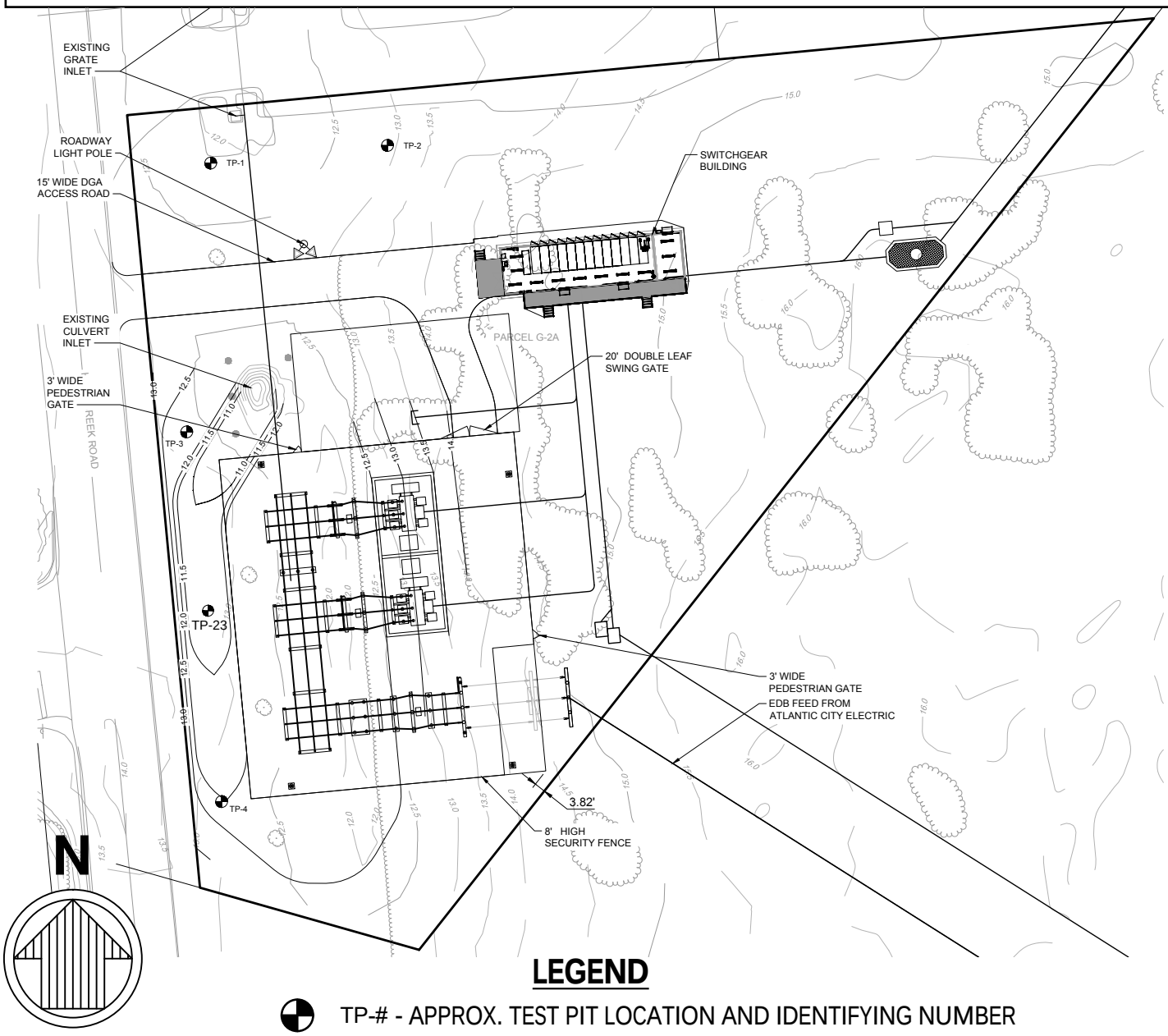
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DRAWN BY:	SCALE:	DATE:
SJC	NTS	08/12/2022
CHECKED BY: TAT	FIGURE No. SK-1	
PROJECT No: MOFNI22003		

NJ WIND PORT - PARCEL G - LOWER ALLOWAYS CREEK TWP, SALEM COUNTY, NJ

Field Testing Location Sketch

Note: This figure is adapted from a drawing titled "Plan - Proposed Geotechnical Exploration," developed by Moffatt & Nichol and stamped "60% Submittal ," dated March 11, 2022.



LEGEND

TP-# - APPROX. TEST PIT LOCATION AND IDENTIFYING NUMBER

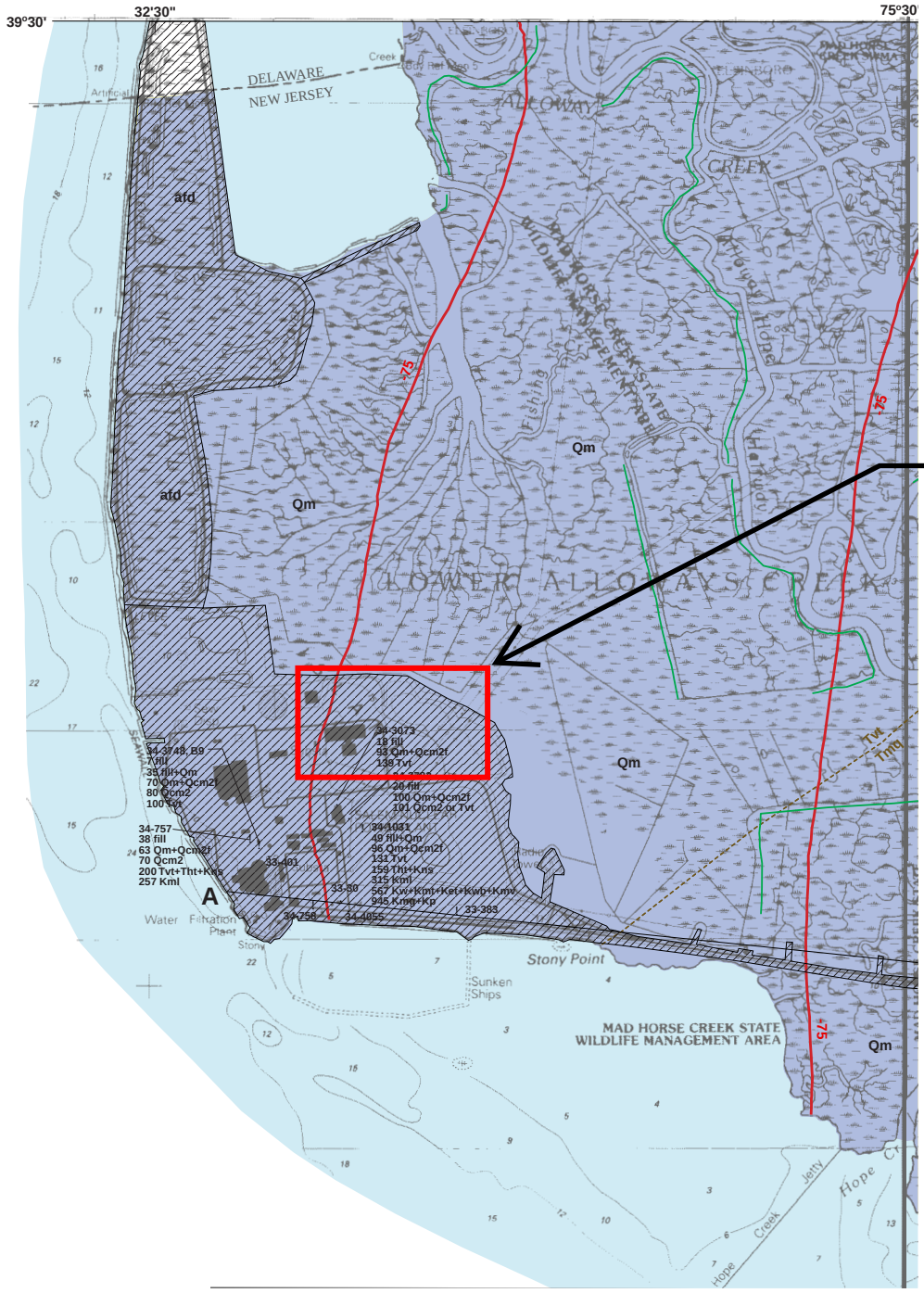
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SJC	NTS	08/12/2022
CHECKED BY: TAT	FIGURE No. SK-2	
PROJECT No: MOFNI22003		

NJ WIND PORT - PARCEL G - LOWER ALLOWAYS CREEK TWP, SALEM COUNTY, NJ

GEOLOGIC MAP SKETCH



APPROXIMATE PARCEL G SITE LOCATION IN RED.

NOTES:
(1) THIS SKETCH WAS ADAPTED BY PENNONI FROM A GEOLOGIC MAP TITLED, "GEOLOGY OF CANTON AND TAYLORS BRIDGE QUADRANGLES - SALEM AND CUMBERLAND COUNTIES, NEW JERSEY," PREPARED IN COOPERATION WITH USGS, DATED 2011.
(2) APPROXIMATE SITE LOCATIONS OUTLINED IN RED.

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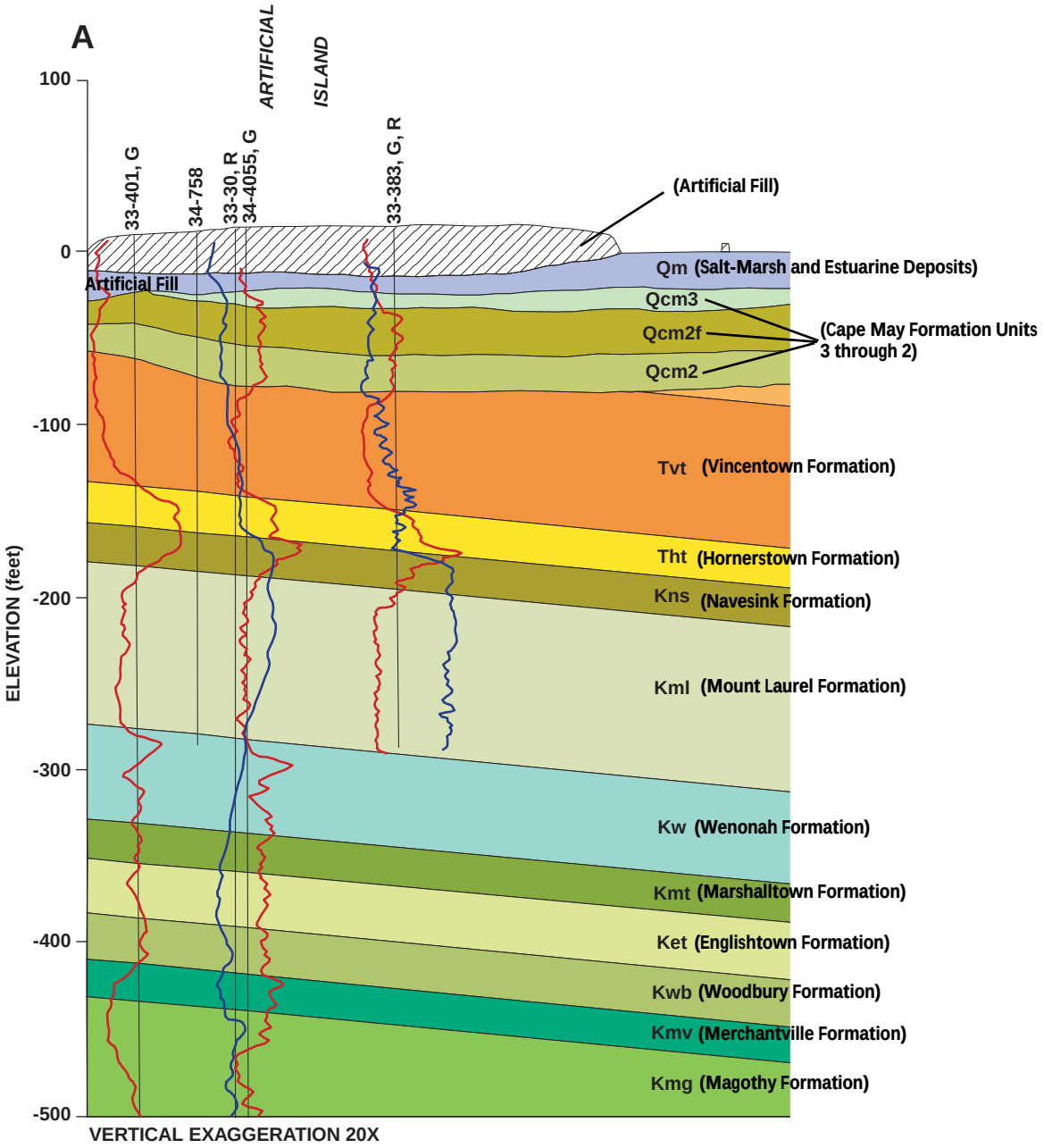
DRAWN BY:	SCALE:	DATE:
SJC	AS SHOWN	08/12/2022
CHECKED BY: TAT		
PROJECT No: MOFNI 22003		

Figure No.

SK-3

NJ WIND PORT - PARCEL G - LOWER ALLOWAYS CREEK TWP, SALEM COUNTY NJ

GEOLOGIC CROSS-SECTION SKETCH



NOTES:

(1) THIS SKETCH WAS ADAPTED BY PENNONI FROM A GEOLOGIC MAP TITLED, "GEOLOGY OF CANTON AND TAYLORS BRIDGE QUADRANGLES - SALEM AND CUMBERLAND COUNTIES, NEW JERSEY," PREPARED BY SCOTT STANFORD IN COOPERATION WITH USGS, DATED 2011.

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SB	AS SHOWN	08/12/2022
CHECKED BY: SJC	Figure No. SK-4	
PROJECT No: MOFNI 21002		

NJ WIND PORT - PARCEL G - LOWER ALLOWAYS CREEK TWP., SALEM COUNTY, NJ

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Salem County, New Jersey

MOFNI22003-06.20.2022-NRCS Web Soil Survey



June 20, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,670 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Salem County, New Jersey
Survey Area Data: Version 18, Aug 31, 2021

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

Date(s) aerial images were photographed: Jun 9, 2020—Jun 13, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UddfB	Udorthents, dredged fine material, 0 to 8 percent slopes	10.9	25.2%
UR	Urban land	32.3	74.8%
Totals for Area of Interest		**43.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Salem County, New Jersey

UddfB—Udorthents, dredged fine material, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 4k49
Elevation: 0 to 170 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Udorthents, Dredged Fine Materials

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy material transported by human activity; fine-loamy dredge spoils

Typical profile

A - 0 to 12 inches: loam
C - 12 to 80 inches: clay

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Water

Percent of map unit: 5 percent

Urban land
Percent of map unit: 5 percent
Hydric soil rating: Unranked

UR—Urban land

Map Unit Setting

National map unit symbol: 4k4c
Elevation: 0 to 170 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Udorthents

Percent of map unit: 5 percent
Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

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SUMMARY OF LABORATORY DATA

BORING NUMBER	SAMPLE NUMBER	DEPTH (ft)	USDA CLASSIFICATION *(BASED ON PARTICLE SIZE LESS THAN NO. 10 SIEVE)*	GRAIN SIZE DISTRIBUTION			PLASTICITY				MOISTURE CONTENT w %	VOLUMETRIC						COMPACTION DATA		
				GRAVEL %	SAND %	SILT/CLAY %	LIQUID LIMIT w_l	PLASTIC LIMIT wp	PLASTICITY INDEX I_P	LIQUIDITY INDEX I_L		MOISTURE CONTENT w %	DRY UNIT WEIGHT (pcf)	MOIST UNIT WEIGHT (pcf)	VOID RATIO (e)	SPECIFIC GRAVITY (G) (*) ASSUMED	DEGREE OF SATURATION %	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT %	STANDARD/MODIFIED
TP-01	GS-2	1.5-4.5	SAND	2	93	3 / 2	NV	NP	NP	NV	14.8					2.7				
TP-02	GS-2	2.5-6.5	SANDY LOAM	21	61	11 / 7					16.3					2.7				
TP-03	GS-3	3.0-6.5	SANDY LOAM	7	58	20 / 15	22	16	6	1.1	22.7					2.6				
TP-04	GS-2	2.5-10	SANDY LOAM	3	52	28 / 17	29	17	12	0.5	23.0					2.6				
TP-05	GS-2	1.5-6	SANDY LOAM	8	72	12 / 8	NV	NP	NP	NV	17.3					2.7				
TP-06	GS-3	4.5-7.5	SANDY LOAM	8	53	23 / 16	31	18	13	0.4	23.2					2.6				
TP-07	GS-2	2.5-5.0	LOAM	8	48	26 / 18	35	19	16	0.3	23.2					2.6				
TP-08	GS-2	2.5-5.0	SANDY LOAM	18	48	21 / 13	34	20	14	0.2	23.3					2.6				
TP-09	GS-1	1.0-6.0	SANDY LOAM	7	66	16 / 11					17.2					2.6				
TP-10	GS-1	1.2-6.5	SANDY LOAM	9	55	22 / 14					14.3					2.6				
TP-11	GS-1	0.8-5.8	SANDY LOAM	9	54	22 / 15	27	16	11	0.4	19.7					2.6				
TP-12	GS-1	0.9-5.5	SANDY CLAY LOAM	11	48	23 / 18					24.0					2.6				
TP-13	GS-2	3.5-11.0	SANDY LOAM	19	56	12 / 13					17.2					2.6				
TP-14	GS-2	5.0-12.0	SANDY LOAM	17	54	17/ 12	29	17	12	0.1	18.1					2.6				
TP-15	GS-2	5.0-12.0	SANDY LOAM	8	54	24 / 14	34	19	15	0.2	22.6					2.6				
TP-16	GS-3	4.5-14.0	SILT LOAM	0	31	54 / 16	91	33	58	0.7	75.6					2.5				
TP-17	GS-2	6.5-18.0	SANDY LOAM	14	58	16 / 12	22	15	7	-0.4	12.1					2.6				
TP-18	GS-1	0.8-9.0	LOAMY SAND	73	23	3 / 1					4.5					2.7				
TP-19	GS-1	0.5-4.5	SAND	38	59	2 / 1					11.3					2.7				
TP-20	GS-1	0.5-3.0	SAND	57	41	1 / 1					11.7					2.7				
TP-21	GS-2	2.5-5.0	LOAMY SAND	12	77	5 / 6					12.5					2.7				
TP-22	GS-1	1.0-3.5	SAND	70	28	1 / 1					8.8					2.7				

PENNONI ASSOCIATES INC.

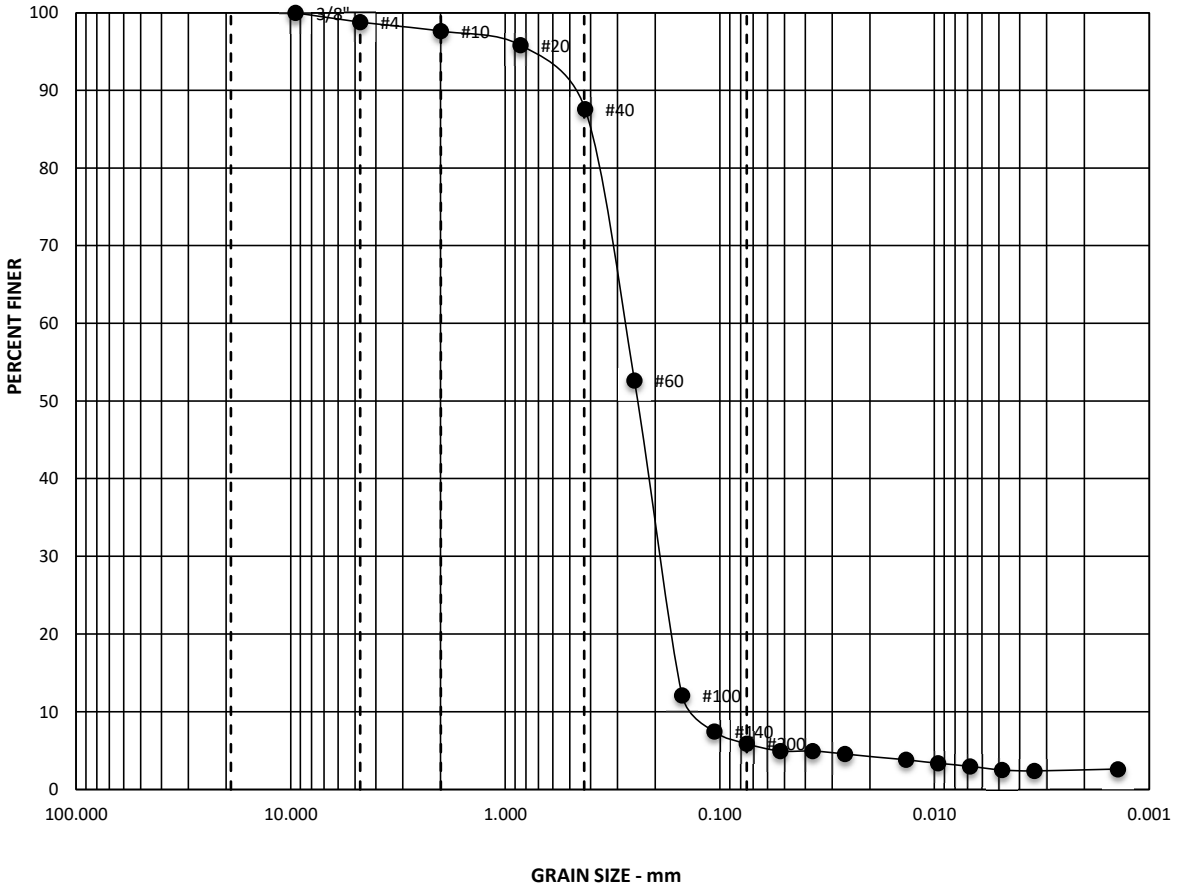
DRAWN BY: SJC — DATE: 7/29/2022

CHECKED BY: TAT — DATE: 7/29/2022

PROJECT: **NJ Wind Port - Parcel G**

LOCATION: **Salem County, NJ**

Particle Size Distribution Report



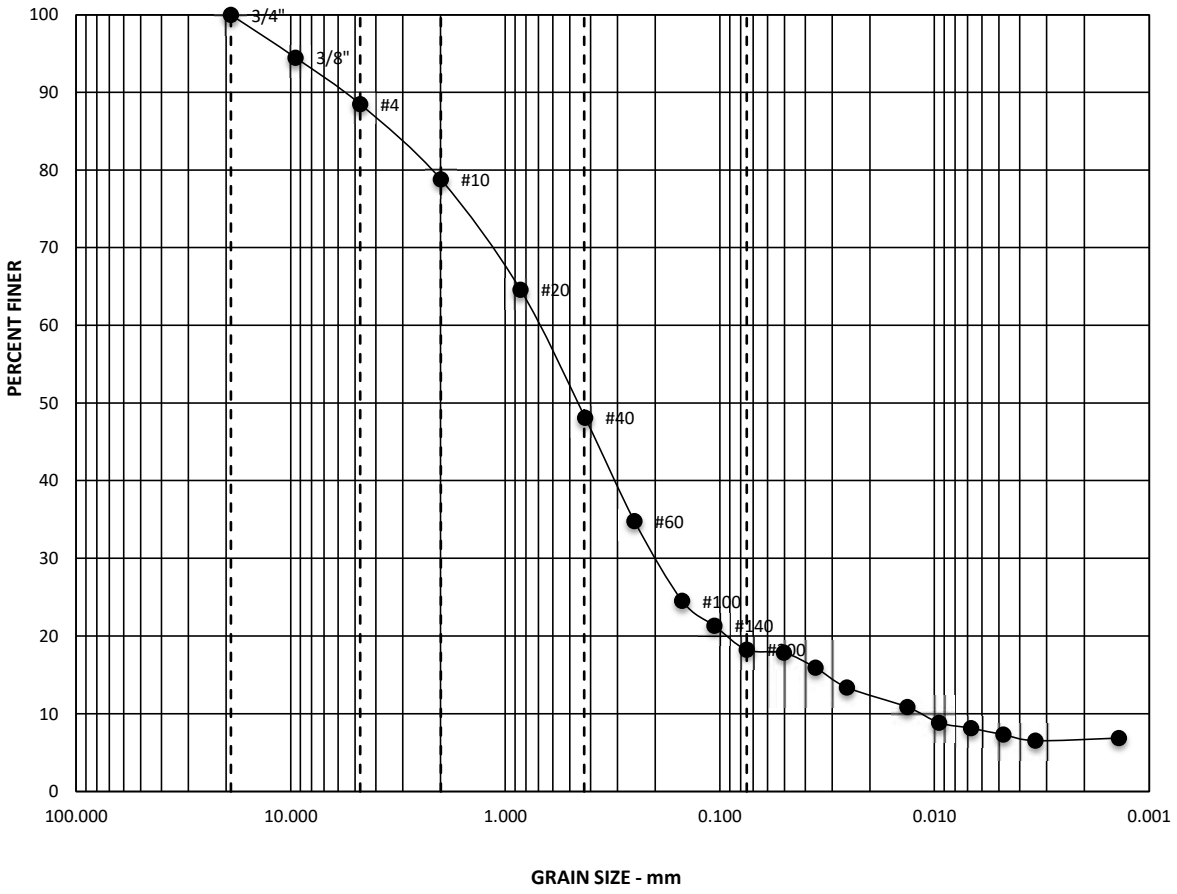
USDA Grain Size Distribution			
% Gravel	% Sand	% Fines	Moisture (%)
		Silt / Clay	
2.3	92.8	2.5 / 2.4	14.8

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
4.9	2.4	2.7

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-01
Sample:	GS-2
Depth (ft):	1.5-4.5
Lab No.	10-199487-1
Figure	S-1

Particle Size Distribution Report



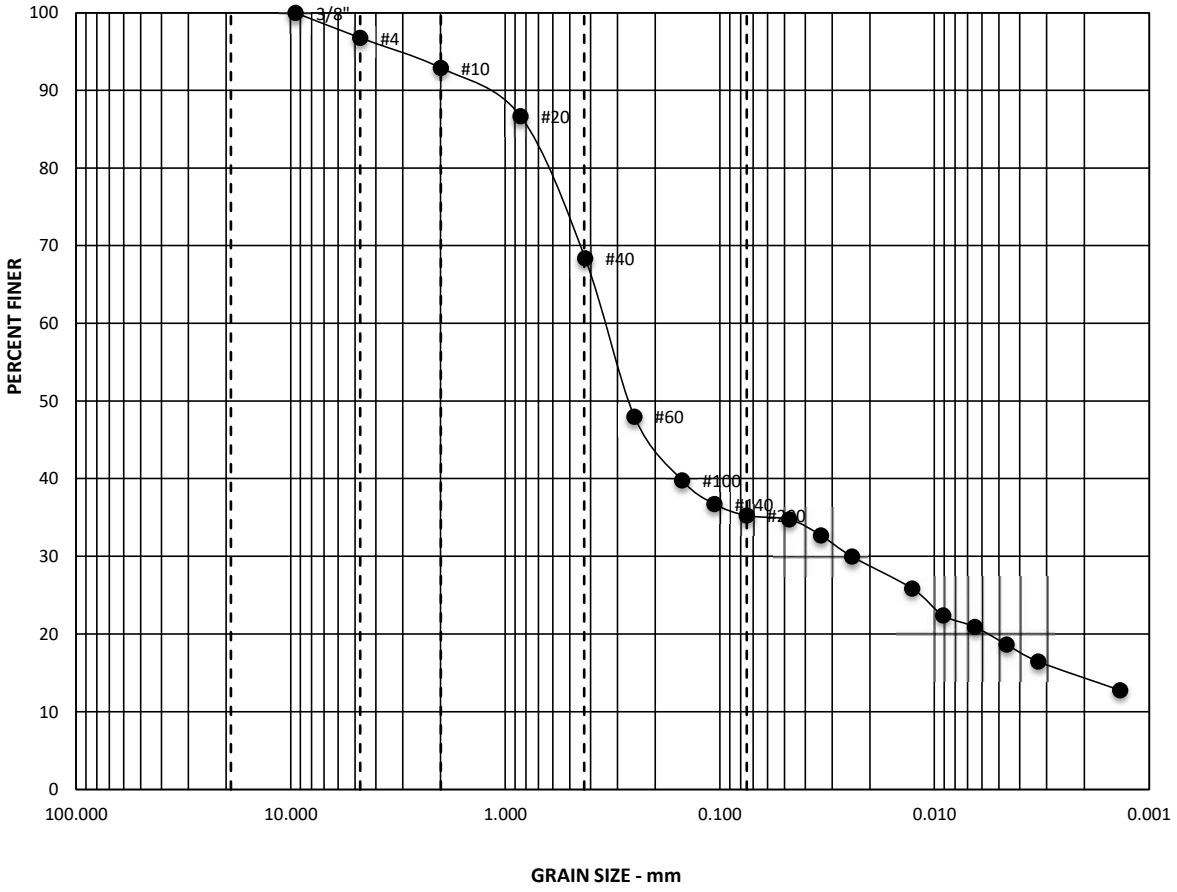
USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
21.2	61.0	11.3	6.5	16.3

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
17.8	6.5	2.7

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-02
Sample:	GS-2
Depth (ft):	2.5-6.5
Lab No.	10-199487-2
	Figure S-2

Particle Size Distribution Report



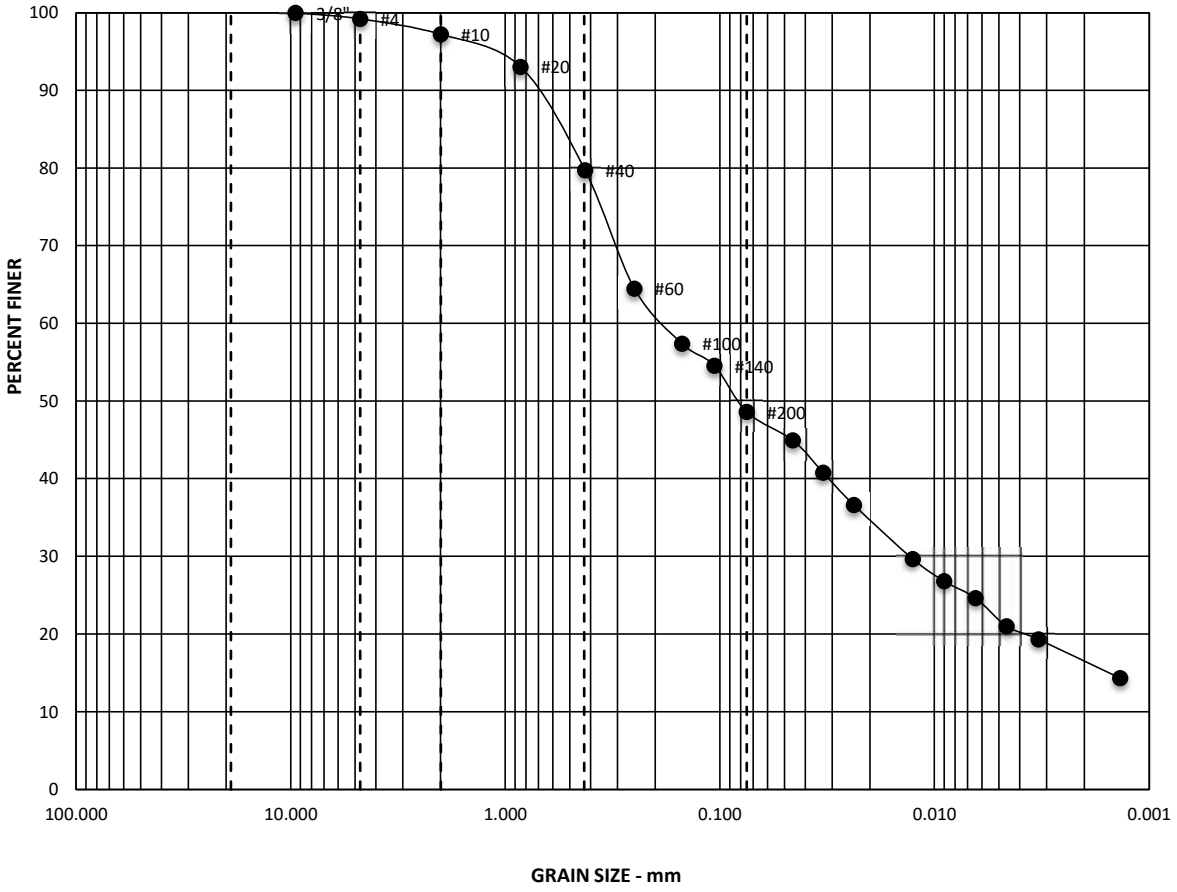
USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
7.1	58.1	20.2	14.6	22.7

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
34.8	14.6	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-03
Sample:	GS-3
Depth (ft):	3.0-6.5
Lab No.	10-199487-3
Figure	S-3

Particle Size Distribution Report



USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
2.8	52.3	28.1	16.8	23.0

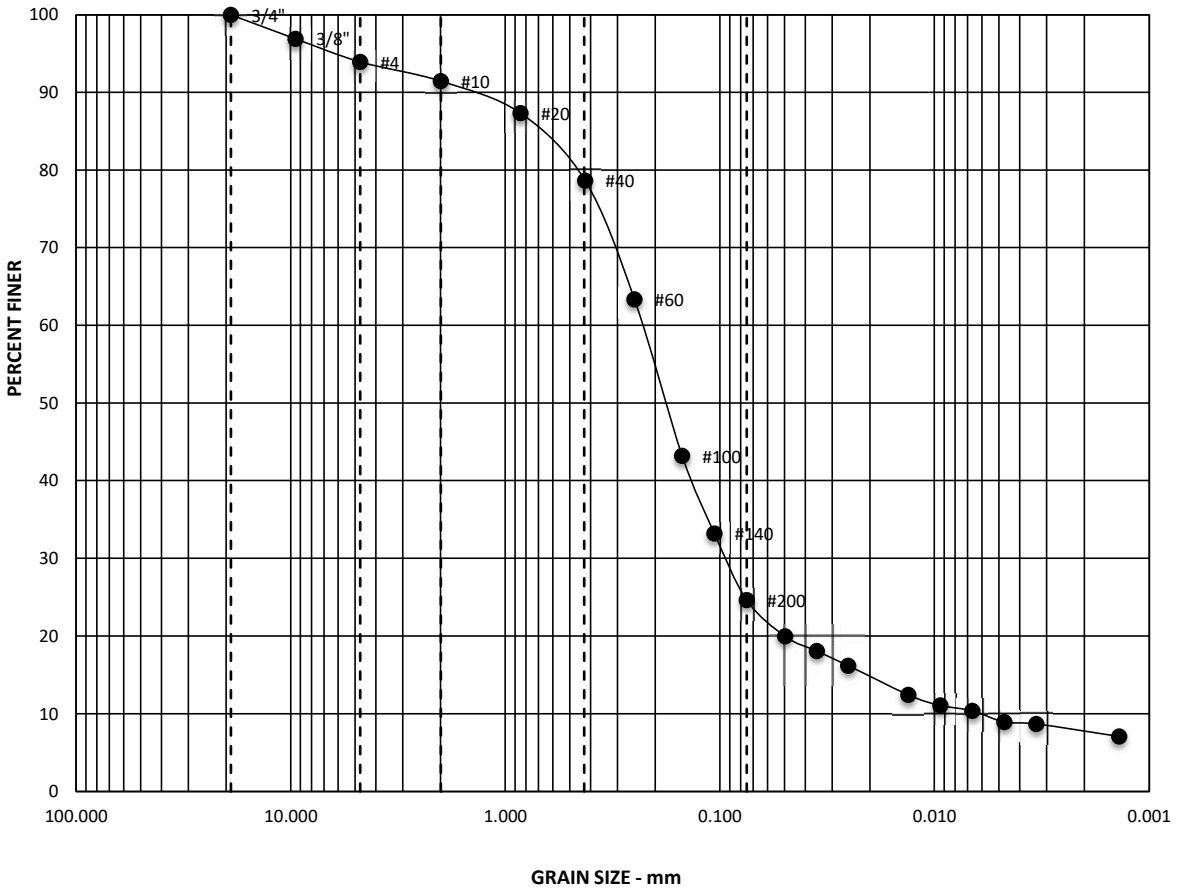
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
44.9	16.8	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-04
Sample:	GS-2
Depth (ft):	2.5-10.0
Lab No.	10-199487-4

Figure S-4

Particle Size Distribution Report



USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
8.5	71.5	12.1	7.9	17.3

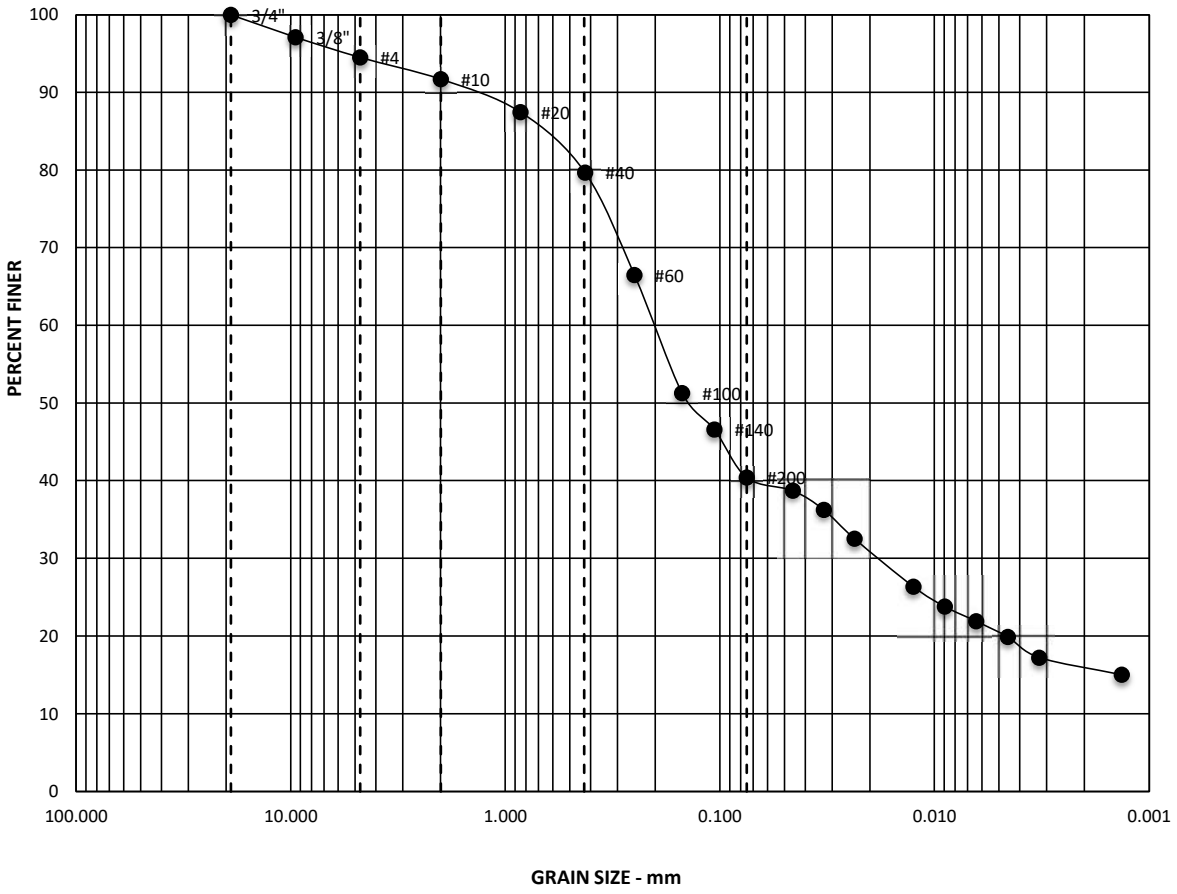
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
20.0	7.9	2.7

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-05
Sample:	GS-2
Depth (ft):	1.5-6.0
Lab No.	10-199487-5

Figure S-5

Particle Size Distribution Report



USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
8.3	53.0	22.6	16.1	23.2

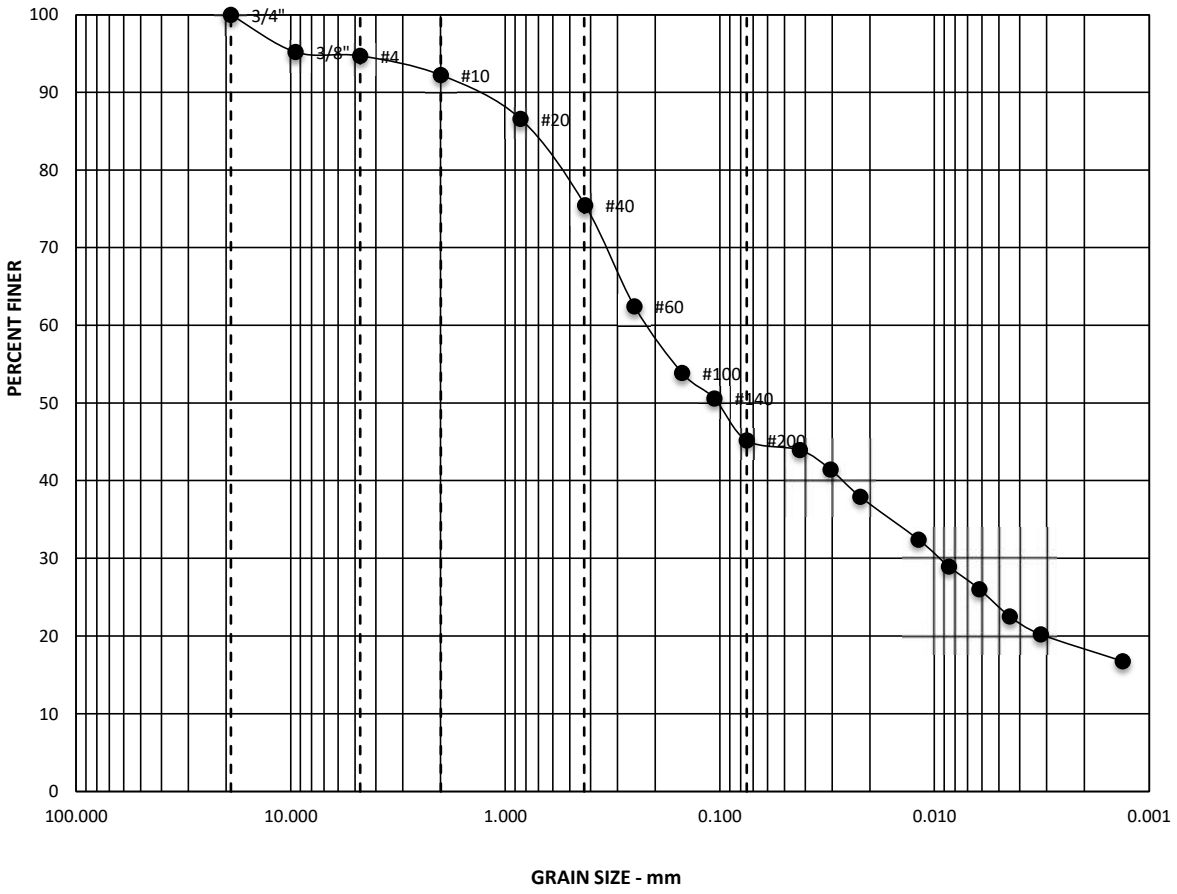
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
38.7	16.1	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-06
Sample:	GS-3
Depth (ft):	4.5-7.5
Lab No.	10-199487-6

Figure S-6

Particle Size Distribution Report



USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
7.8	48.2	25.5	18.5	23.2

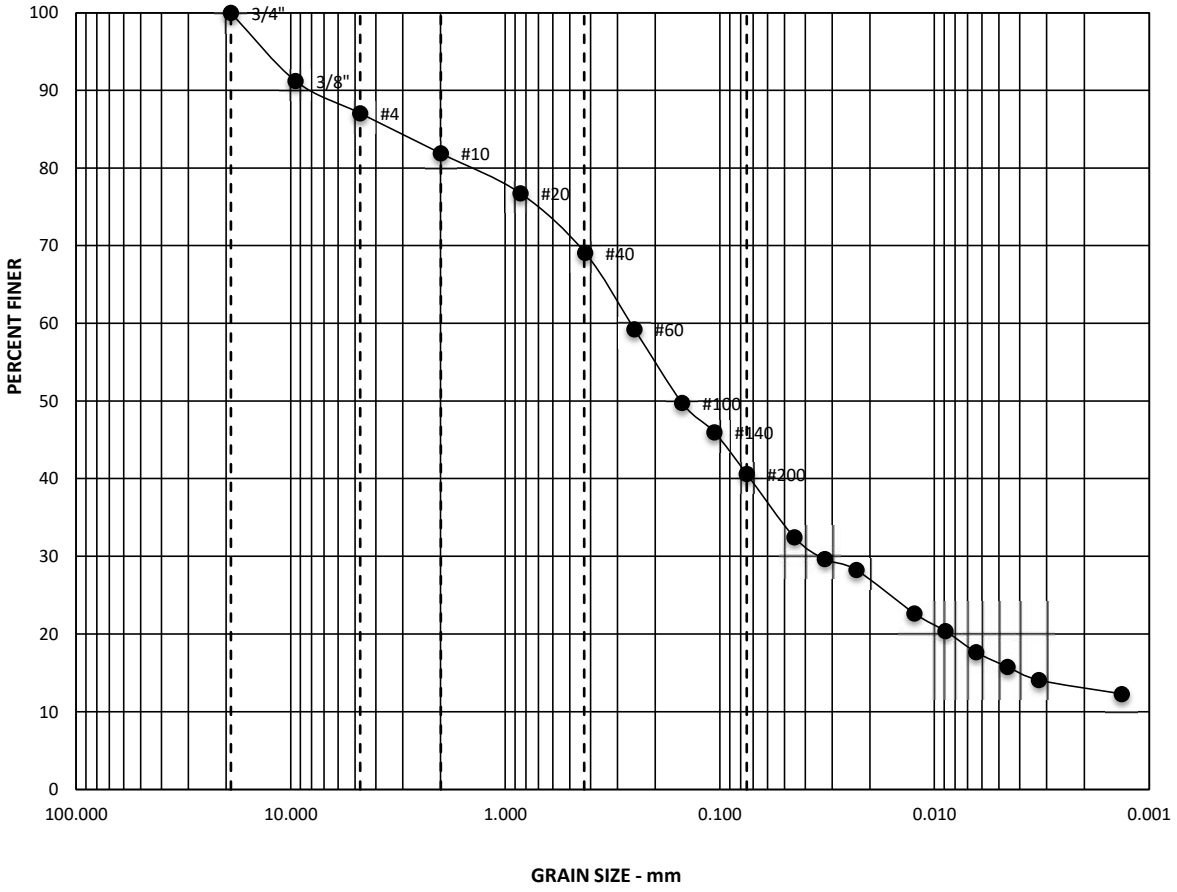
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
44.0	18.5	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-07
Sample:	GS-2
Depth (ft):	2.5-5.0
Lab No.	10-199487-7

Figure S-7

Particle Size Distribution Report



USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
18.1	47.8	21.3	12.8	23.3

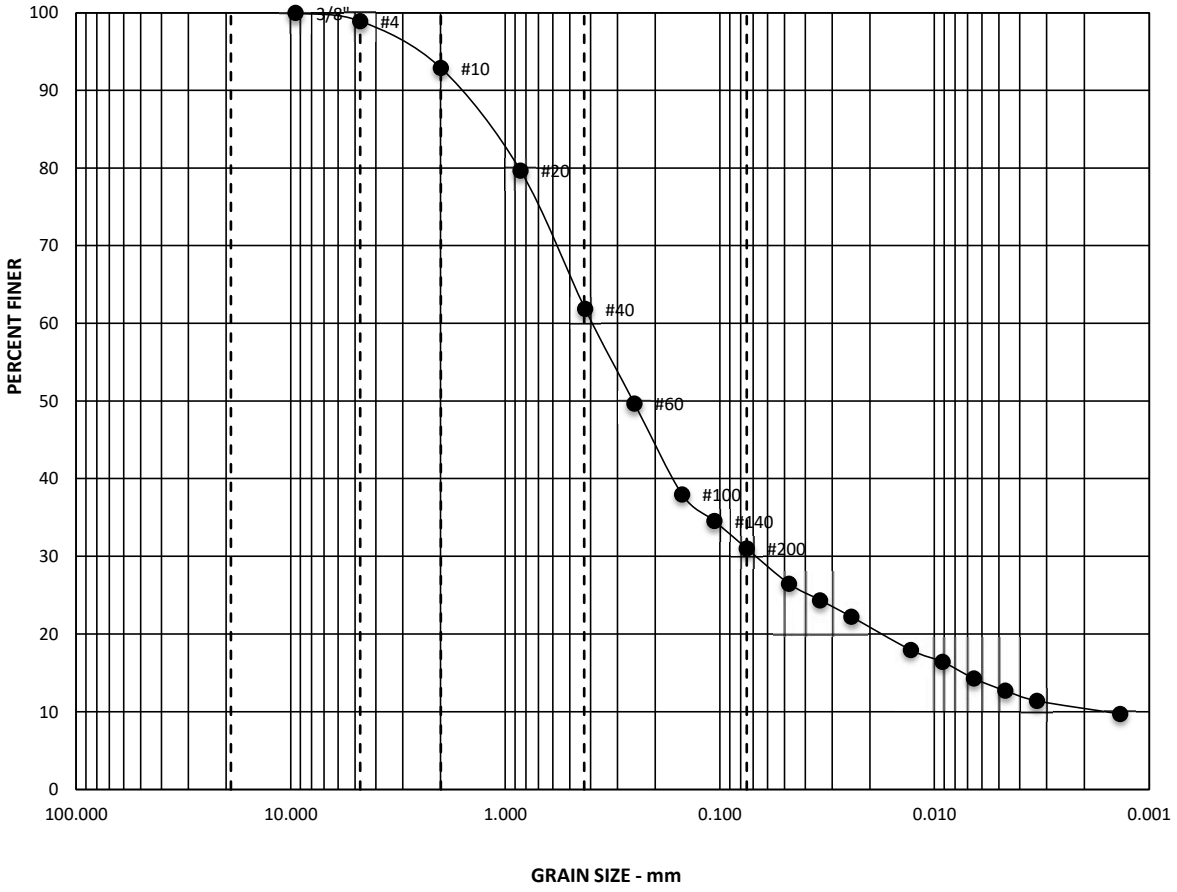
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
34.1	12.8	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-08
Sample:	GS-2
Depth (ft):	2.5-5.0
Lab No.	10-199487-8

Figure S-8

Particle Size Distribution Report



USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
7.1	66.4	15.9	10.6	17.2

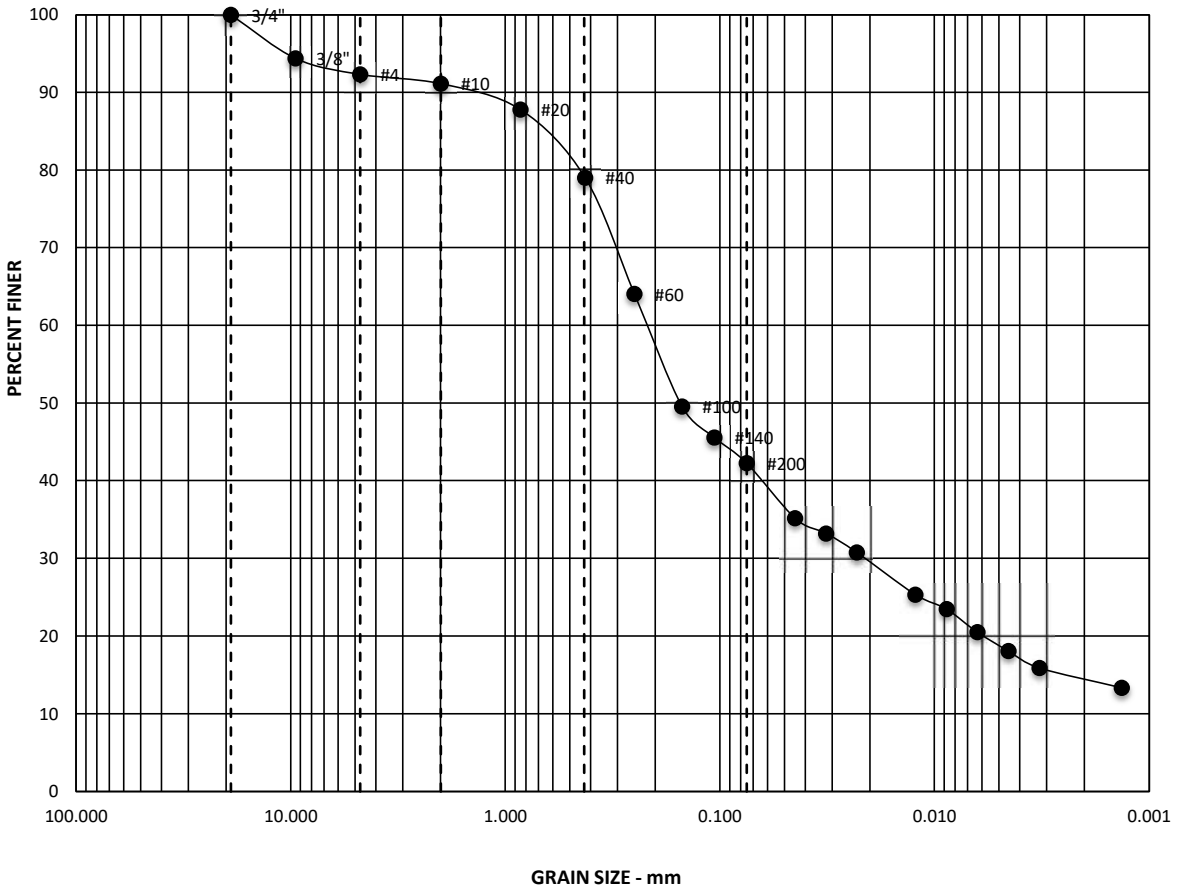
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
26.5	10.6	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-09
Sample:	GS-1
Depth (ft):	1-6
Lab No.	10-199487-9

Figure S-9

Particle Size Distribution Report



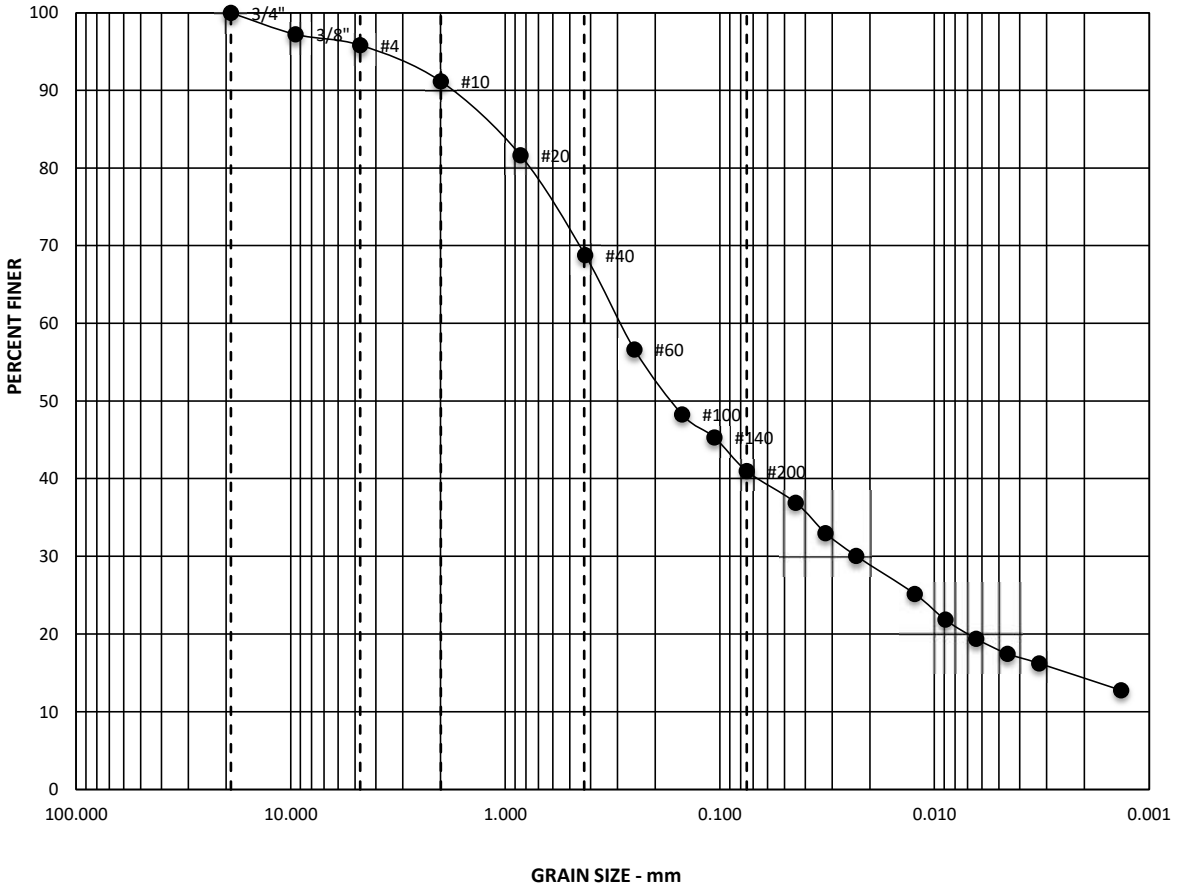
USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
8.9	55.9	20.6	14.6	14.3

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
35.2	14.6	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-10
Sample:	GS-1
Depth (ft):	1.2-6.5
Lab No.	10-199487-10
Figure	S-10

Particle Size Distribution Report



USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
8.8	54.3	22.4	14.5	19.7

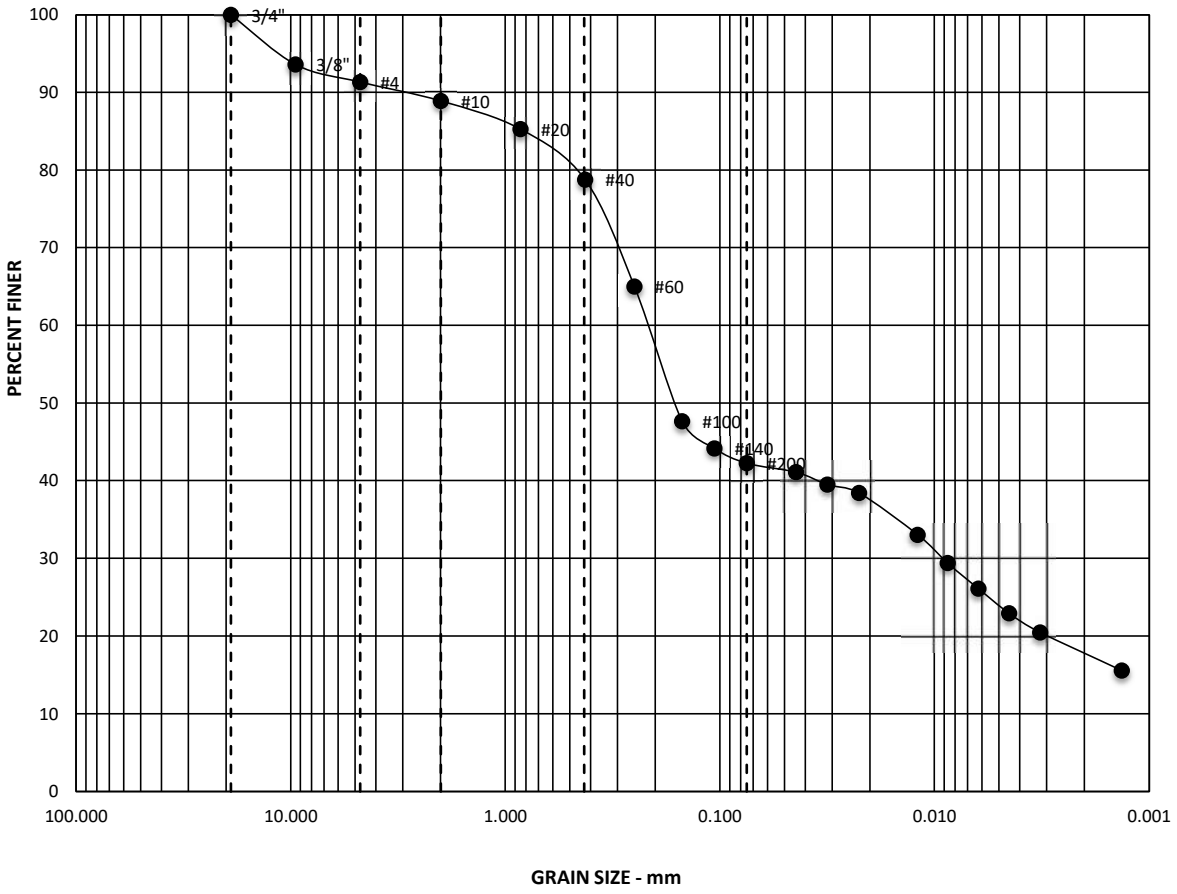
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
36.9	14.5	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-11
Sample:	GS-1
Depth (ft):	0.8-5.8
Lab No.	10-199487-11

Figure S-11

Particle Size Distribution Report



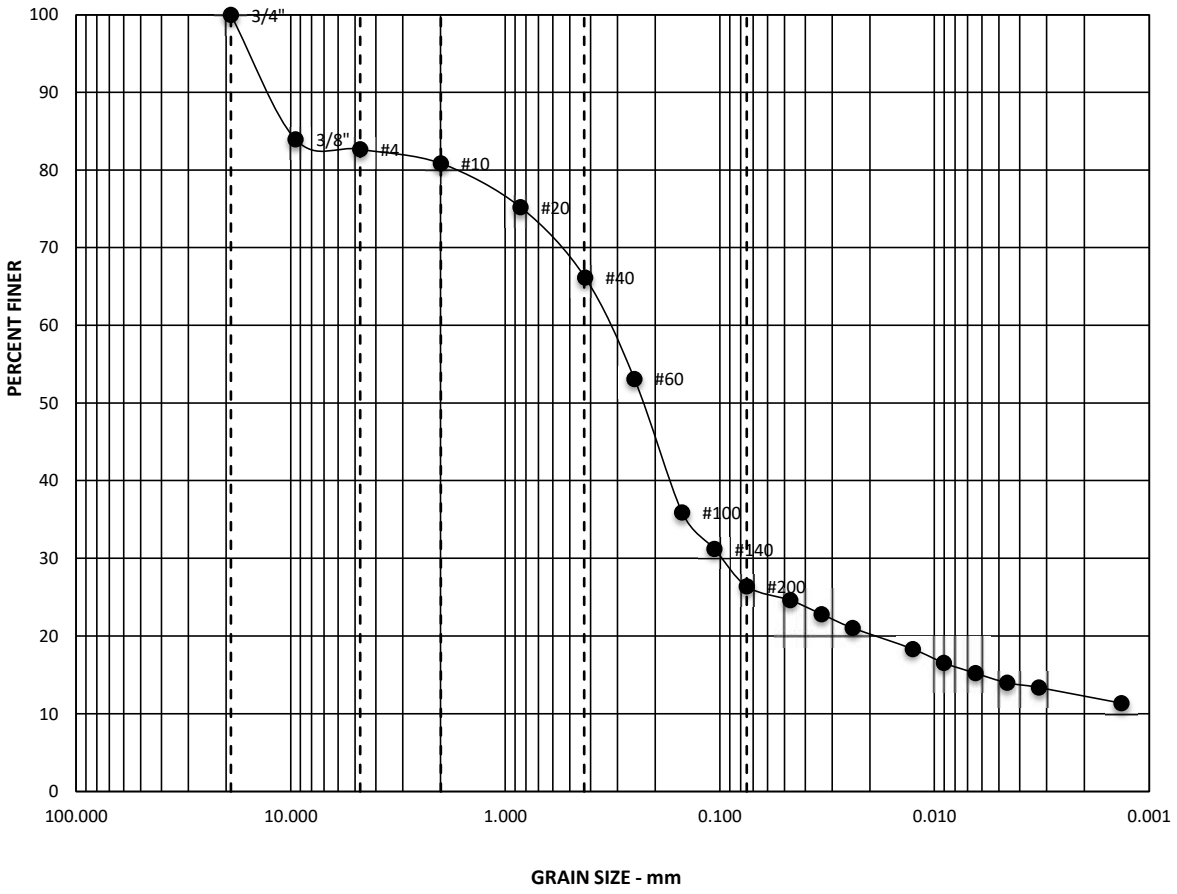
USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
11.1	47.8	23.1	18.0	24.0

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
41.1	18.0	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-12
Sample:	GS-1
Depth (ft):	0.9-5.5
Lab No.	10-199487-12
Figure	S-12

Particle Size Distribution Report



USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
19.1	56.3	12.3	12.3	17.2

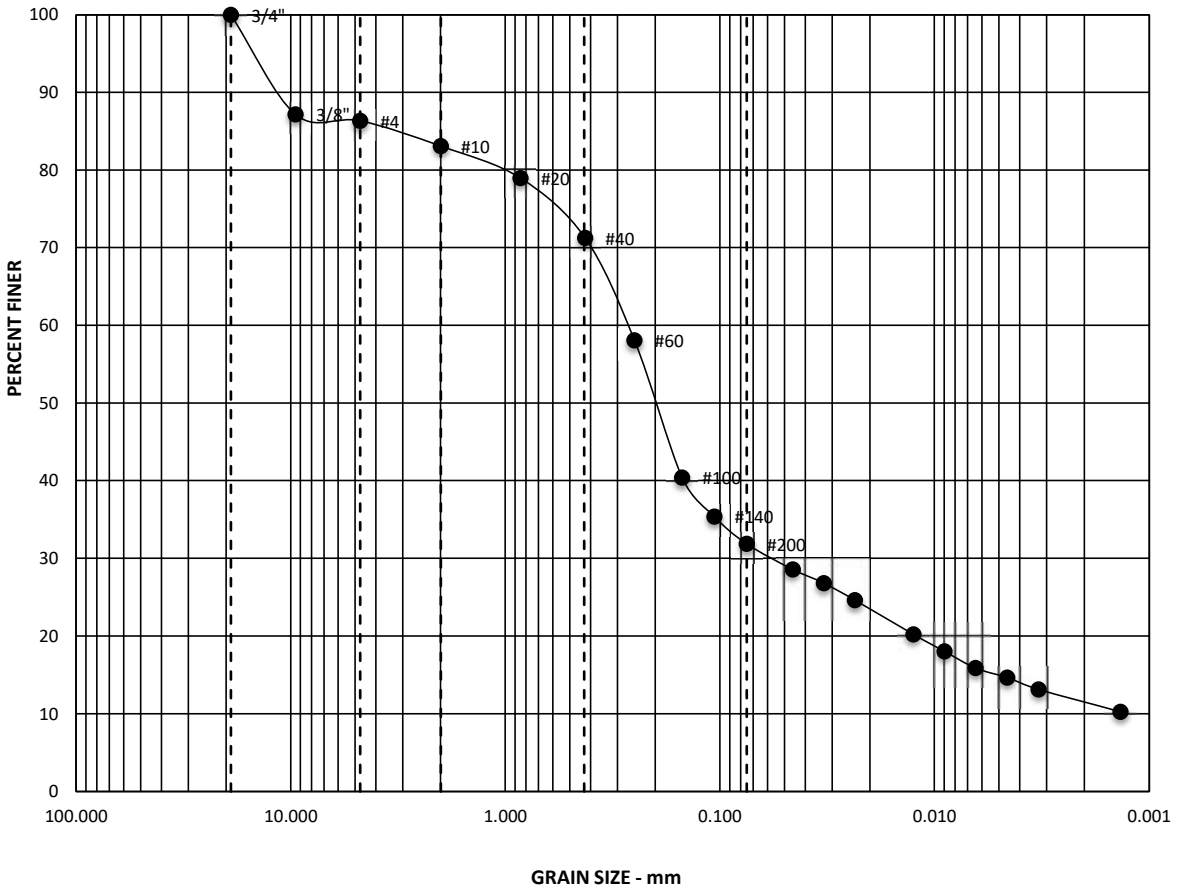
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
24.6	12.3	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-13
Sample:	GS-2
Depth (ft):	3.5-11
Lab No.	10-199487-13

Figure S-13

Particle Size Distribution Report



USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
16.9	54.5	16.9	11.7	18.1

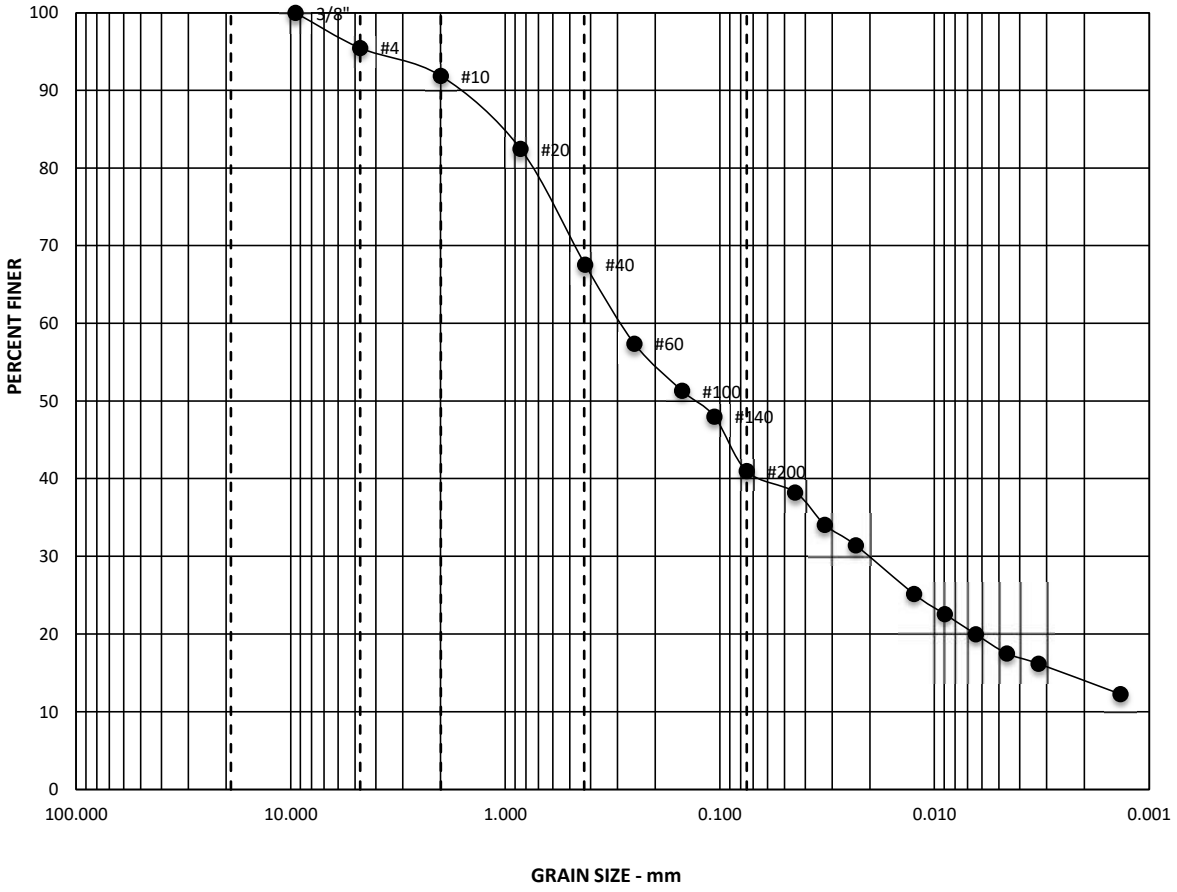
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
28.6	11.7	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-14
Sample:	GS-2
Depth (ft):	5-13
Lab No.	10-199487-14

Figure S-14

Particle Size Distribution Report



USDA Grain Size Distribution			
% Gravel	% Sand	% Fines	Moisture (%)
		Silt / Clay	
8.1	53.6	24.0 / 14.3	22.6

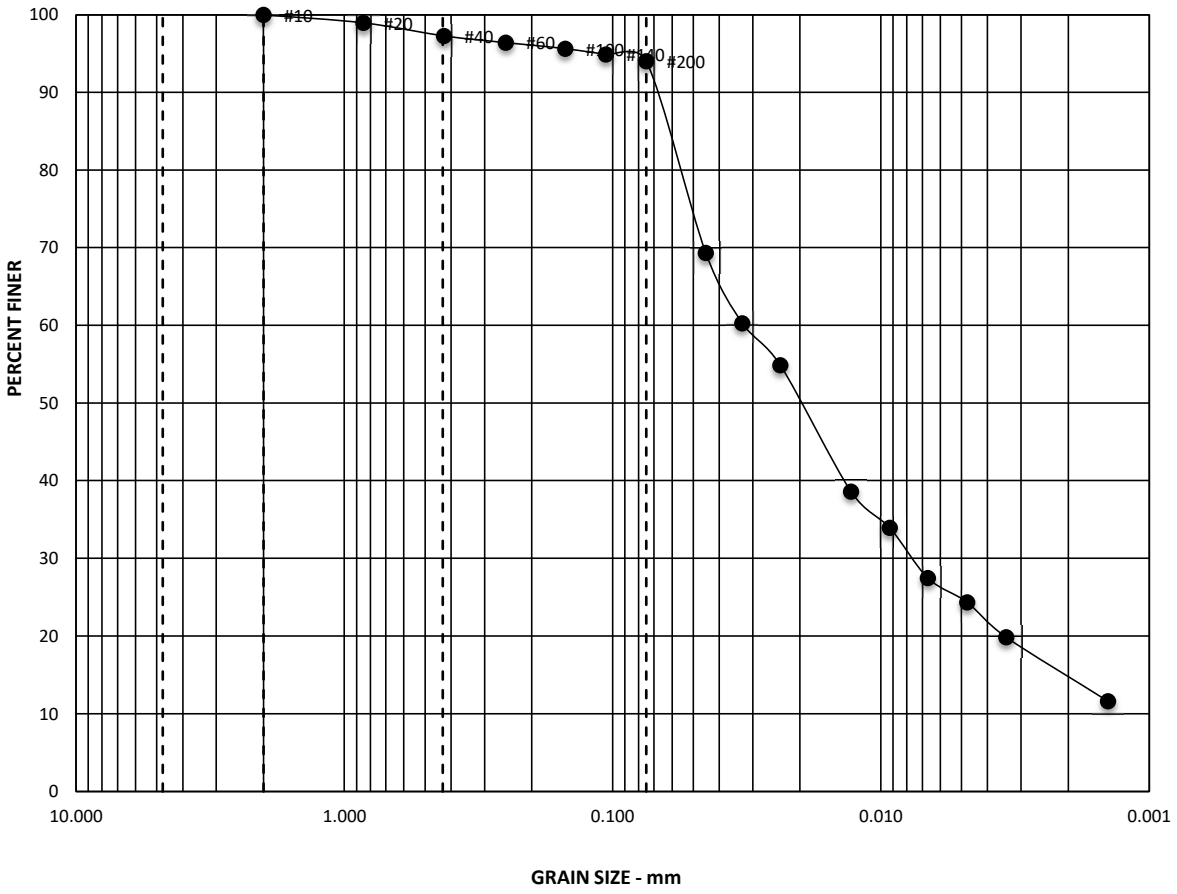
% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
38.3	14.3	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-15
Sample:	GS-2
Depth (ft):	5-12
Lab No.	10-199487-15

Figure S-15

Particle Size Distribution Report



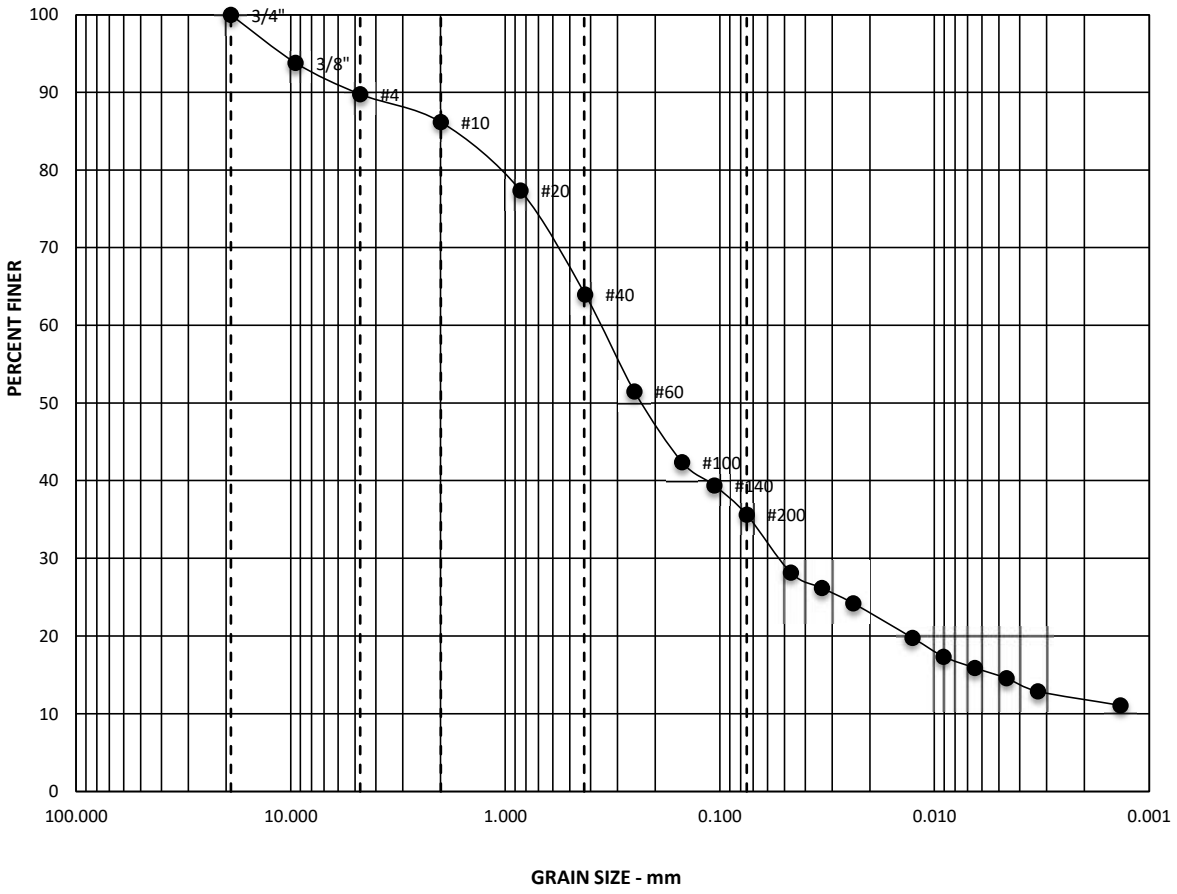
USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
0	30.7	53.6	15.7	75.6

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
69.3	15.7	2.5

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-16
Sample:	GS-3
Depth (ft):	4.5-14
Lab No.	10-199487-16
Figure	S-16

Particle Size Distribution Report



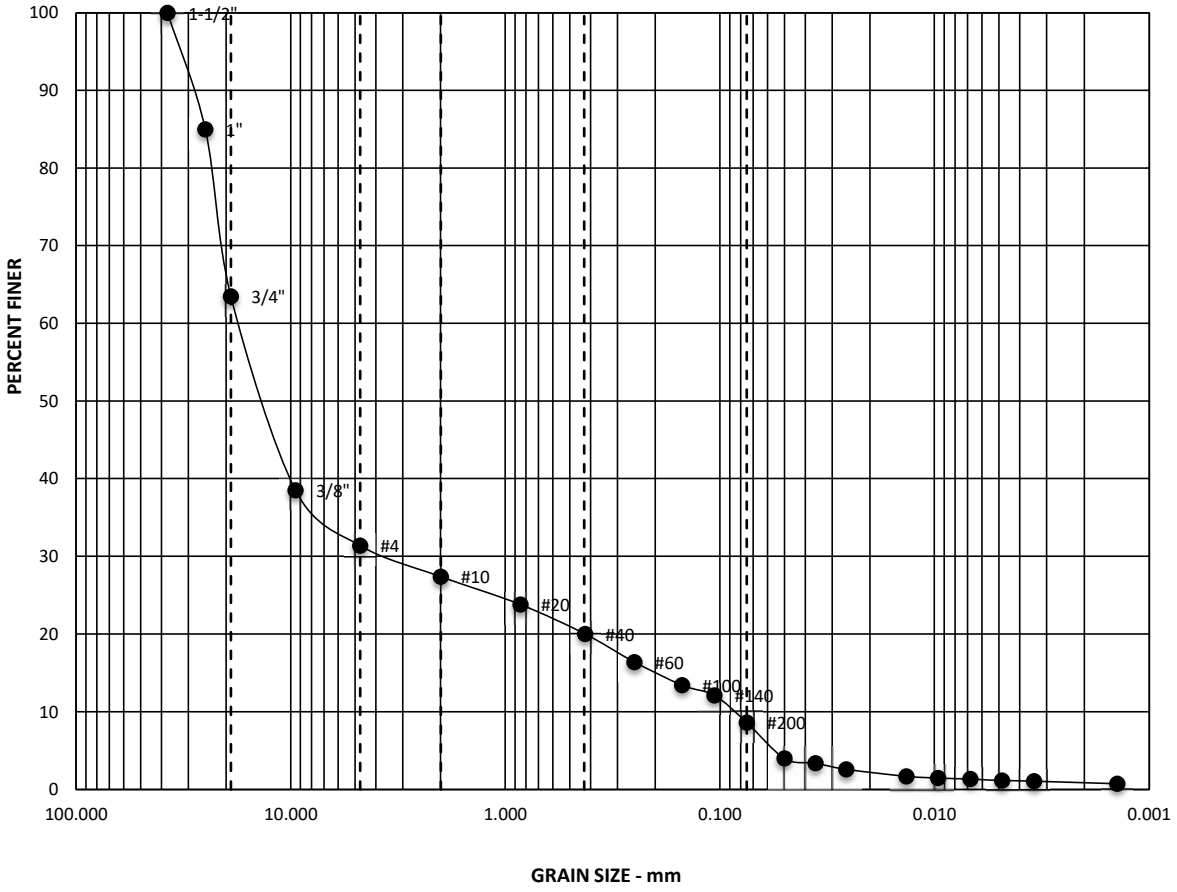
USDA Grain Size Distribution			
% Gravel	% Sand	% Fines	Moisture (%)
		Silt / Clay	
13.8	58.0	16.2 / 12.0	12.1

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
28.2	12.0	2.6

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-17
Sample:	GS-2
Depth (ft):	6.5-18
Lab No.	10-199487-17
Figure	S-17

Particle Size Distribution Report



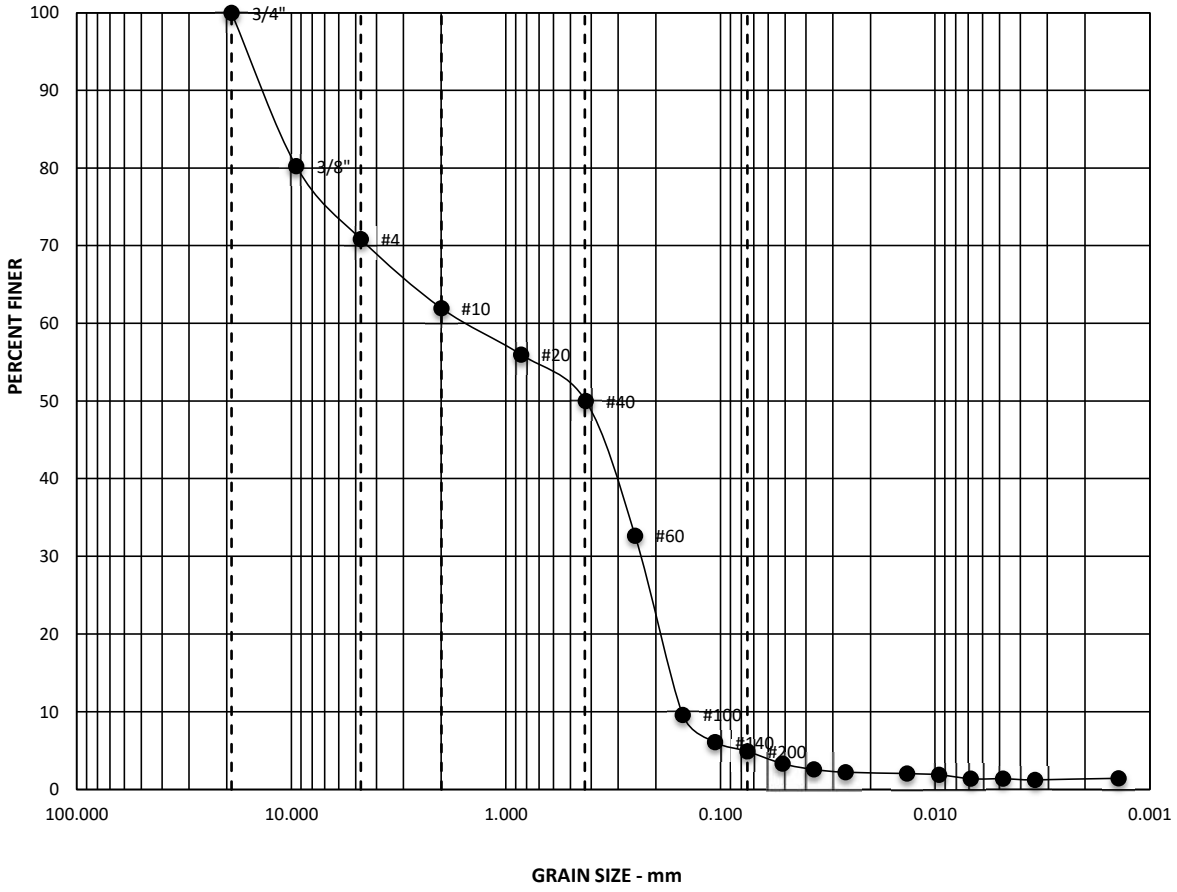
USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
72.6	23.4	3.1	0.9	4.5

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
4.0	0.9	2.7

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-18
Sample:	GS-1
Depth (ft):	0.8-9.0
Lab No.	10-199487-18
Figure	S-18

Particle Size Distribution Report



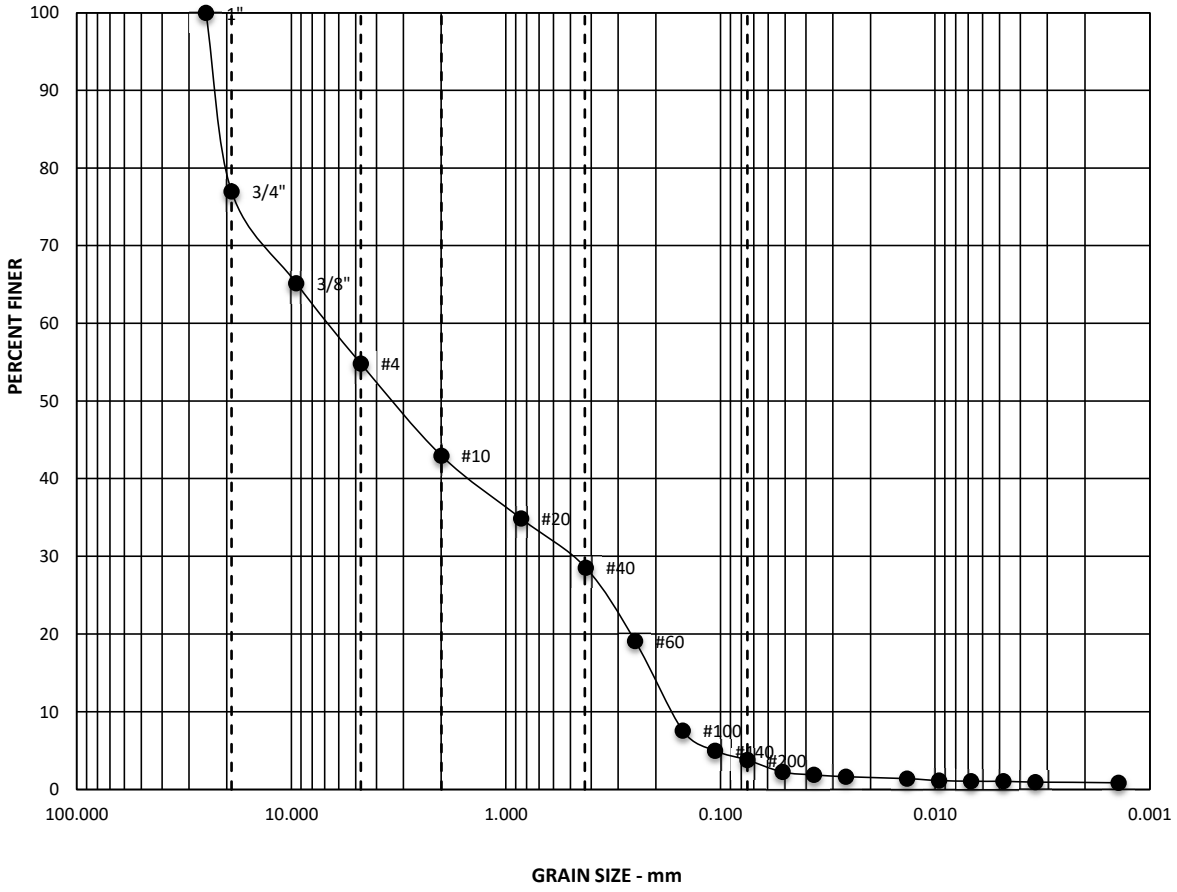
USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
38.0	58.7	2.1	1.2	11.3

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
3.3	1.2	2.7

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-19
Sample:	GS-1
Depth (ft):	0.5-4.5
Lab No.	10-199487-19
Figure	S-19

Particle Size Distribution Report



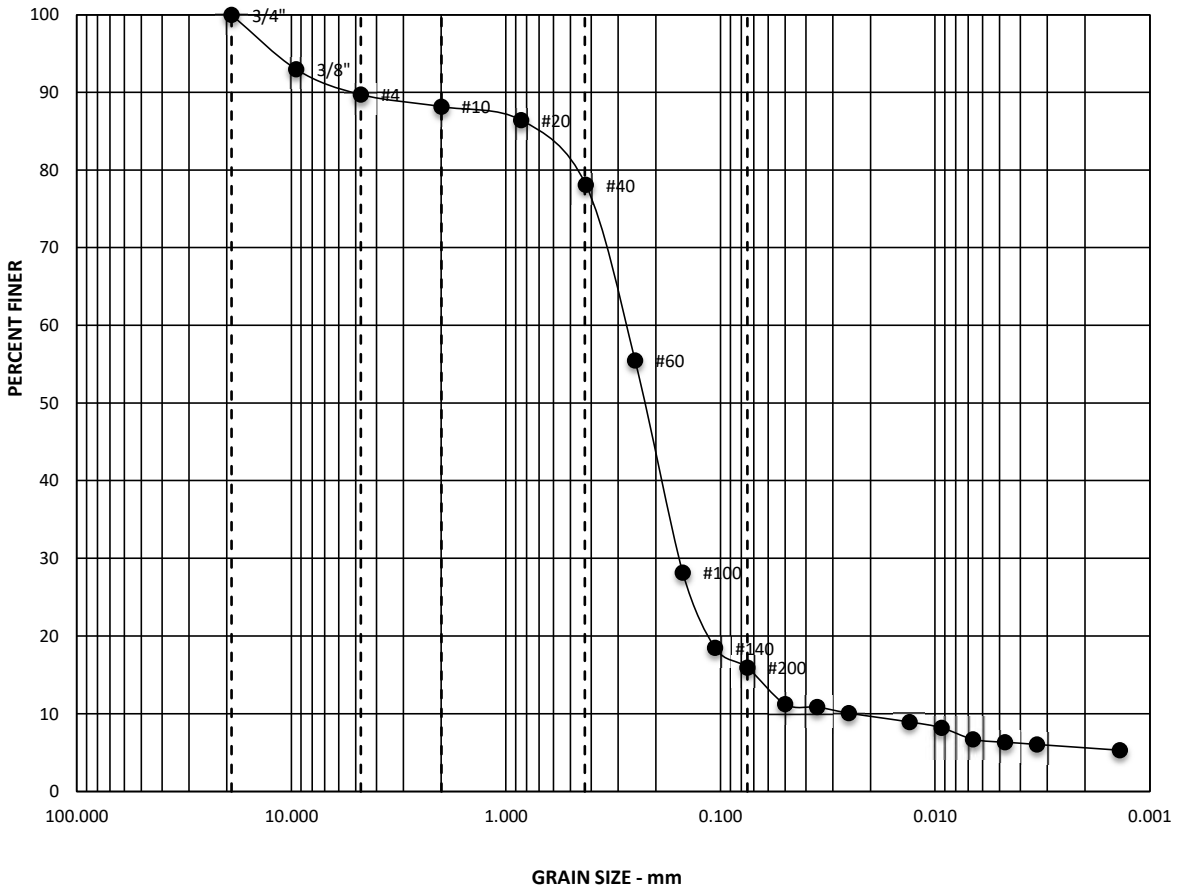
USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
57.0	40.8	1.4	0.8	11.7

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
2.2	0.8	2.7

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-20
Sample:	GS-1
Depth (ft):	0.5-3
Lab No.	10-199487-20
Figure	S-20

Particle Size Distribution Report



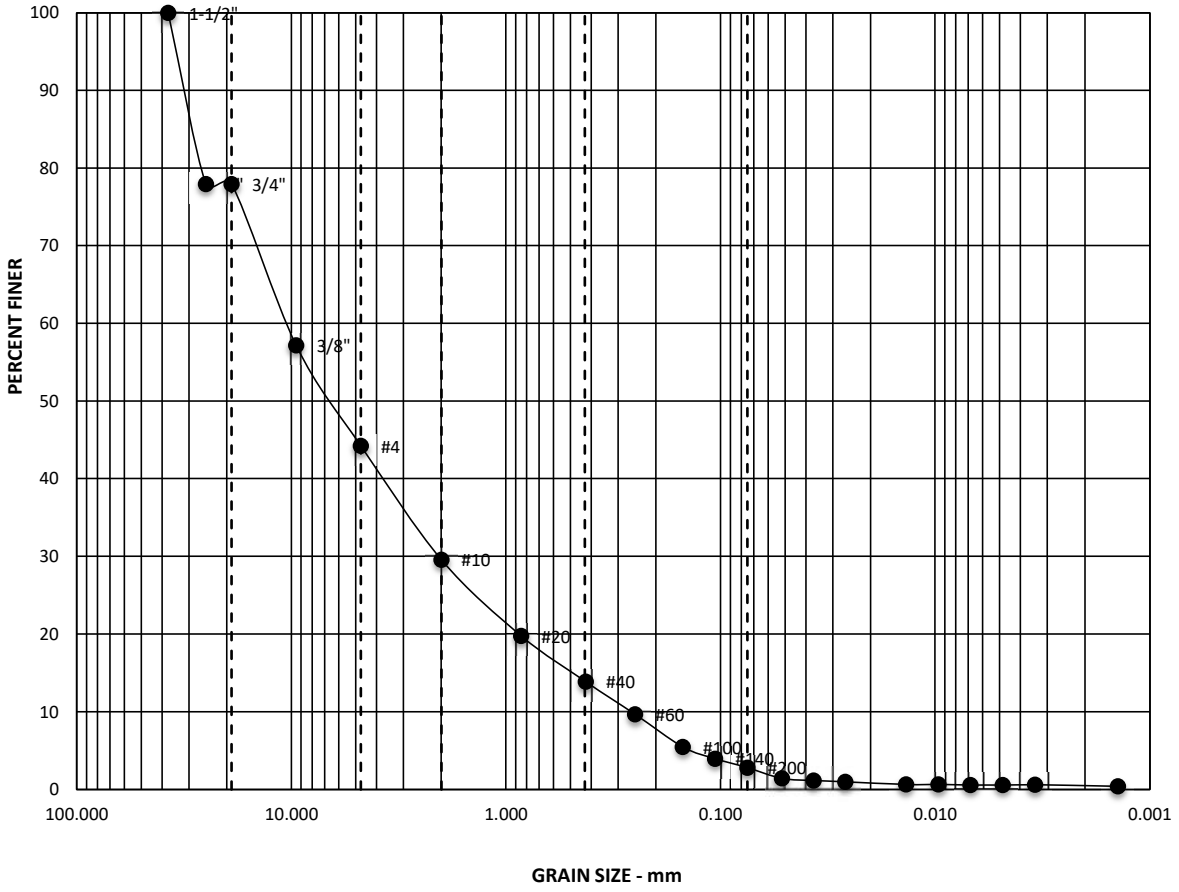
USDA Grain Size Distribution			
% Gravel	% Sand	% Fines	Moisture (%)
		Silt / Clay	
11.8	77.0	5.5 / 5.7	12.5

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
11.2	5.7	2.7

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-21
Sample:	GS-2
Depth (ft):	2.5-5
Lab No.	10-199487-21
Figure	S-21

Particle Size Distribution Report



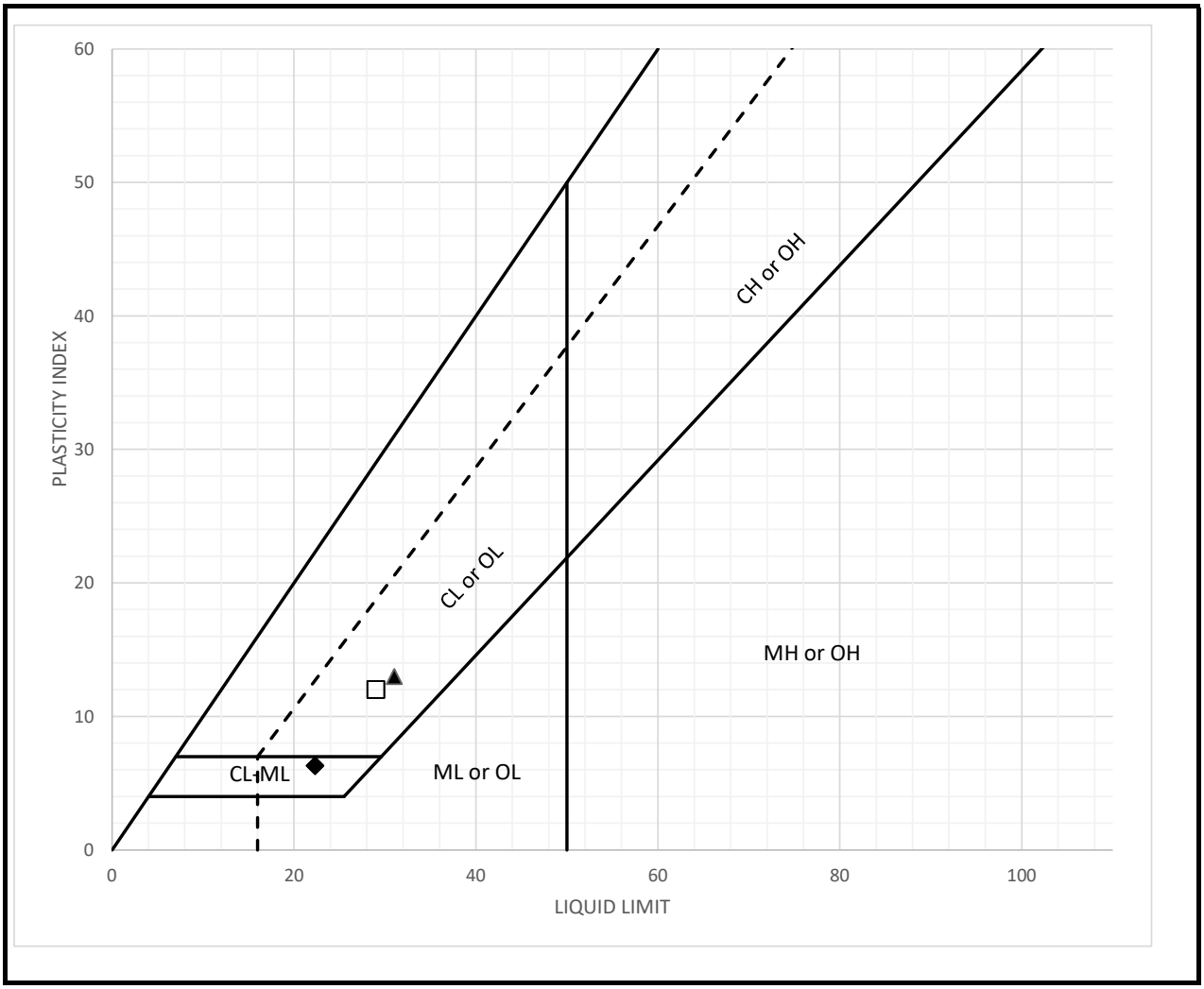
USDA Grain Size Distribution				
% Gravel	% Sand	% Fines		Moisture (%)
		Silt	Clay	
70.4	28.2	0.9	0.5	8.8

% Finer Than:		
0.05 mm	0.002 mm	Specific Gravity
1.4	0.5	2.7

PENNONI ASSOCIATES INC.

Client:	Moffatt & Nichol
Project:	NJ Wind Port - Parcel G Geotech
Location:	Salem, NJ
Source:	TP-22
Sample:	GS-1
Depth (ft):	1.0-3.5
Lab No.	10-199487-22
Figure	S-22

ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils



Symbol	Source	Sample No.	Depth	Natural Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index	USCS (fines only)
△	TP-01	GS-2	1.5-4.5	14.8	NP	NV	NP	ML
●	TP-02	GS-2	2.5-6.5	16.3				
◆	TP-03	GS-3	3.0-6.5	22.7	16	22	6	CL-ML
□	TP-04	GS-2	2.5-10.0	23.0	17	29	12	CL
*	TP-05	GS-2	1.5-6.0	17.3	NP	NV	NP	ML
▲	TP-06	GS-3	4.5-7.5	23.2	18	31	13	CL

PENNONI ASSOCIATES INC.
Bethlehem, PA

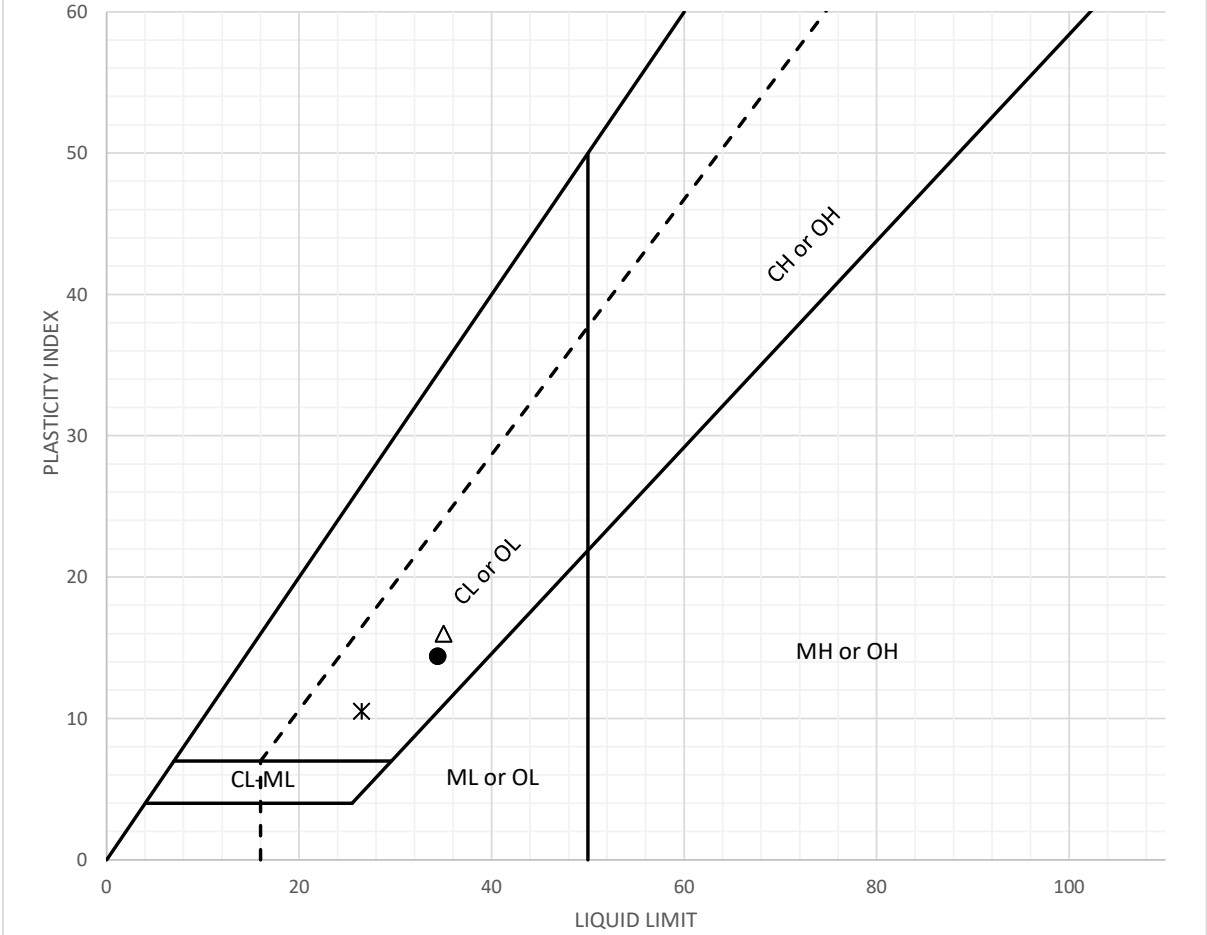
Project No.: MOFNI 22003 **Client:** Moffatt & Nichol
Project: NJ Wind Port - Parcel G Geotech Infiltration Testing
Notes: Plastic Limit Procedure 1
Manual liquid limit device and plastic grooving tool

Figure A-1

2041 Avenue C ▪ Suite 100 ▪ Bethlehem, PA 18017 ▪ Tel: 610-231-0600 ▪ Fax: 610-231-2033
www.pennoni.com

AASHTO R18

ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils



Symbol	Source	Sample No.	Depth	Natural Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index	USCS (fines only)
△	TP-07	GS-2	2.5-5.0	23.2	19	35	16	CL
●	TP-08	GS-2	2.5-5.0	23.3	20	34	14	CL
◆	TP-09	GS-1	1-6	17.2				
□	TP-10	GS-1	1.2-6.5	14.3				
*	TP-11	GS-1	0.8-5.8	19.7	16	27	11	CL
▲	TP-12	GS-1	0.9-5.5	24.0				

PENNONI ASSOCIATES INC.
Bethlehem, PA

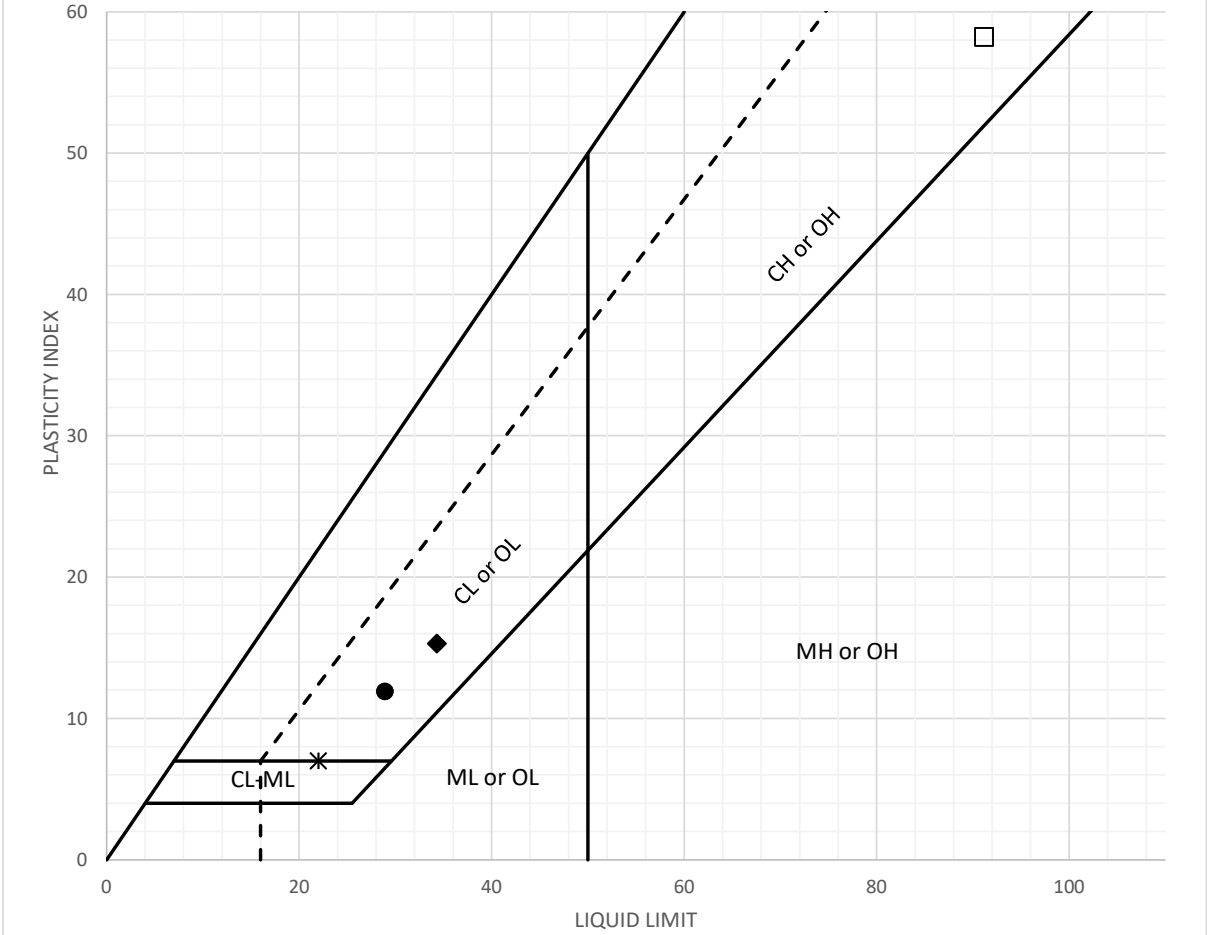
Project No.: MOFNI 22003 **Client:** Moffatt & Nichol
Project: NJ Wind Port - Parcel G Geotech Infiltration Testing
Notes: Plastic Limit Procedure 1
Manual liquid limit device and plastic grooving tool

Figure A-2

2041 Avenue C ▪ Suite 100 ▪ Bethlehem, PA 18017 ▪ Tel: 610-231-0600 ▪ Fax: 610-231-2033
www.pennoni.com

AASHTO R18

ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils



Symbol	Source	Sample No.	Depth	Natural Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index	USCS (fines only)
△	TP-13	GS-2	3.5-11	17.2				
●	TP-14	GS-2	5-13	18.1	17	29	12	CL
◆	TP-15	GS-2	5-12	22.6	19	34	15	CL
□	TP-16	GS-3	4.5-14	0.0	33	91	58	CH
*	TP-17	GS-2	6.5-18	12.1	15	22	7	CL-ML
▲	TP-18	GS-1	0.8-9.0	4.5				

PENNONI ASSOCIATES INC.
Bethlehem, PA

Project No.: MOFNI 22003 **Client:** Moffatt & Nichol
Project: NJ Wind Port - Parcel G Geotech Infiltration Testing
Notes: Plastic Limit Procedure 1
Manual liquid limit device and plastic grooving tool

Figure A-3

2041 Avenue C ▪ Suite 100 ▪ Bethlehem, PA 18017 ▪ Tel: 610-231-0600 ▪ Fax: 610-231-2033
www.pennoni.com

AASHTO R18

Appendix I – Groundwater Table Impacts-Hantush Workbook

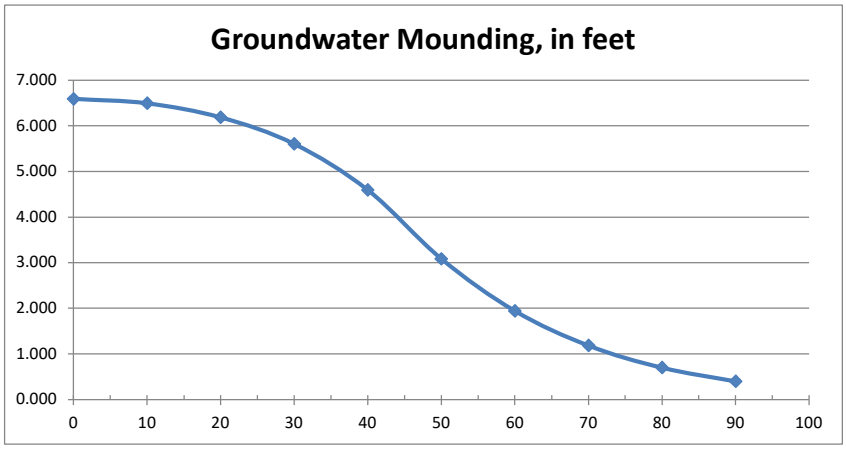
Input Values

2.75	*R*	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
13.75	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
44.500	x	1/2 length of basin (x direction, in feet)
16.500	y	1/2 width of basin (y direction, in feet)
11.22	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

16.588	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
6.588	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
6.588	0
6.492	10
6.184	20
5.600	30
4.591	40
3.084	50
1.940	60
1.182	70
0.698	80
0.399	90

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

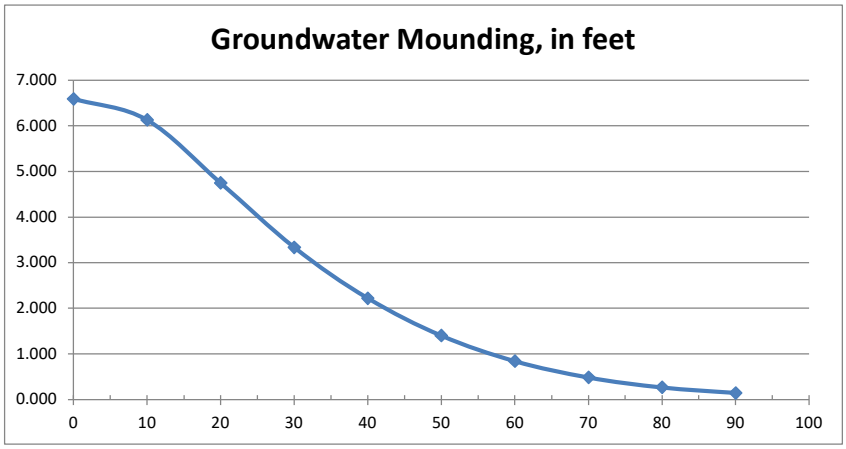
Input Values

2.75	*R*	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
13.75	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
16.500	x	1/2 length of basin (x direction, in feet)
44.500	y	1/2 width of basin (y direction, in feet)
11.22	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

16.588	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
6.588	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
6.588	0
6.129	10
4.746	20
3.333	30
2.217	40
1.398	50
0.839	60
0.481	70
0.265	80
0.141	90

Re-Calculate Now



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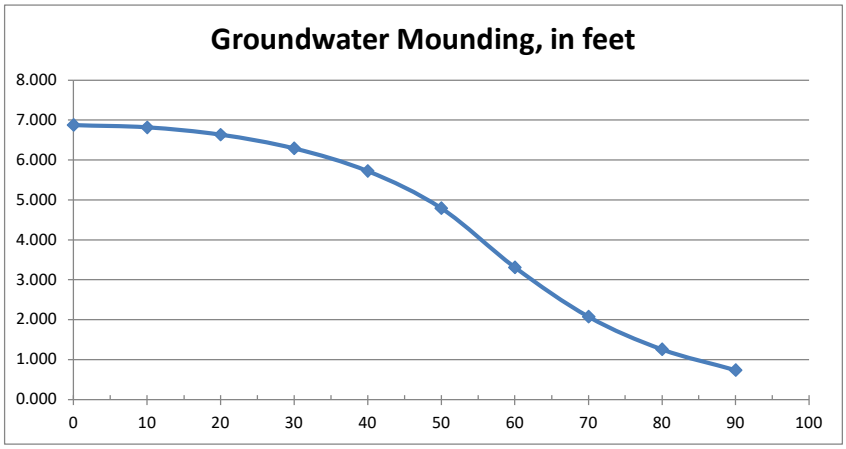
Input Values

2.75	*R*	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
13.75	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
56.500	x	1/2 length of basin (x direction, in feet)
16.500	y	1/2 width of basin (y direction, in feet)
10.81	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

16.874	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
6.874	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
6.874	0
6.816	10
6.632	20
6.291	30
5.723	40
4.791	50
3.309	60
2.072	70
1.256	80
0.737	90

Re-Calculate Now



Disclaimer

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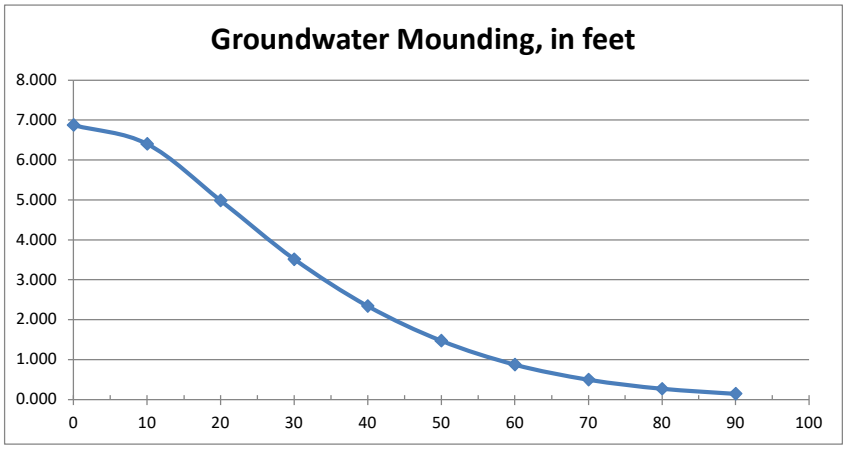
Input Values

2.75	*R*	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
13.75	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
16.500	x	1/2 length of basin (x direction, in feet)
56.500	y	1/2 width of basin (y direction, in feet)
10.81	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

16.874	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
6.874	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
6.874	0
6.402	10
4.982	20
3.514	30
2.339	40
1.469	50
0.874	60
0.496	70
0.270	80
0.141	90

Re-Calculate Now



Disclaimer

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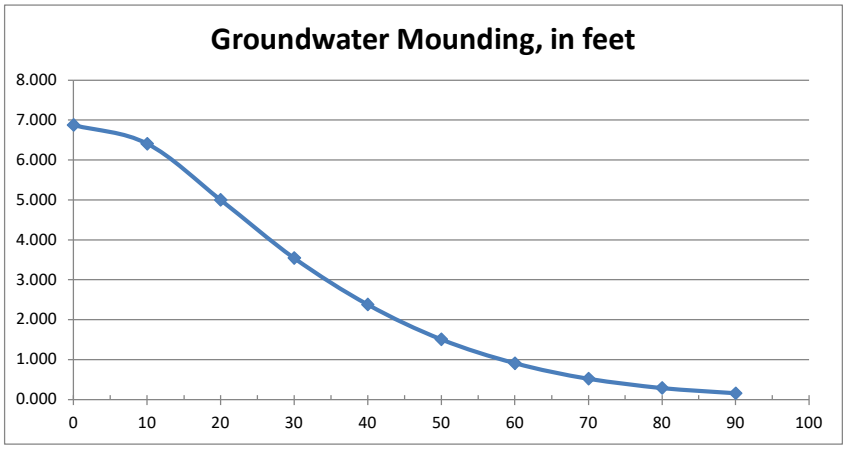
Input Values

2.75	*R*	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
13.75	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
16.500	x	1/2 length of basin (x direction, in feet)
52.500	y	1/2 width of basin (y direction, in feet)
11.21	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

16.875	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
6.875	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
6.875	0
6.407	10
4.999	20
3.543	30
2.375	40
1.507	50
0.907	60
0.521	70
0.288	80
0.153	90

Re-Calculate Now



Disclaimer

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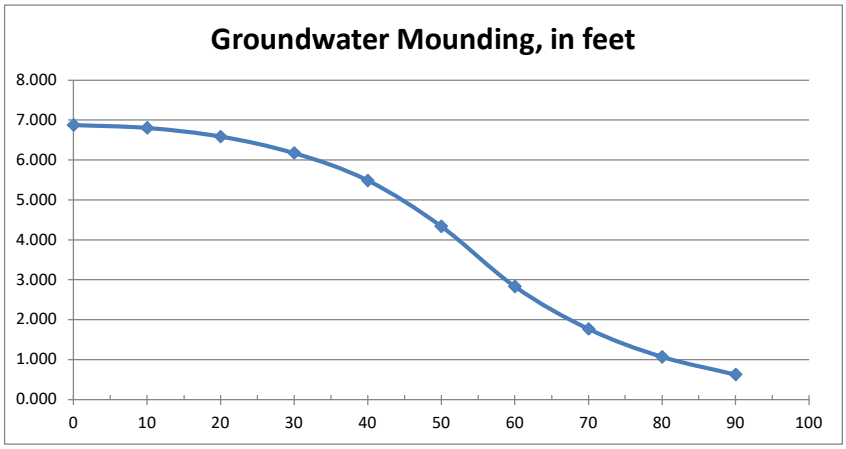
Input Values

2.75	R	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
13.75	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
52.500	x	1/2 length of basin (x direction, in feet)
16.500	y	1/2 width of basin (y direction, in feet)
11.21	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

16.875	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
6.875	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
6.875	0
6.806	10
6.585	20
6.173	30
5.485	40
4.337	50
2.827	60
1.765	70
1.067	80
0.625	90

Re-Calculate Now

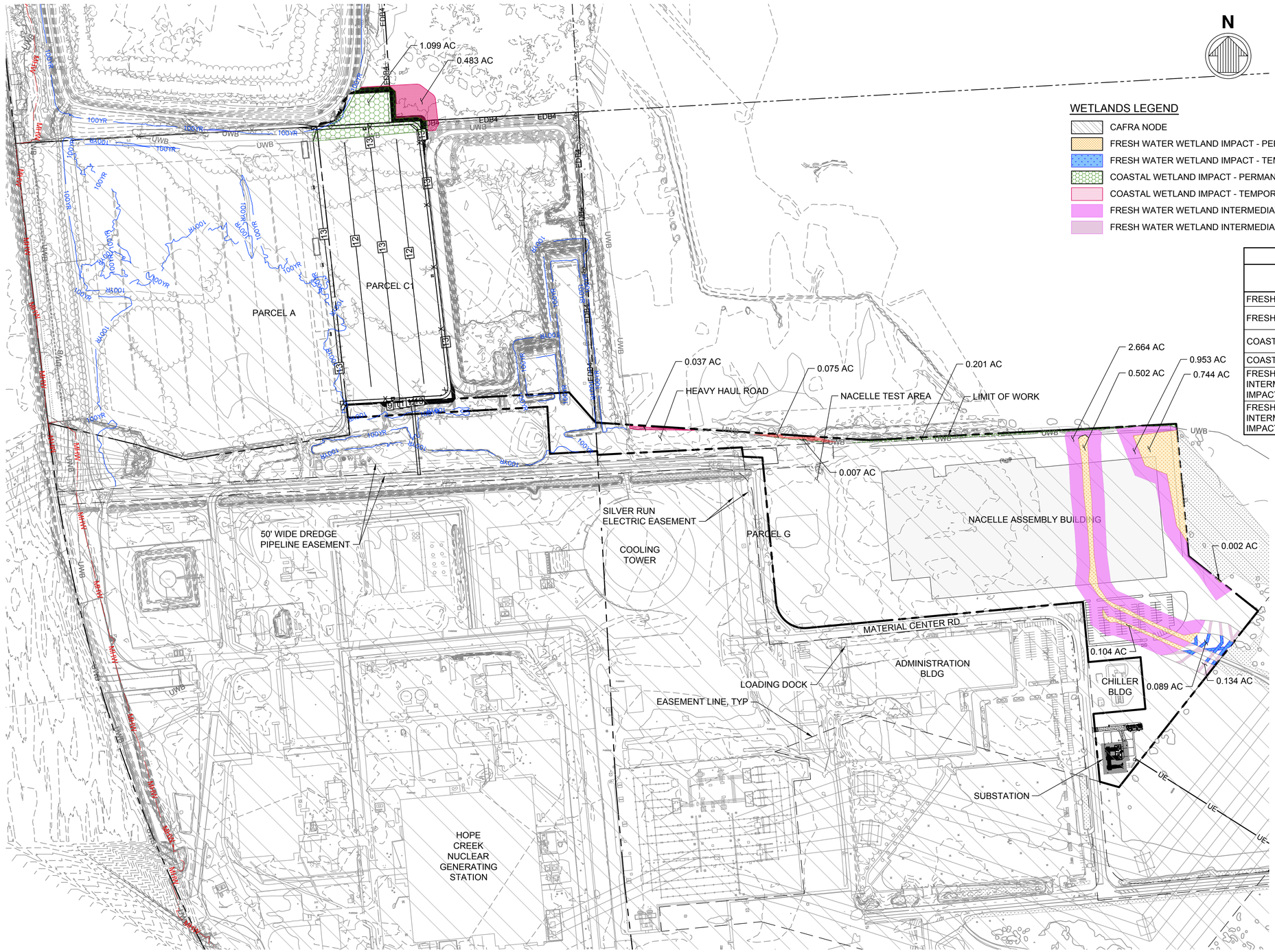


Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

ATTACHMENT C

PROPOSED ENVIRONMENTAL IMPACT DRAWINGS



PROPOSED IMPACT AREAS	
REGULATED AREA	PROPOSED IMPACTS
FRESHWATER WETLAND - PERMANENT	1.352 ACRES
FRESHWATER WETLAND - TEMPORARY	0.089 ACRES
COASTAL WETLAND - PERMANENT	1.307 ACRES
COASTAL WETLAND - TEMPORARY	0.595 ACRES
FRESHWATER WETLAND INTERMEDIATE TRANSITION AREA IMPACT - PERMANENT	3.617 ACRES
FRESHWATER WETLAND INTERMEDIATE TRANSITION AREA IMPACT - TEMPORARY	0.134 ACRES

NOTES:
1. NJDEP MAPPED COASTAL WETLAND LINE AS PRESENTED ON NJDEP COASTAL WETLAND MAPS NOS. 231-1752, 231-1758, 224-1752 & 224-1758. REVISED PER PETITION BY PSEG NUCLEAR LLC DATED NOVEMBER 2020
2. NJDEP FRESHWATER WETLAND LETTER OF INTERPRETATION/LINE VERIFICATION FILE NO. 1704-02-0001.4, FWW090001, DATED APRIL 21, 2010. EXTENSION FILE NO. 1704-02-0001.4 FWW140001 REF FILE NO. FWW090001, DATED FEBRUARY 13, 2015. FIELD VERIFIED BY AKRF PERSONNEL MAY 2020.

A1
CE101
ENLARGED PLAN - ENVIRONMENTAL IMPACT
SCALE: 1"=100'

SCALE: 1"=200'

EXHIBIT
ISSUED: 2023-01-12
NOT TO BE USED FOR CONSTRUCTION

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

NEW JERSEY WIND PORT
PARCEL G1 - ENGINEERING FOR PERMITTING
LOWER ALLOWAYS CREEK TOWNSHIP
SALEM COUNTY, NJ

PLAN - ENVIRONMENTAL IMPACT

Rev.	Date	Description	Appr
REVNO	DATE		

Date: DATE
M&N Project No.: 11102-06
Designed by: DSGN
Cad by: CHKR
Drawn by: DRFT
Drawing scale:
Reviewed by: REVR
Drawing Scale:
Submitted by: MOFFATT & NICHOL
Plot scale: 1:1 (0 SHEET)

180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330
moffatt & nichol

NEW JERSEY WIND PORT
NJEDA

Sheet
Reference No.
CE101
INDEX: INDX OF ----

File: Q:\BOS\Projects\11102-06 NJ Wind G Eng Perm\500 CADD_ACTIVE_Exhibits\008_Wetland Impact\11102006CE-101 - Plotted: 2/6/2023 4:00 PM by VOELKER, PAUL , Saved: 2/6/2023 3:59 PM by PVOELKER

ATTACHMENT D

USFWS IPAC RESULTS, DATED NOVEMBER 29, 2022

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

Salem County, New Jersey



Local office

New Jersey Ecological Services Field Office

(609) 646-9310

4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205

NOT FOR CONSULTATION

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.

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
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Eastern Black Rail Laterallus jamaicensis ssp. jamaicensis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10477	Threatened

NOT FOR CONSULTATION

NAME	STATUS
Red Knot Calidris canutus rufa Wherever found	Threatened

This species only needs to be considered if the following condition applies:

- This activity area is upstream of red knot habitat. Consultation is needed ONLY for proposed new or changed petroleum product storage or transport, and for spill response planning. No other activity types are expected to affect red knots in this area.

There is **proposed** critical habitat for this species.
https://ecos.fws.gov/ecp/species/1864

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found	Candidate

This species only needs to be considered if the following condition applies:

- The monarch is a candidate species and not yet listed or proposed for listing. There are generally no section 7 requirements for candidate species (FAQ found here: https://www.fws.gov/savethemonarch/FAQ-Section7.html).

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9743

Flowering Plants

NAME	STATUS
Sensitive Joint-vetch Aeschynomene virginica Wherever found	Threatened

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/855

NAME	STATUS
Swamp Pink Helonias bullata	Threatened

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4333

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.

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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 should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species

- 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

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, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list 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
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
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
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
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
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
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

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Ruddy Turnstone Arenaria interpres morinella This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
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
Short-billed Dowitcher Limnodromus griseus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
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 and understand the FAQ "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.

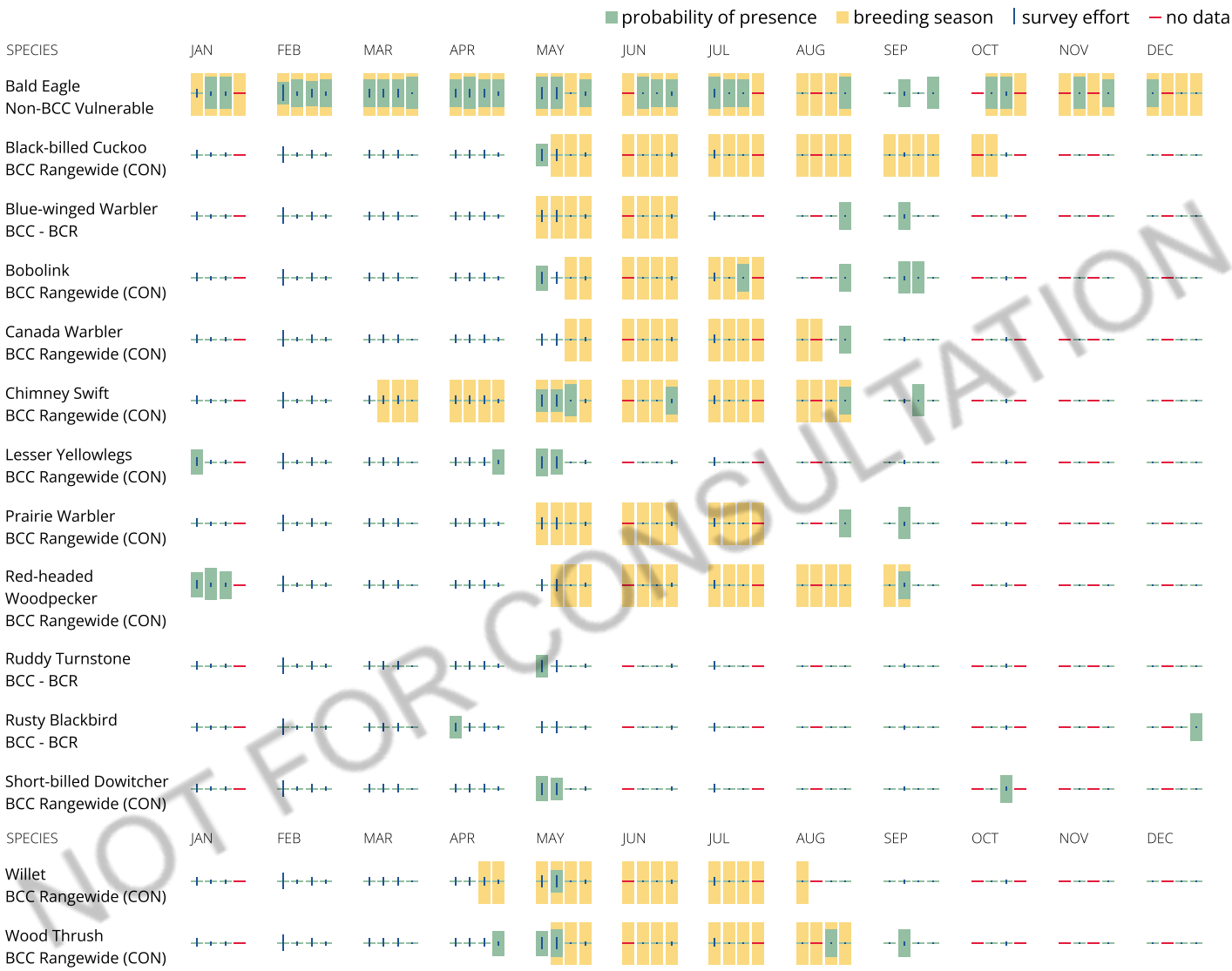
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

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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.



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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

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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.

Coastal Barrier Resources System

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

There are no known coastal barriers at this location.

Data limitations

The CBRS boundaries used in IPaC are representations of the controlling boundaries, which are depicted on the official CBRS maps. The boundaries depicted in this layer are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e., within the "CBRS Buffer Zone" that appears as a hatched area on either side of the boundary). For projects that are very close to a CBRS boundary but do not clearly intersect a unit, you may contact the Service for an official determination by following the instructions here: https://www.fws.gov/service/coastal-barrier-resources-system-property-documentation

Data exclusions

CBRS units extend seaward out to either the 20- or 30-foot bathymetric contour (depending on the location of the unit). The true seaward extent of the units is not shown in the CBRS data, therefore projects in the offshore areas of units (e.g., dredging, breakwaters, offshore wind energy or oil and gas projects) may be subject to CBRA even if they do not intersect the CBRS data. For additional information, please contact CBRA@fws.gov.

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.

Wetland information is not available at this time

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This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

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.

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ATTACHMENT E

NEW JERSEY NATURAL HERITAGE PROGRAM CORRESPONDENCE

State of New Jersey
MAIL CODE 501-04
DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE PARKS, FORESTS & HISTORIC SITES
OFFICE OF NATURAL LANDS MANAGEMENT
501 East State Street
P.O. Box 420, Mail Code 501-04
Trenton, NJ 08625-0420
Tel. (609) 984-1339 • Fax (609) 984-0427

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Commissioner

October 5, 2022

Kevin Dare
AKRF, Inc.
307 Fellowship Road, Suite 214
Mount Laurel, NJ 08054

Re: End of Alloway Creek Neck Road
Block(s) - 26, Lot(s) - 2, 4, 4.01, 5, 5.01
Lower Alloways Creek Township, Salem County

Dear Mr. Dare:

Thank you for your data request regarding rare species information for the above referenced project site.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.3) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the map(s) submitted with the Natural Heritage Data Request Form into our GIS. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the immediate vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the county (or counties), referenced above, can be downloaded from https://nj.gov/dep/parksandforests/natural/heritage/database.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from https://nj.gov/dep/parksandforests/natural/docs/nhpcodes_2010.pdf.

Beginning May 9, 2017, the Natural Heritage Program reports for wildlife species will utilize data from Landscape Project Version 3.3. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive web application at the following URL,

https://njdep.maps.arcgis.com/apps/webappviewer/index.html?id=0e6a44098c524ed99bf739953cb4d4c7, or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

For additional information regarding any Federally listed plant or animal species, please contact the U.S. Fish & Wildlife Service, New Jersey Field Office at http://www.fws.gov/northeast/njfieldoffice/endangered/consultation.html.

Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements (species and/or ecological communities) or their locations. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

c: NHP File No. 22-3907545-25876

Table 1: On Site Data Request Search Results (6 Possible Reports)

Report Name	Included	Number of Pages
1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. Natural Heritage Priority Sites On Site	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches	Yes	2 page(s) included
4. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.3	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Stream Habitat File	No	0 pages included
6. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	No	0 pages included

Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
Aves								
	Bald Eagle	Haliaeetus leucocephalus	Foraging	4	NA	State Endangered	G5	S1B,S2N
	Bald Eagle	Haliaeetus leucocephalus	Nest	4	NA	State Endangered	G5	S1B,S2N
	Great Blue Heron	Ardea herodias	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Osprey	Pandion haliaetus	Foraging	3	NA	State Threatened	G5	S2B,S4N
	Osprey	Pandion haliaetus	Nest	3	NA	State Threatened	G5	S2B,S4N
Osteichthyes								
	Atlantic Sturgeon	Acipenser oxyrinchus	Migration Corridor - Adult Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
	Atlantic Sturgeon	Acipenser oxyrinchus	Migration Corridor - Juvenile Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
	Shortnose Sturgeon	Acipenser brevirostrum	Migration Corridor - Adult Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
Reptilia								
	Atlantic Green Turtle	Chelonia mydas	Occupied Habitat	5	Federally Listed Threatened	State Threatened	G3	S1
	Atlantic Loggerhead	Caretta caretta	Occupied Habitat	5	Federally Listed Threatened	State Endangered	G3	S1

Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Kemp's or Atlantic Ridley	Lepidochelys kempii	Occupied Habitat	5	Federally Listed Endangered	State Endangered	G1	S1

Table 2: Vicinity Data Request Search Results (6 possible reports)

Report Name	Included	Number of Pages
1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. Natural Heritage Priority Sites within the Immediate Vicinity	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches	Yes	2 page(s) included
4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.3	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Stream Habitat File	No	0 pages included
6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	No	0 pages included

Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
Aves								
	Bald Eagle	Haliaeetus leucocephalus	Foraging	4	NA	State Endangered	G5	S1B,S2N
	Bald Eagle	Haliaeetus leucocephalus	Nest	4	NA	State Endangered	G5	S1B,S2N
	Bald Eagle	Haliaeetus leucocephalus	Wintering	3	NA	State Threatened	G5	S1B,S2N
	Great Blue Heron	Ardea herodias	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Osprey	Pandion haliaetus	Foraging	3	NA	State Threatened	G5	S2B,S4N
	Osprey	Pandion haliaetus	Nest	3	NA	State Threatened	G5	S2B,S4N
Osteichthyes								
	Atlantic Sturgeon	Acipenser oxyrinchus	Migration Corridor - Adult Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
	Atlantic Sturgeon	Acipenser oxyrinchus	Migration Corridor - Juvenile Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
	Shortnose Sturgeon	Acipenser brevirostrum	Migration Corridor - Adult Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
Reptilia								
	Atlantic Green Turtle	Chelonia mydas	Occupied Habitat	5	Federally Listed Threatened	State Threatened	G3	S1
	Atlantic Loggerhead	Caretta caretta	Occupied Habitat	5	Federally Listed Threatened	State Endangered	G3	S1

Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Kemp's or Atlantic Ridley	Lepidochelys kempii	Occupied Habitat	5	Federally Listed Endangered	State Endangered	G1	S1

ATTACHMENT F

PHOTOGRAPHIC LOG

Parcel G Photos

(Photo Numbers 1 – 16)



Photo 1 – Parcel G: Photo looking southeast into the southern most portion of Parcel G



Photo 2 – Parcel G: Photo looking northwest into Parcel G. Area is currently being used as a laydown area by PSEG.



Photo 3 – Parcel G: Photo looking north into the eastern portion of Parcel G.



Photo 4 – Parcel G: Photo taken on the edge of the Parcel G boundary looking north into the eastern portion of Parcel G.



Photo 5 – Parcel G: Photo taken on the edge of the Parcel G looking northwest down the existing dirt access road going through Parcel G.



Photo 6 – Parcel G: Photo taken on the edge of the Parcel G boundary looking southwest into the southern portion of Parcel G.



Photo 7 – Parcel G: Photo looking north into Parcel G/existing PSEG material laydown area. Photo shows the eastern portion of the laydown area.



Photo 8 – Parcel G: Photo looking northwest into Parcel G/existing PSEG material laydown area. Photo looking into the center of the laydown area.



Photo 9 – Parcel G: Photo looking north into Parcel G/existing PSEG material laydown area. Photo looking into the center of the laydown area.



Photo 10 – Parcel G: Photo looking north into Parcel G. Photo showing the western portion of Parcel G near the existing PSEG Combo Shop (right).



Photo 11 – Parcel G: Photo looking east into Parcel G. Photo showing the center of Parcel G/existing PSEG laydown area.



Photo 12 – Parcel G: Photo looking west into Parcel G. Photo showing the center of Parcel G/existing PSEG laydown area.



Photo 13 – Parcel G: Photo looking southwest into Parcel G/existing PSEG laydown area.



Photo 14 – Parcel G: Photo looking south into the center of Parcel G/existing PSEG laydown area.



Photo 15 – Parcel G: Photo looking southwest into the center of Parcel G/existing PSEG laydown area.



Photo 16 – Parcel G: Photo looking south into Parcel G. Photo showing the western portion of Parcel G near the existing PSEG Combo Shop (left).

Heavy Haul Road Photos

(Photo Numbers 17 – 20)



Photo 17 – Heavy Haul Road: Photo looking west down the proposed heavy haul road. Note existing PSEG structure and storage area.



Photo 18 – Heavy Haul Road: Photo looking west down proposed heavy haul road location. Note existing PSEG security training facilities in the background.



Photo 19 – Heavy Haul Road: Photo looking east down proposed heavy haul road location. Note existing PSEG security training facilities (left).



Photo 20 – Heavy Haul Road: Photo looking west down proposed heavy haul road location. Note existing dirt access road to PSEG's CDF.

Parcel C1 Photos

(Photo Numbers 21 – 30)



Photo 21 – Parcel C1: Photo taken in the southeast corner of Parcel C1 looking northwest into Parcel C1.



Photo 22 – Parcel C1: Photo taken in the southeast corner of Parcel C1 looking north into Parcel C1.



Photo 23 – Parcel C1: Photo taken in the southwest corner of Parcel C1 looking north into Parcel C1.



Photo 24 – Parcel C1: Photo taken in the southwest corner of Parcel C1 looking east into the southern end of Parcel C1.



Photo 25 – Parcel C1: Photo taken in the approximate center of Parcel C1, looking south.



Photo 26 – Parcel C1: Photo taken in the approximate center of Parcel C1, looking north.



Photo 27 – Parcel C1: Photo taken in the northwest corner of Parcel C1 looking southeast into Parcel C1.



Photo 28 – Parcel C1: Photo taken in the northwest corner of Parcel C1 looking south into Parcel C1.



Photo 29 – Parcel C1: Photo taken in the northeast corner of Parcel C1 looking south into Parcel C1.



Photo 30 – Parcel C1: Photo taken in the northeast corner of Parcel C1 looking west at the northern portion of Parcel C1.

ATTACHMENT G

PROOF OF PUBLIC NOTICE

LOWER
ALLOWAYS CREEK
TOWNSHIP

MUNICIPAL BUILDING
HANCOCK'S BRIDGE, NJ 08038
PHONE (856) 935-1549

November 3, 2022

Mr. Kevin M. Dare
Environmental, Planning & Engineering Consultants
307 Fellowship Rd., Suite 214
Mt. Laurel, NJ 08054

RE: Property Owner List
Block 26, Lots 4, 4.01, 4.02, 5, 5.01, 5.02 & 5.03

Dear Mr. Dare:

Per your request, please find enclosed property owner list within 200' of Block 26, Lots 4, 4.01, 4.02, 5, 5.01, 5.02 & 5.03 in the Township of Lower Alloways Creek. Should you have any questions please feel free to contact me at: LJPERELLA@YAHOO.COM

Very truly yours,

Lisa J. Perella, CTA
Assessor

O W N E R & A D D R E S S R E P O R T

LOWER ALLOWAYS CREEK

BLOCK	LOT	QUAL	CLA	PROPERTY OWNER	PROPERTY LOCATION	Add'l Lots
26	1 & 2		15C	UNITED STATES OF AMERICA 302 GENERAL LEE AVE BROOKLYN, NY 11252	ALLOWAYS CREEK NECK RD	
26	3		15C	UNITED STATES OF AMERICA DEPT OF AG 1400 INDEPENDENCE AVE SW WASHINGTON DC 20405	ALLOWAYS CREEK NECK RD	
26	3.01		15C	NJ DEPT ENVIRONMENTAL PROTECTION CN 229 JOHN FITCH PLAZA TRENTON NJ 08625	ALLOWAYS CREEK	
26	3.02		15C	NJ DEPT ENVIRONMENTAL PROTECTION CN 229 JOHN FITCH PLAZA TRENTON NJ 08625	HOPE CREEK	

The following must also be notified:

Salem County Planning Board
110 Fifth St., Suite 500
Salem, NJ 08079

Atlantic City Electric Company
Real Estate Department
5100 Harding Highway
Mays Landing, NJ 08330

Only notify NJDOT if subject property is located on State Highway:

New Jersey Department of Transportation
1035 Parkway Avenue
Trenton, NJ 08625

Note: The Subject properties are not farmland assessed