Stormwater Management Measures
Maintenance Plan & Field Manuals

7th Avenue and Douglas Street

Block 143 Lot 1
Elk Township, Gloucester County, New Jersey

Prepared by

TRISTATE ENGINEERING & SURVEYING

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Party Responsible for Maintenance:

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This plan is recorded in

Deed Book # _____ Page # ____ with _____ County Clerk on Date _____

Last Revised on __MM__/__DD__/__YYYY__

NOTE

This Maintenance Plan is intended to be editable and adjustable in accordance with the design of stormwater management measures, the site conditions, and the special needs of responsible party.

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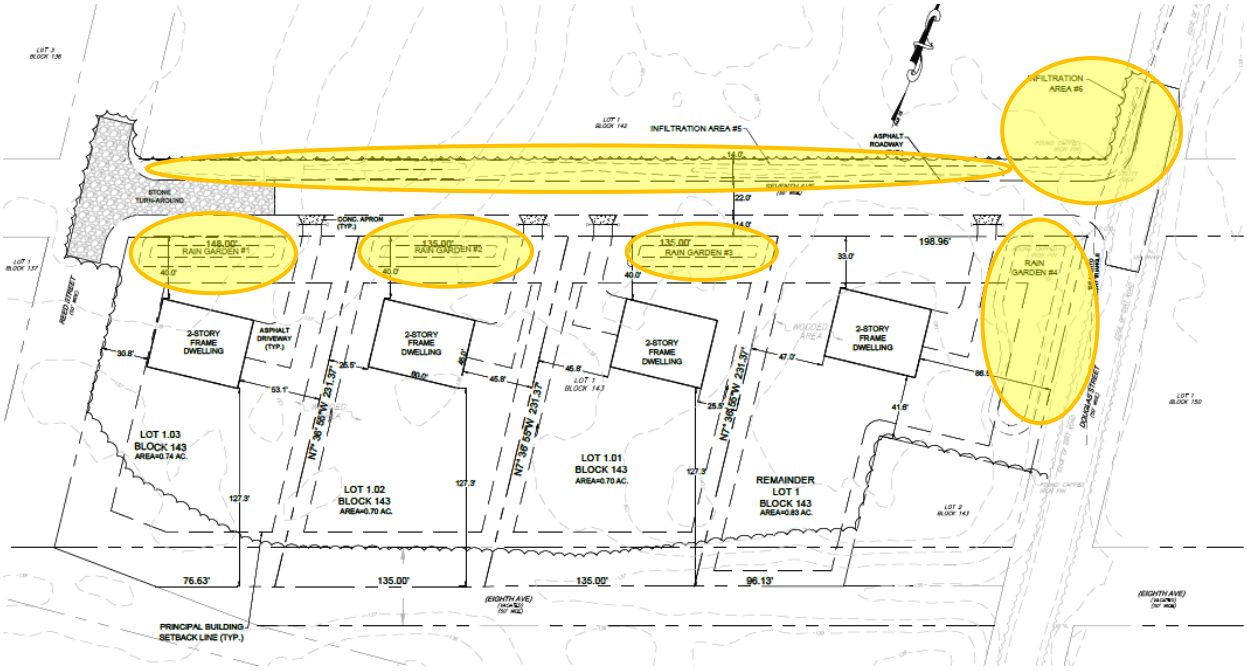
Part I- Maintenance Plan

List of Stormwater Management Measures

The stormwater management measures incorporated into this development are listed below. The corresponding Field Manuals for the stormwater management measures are located in Part II of the Maintenance Plan.

Type of Stormwater Management Measure	BMP No.	Location Description	State Plane Coordinates / Lat., Long.
Rain Garden	Bioretention System #1	Northerly side of Block 143 Lot 1.03; along Seventh Avenue frontage	39°40'30.6"N -75°06'55.5"W
Rain Garden	Bioretention System #2	Northerly side of Block 143 Lot 1.02; along Seventh Avenue frontage	39°40'31.1"N -75°06'53.9"W
Rain Garden	Bioretention System #3	Northeasterly corner of Block 143 Lot 1.01; along Seventh Avenue frontage	39°40'31.7"N -75°06'31.8"W
Rain Garden	Bioretention System #4	Northeasterly corner of Block 143 Lot 1; along Seventh Avenue frontage	39°40'32.3"N -75°06'49.4"W
Infiltration Area	Small-Scale Infiltration Basin #5	Northerly side of Seventh Avenue, along frontage of Block 142 Lot 1	39°40'32.3"N -75°06'51.8"W
Infiltration Area	Small-Scale Infiltration Basin #6	Northwesterly corner of Seventh Avenue and Douglas Street intersection	39°40'33.3"N -75°06'49.1"W

Location Map



No.	Type of Stormwater Management Measure
Bioretention System #1	Rain Garden #1
Bioretention System #2	Rain Garden #2
Bioretention System #3	Rain Garden #3
Bioretention System #4	Rain Garden #4
Small-Scale Infiltration Basin #5	Infiltration Area #5
Small-Scale Infiltration Basin #6	Infiltration Area #6

Description of Stormwater Management Measures

Bioretention System #1 (Rain Garden #1)
Design storm: 100-year storm

- Design Purposes:
  - Water quality, water quantity, and groundwater recharge
  - 2-year storm (3.29 inches);
  - 10-year storm (5.05 inches);
  - 100-year storm (8.55 inches)
- Dimensions: 92 ft (Length) x 20 ft (Width) x 2 ft (Depth)

Bioretention System #2 (Rain Garden #2)
Design storm: 100-year storm

- Design Purposes:
  - Water quality, water quantity, and groundwater recharge
  - 2-year storm (3.29 inches);
  - 10-year storm (5.05 inches);
  - 100-year storm (8.55 inches)
- Dimensions: 87 ft (Length) x 20 ft (Width) x 2 ft (Depth)

Bioretention System #3 (Rain Garden #3)
Design storm: 100-year storm

- Design Purposes:
  - Water quality, water quantity, and groundwater recharge
  - 2-year storm (3.29 inches);
  - 10-year storm (5.05 inches);
  - 100-year storm (8.55 inches)
- Dimensions: 88 ft (Length) x 20 ft (Width) x 2 ft (Depth)

Bioretention System #4 (Rain Garden #4)
Design storm: 100-year storm

- Design Purposes:
  - Water quality, water quantity, and groundwater recharge
  - 2-year storm (3.29 inches);
  - 10-year storm (5.05 inches);
  - 100-year storm (8.55 inches)
- Dimensions: 130 ft (Length) x 43 ft (Width) x 2 ft (Depth)

Small-Scale Infiltration Basin #5 (Infiltration Area #5)
Design storm: 100-year storm

- Design Purposes:
  - Water quality, water quantity, and groundwater recharge
  - 2-year storm (3.29 inches);
  - 10-year storm (5.05 inches);

    - 100-year storm (8.55 inches)
- Dimensions: 555 ft (Length) x 12 ft (Width) x 2 ft (Depth)

Small-Scale Infiltration Basin #6 (Infiltration Area #6)

Design storm: 100-year storm

- Design Purposes:
    - Water quality, water quantity, and groundwater recharge
    - 2-year storm (3.29 inches);
    - 10-year storm (5.05 inches);
    - 100-year storm (8.55 inches)
- Dimensions: 115 ft (Length) x 12 ft (Width) x 1 ft (Depth)

Preventative and Corrective Maintenance Action Plan

As per N.J.A.C. 7:8-5.8(b) & (e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including, but not limited to, repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per NJDEP BMP Manual Ch. 8 Feb. 2004), maintenance plans should include specific preventative and corrective maintenance tasks such as removal of sediment, trash, and debris; mowing, pruning, and restoration of vegetation; restoration of eroded areas; elimination of mosquito breeding habitats; control of aquatic vegetation; and repair or replacement of damaged or deteriorated components.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include recommended corrective responses to various emergency conditions that may be encountered at the stormwater management measure. It should be noted that if the stormwater management measure includes a Class I or II dam as defined in the NJDEP Dam Safety Standards at N.J.A.C. 7:20, an emergency action plan for the dam is also required. See N.J.A.C. 7:20-1.7(f) for more information.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), the maintenance plan should address the maintenance of access points to the stormwater management measures in accordance with the following:

- all components of the stormwater management measures must be readily accessible for inspection and maintenance;
- trees, shrubs, and underbrush must be pruned or trimmed as necessary to maintain access to the stormwater management measure via roadways, paths, and ramps, including paths through perimeter vegetation to permanent pools, aquatic benches, and safety ledges to allow for the inspection and control of mosquito breeding; and
- the exact limits of inspection and maintenance easements and rights-of-way should be specified on stormwater management measure plans and included in the maintenance plan.

Preventative Maintenance Actions

Frequency	Preventative Maintenance Actions	Stormwater Measures/ No.
Monthly	Vegetation mowing and removal in growing season, Trash removal	Bioretention Systems #1-4, Small-Scale Infiltration Basins #5-6, Access
Quarterly	Quarterly inspection, Sediment Removal	Bioretention Systems #1-4, Small-Scale Infiltration Basins #5-6
Annual	Bioretention System Structural Inspection	Bioretention Systems #1-4, Small-Scale Infiltration Basins #5-6
Unscheduled	Quick inspection after every 1" rain	Bioretention Systems #1-4, Small-Scale Infiltration Basins #5-6

Corrective Maintenance Actions

Depending on many factors, such as the performance of preventative maintenance actions, weather, or unexpected incidents, corrective maintenance requirements may not be precisely anticipated; however, a list of potential corrective maintenance actions may assist the responsible party in planning and estimating costs in advance.

Potential Corrective Maintenance Actions	Stormwater Management Measures/No.
Revegetation of eroded side slope and basin bottom	Bioretention Systems #1-4, Small-Scale Infiltration Basins #5-6
Filling eroded areas or gullies and seeding to stabilize the area. Stabilize minor erosion by top soiling, seeding and erosion control matting to facilitate grass growth. More severe stabilization may require filter fabric and riprap stone slope protection	Bioretention Systems #1-4, Small-Scale Infiltration Basins #5-6
Clearing of trees, shrubs and underbrush in the basin embankment, berm, near the overflow structure and wingwalls and in the immediate vicinity of the exit channel	Bioretention Systems #1-4, Small-Scale Infiltration Basins #5-6
Removal of burrowing animals and filling the holes.	Bioretention Systems #1-4, Small-Scale Infiltration Basins #5-6

Inspection and Logs of All Preventative and Corrective Maintenance

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

As per NJDEP BMP Manual Ch. 8 (Feb, 2004), a maintenance plan shall include a schedule of regular inspections and tasks, and detailed logs of all preventative and corrective maintenance performed on the stormwater management measure, including all maintenance-related work orders. The person with maintenance responsibility must retain and, upon request, make available the maintenance plan and associated logs and other records for review by a public entity with administrative, health, environmental, or safety authority over the site.

Inspection Checklists in the Field Manual for the stormwater management measures on this site include:

- Field Manual for Bioretention Systems
- Field Manual for Small-Scale Infiltration Basins

The logs of all inspections, and both preventative and corrective maintenance performed should be attached in the "**Maintenance Logs and Inspection Records**" section. See Part II of the Maintenance Plan

Maintenance Personnel, Equipment, Tools, and Supplies

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include equipment, tools, and supplies necessary to perform the various preventative and corrective maintenance tasks specified in the plan. Sources of specialized, proprietary, and nonstandard equipment, tools, and supplies should also be provided.

This section applies to both maintenance tasks that are performed by in-house personnel or are outsourced. The design engineer has to list the required amount of maintenance personnel, equipment, tools, and supplies necessary to perform the various preventative and corrective maintenance tasks specified in the plan. In addition, the sources of specialized, proprietary, and nonstandard equipment, tools and supplies for specific measures, such as manufactured treatment devices should also be listed.

Maintenance Personnel/Equipment/Tools/Supplies

The following is a list of required inspection equipment for performing M&R procedures and Inspections.

1. A clip board, a pencil and inspection checklist – the inspection checklist is included in the following section.
2. A standard 6-foot collapsible ruler.
3. A camera – photographs or observed portions of the basin will provide a measure of performance when comparing past and present maintenance practice.
4. A probe – any stiff light stick or rod with a blunt tip of sufficient strength to penetrate soil. The probe can provide information on conditions below the surface of the basin such as the depth and softness of a saturated area.
5. A weed whacker – can be used to clear non-visible areas and to perform routine maintenance on the embankments.
6. A flashlight – a flashlight can be used to observe areas where there is a low level of light.
7. A hammer - for sounding concrete to detect deteriorated areas.
8. Pump for draining ponds or dry basins that are not drained, according to soil conservation regulations.

Maintenance at the basin may require heavy equipment including the following:

1. Chain saw.
2. Stump grinder.
3. Wheelbarrow.
4. Backhoe
5. Dump truck.

Sources of the following materials should be identified for immediate use if warranted by the inspection.

1. Native, silty sand for filling erosion rills and gullies.
2. Topsoil mixture, fertilizer and seed.
3. Large stone rip rap for emergency repairs caused by erosion.
4. Synthetic geofabric netting and stakes to prevent seed and topsoil from blowing away.
5. Specialized, proprietary or nonstandard equipment, tools and supplies, if applicable

Disposal Plan

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), the maintenance plan should include approved disposal and recycling sites and procedures for sediment, trash, debris and other material removed from stormwater management measures during maintenance operations.

Disposal/Recycling Procedures

- Dewatering shall be conducted in accordance with the Standards for Soil Erosion & Sediment Control in New Jersey
- Disposal of debris, trash, sediment and other waste material shall be done at suitable disposal/recycling sites and in compliance with all applicable local, state, and federal waste regulations.
- Any new correspondence or contract data must be copied and included in the Documents section of the Maintenance Plan if available.

Cost Estimate

As per N.J.A.C.7:8-5.8(b), cost estimates of maintenance tasks, including, but not limited to, sediment, trash and debris removal must be included in the maintenance plan. Below is an illustration of a cost breakdown and estimation for maintenance of stormwater management measures. The design engineer should estimate the cost based on the expected maintenance required for each stormwater management measure. The actual costs may vary with factors such as local requirements, equipment, personnel, weather, and maintenance methods.

The requirement to obtain State permits depends on specific circumstances, such as, but not limited to, the specific design of the stormwater management measures, the maintenance actions, the access and disturbance, the disposal methods, the location of disposal, the method to empty a basin, the method to dredge the basin, the pollutants in the basin, the damages to the basin, and the method to repair the basin.

Check Maintenance Guidance in NJDEP Stormwater Management Website for details and links to the relevant permits and program areas (http://www.njstormwater.org).

COST ESTIMATES

Basin Maintenance Tasks	Frequency	Manpower	Hourly Rate *(K)	Amount
Grass Cutting & Grass Clipping Disposal - *(A), *(B)	2 per month	2 hours	$25	$800
Weed Control - Pesticides - *(C), *(A)	1 per month	3 hours	$25	$600
Sediment Removal - *(D), *(G), *(A)	1 per year	8 hours	$25	$200
Erosion Repair - *(E), *(B)	1 per year	12 hours	$25	$300
Trash and Debris Removal *(F), *(G), *(A)	1 per 3 months	3 hours	$25	$300
Inspection - All Structural Components *(I)	1 per 6 months	2 hours	$25	$100
			Total Yearly Engineer's Estimate of Probable Maintenance Cost	**$2,300 All BMPs**

Notes:

A) Disposal of debris, trash, sediment and other waste materials should be done at suitable disposal/recycling sites and in compliance with all local, state, & federal waste regulations.
B) Ground Cover consists of fertilizer, lime application, and mulching and shall be placed to assure vegetation health and re-establish stability after filling and compaction.
C) Weeds shall be removed from headwalls, outlet structures, low flow channels and rip-rapped areas.
D) Sediment shall be removed from piping, outlet structures, low flow channels, and rip-rapped areas.
E) Erosion Repair consists of any eroded areas especially low and depressed areas to prevent mosquito breeding habitats.
F) Trash and Debris shall be removed quarterly as well as following any rain events exceeding 1-inch of rainfall.
G) All Structural Components must be inspected for cracking, subsidence, spalling, erosion, and deterioration.
H) Vacuum Truck & 2-man crew to remove sediment once per year, clean and replace/repair filter cartridges typically 4-hour minimum.
I) The hourly rate for manpower is $25 per hour. This price includes all necessary tools and overhead costs.

Safety Measures and Procedures

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include procedures and equipment required to protect the safety of inspection and maintenance personnel.

Safety Regulations and Requirements

The owner or the owner's designated personnel or contractor shall be responsible to identify all applicable safety regulations and requirements associated with required preventative and corrective maintenance activities and inspections.

Safety Procedures

The owner or the owner's designated personnel or contractor shall be responsible to identify all applicable local, state, and federal laws and regulations, and the safety instructions procided by the equipment or device manufacturers associate with required preventative and corrective maintenance activities.

Emergency Procedures

Concact 911 for any immediate medical emergencies

Training Plan and Records

As per NJDEP BMP Manual Ch. 8 (February 2004), maintenance training begins with a basic description of the purpose and function of the overall stormwater management measure and its major components. Such understanding will enable maintenance personnel to provide more effective component maintenance and more readily detect maintenance-related problems. Depending on the size, character, location, and components of each stormwater management measure, maintenance personnel may also require training in specialized inspection and maintenance tasks and/or the operation and care of specialized maintenance equipment. Training should also be provided in the need for and use of all required safety equipment and procedures.

I. Training Plan

- **Stormwater Management Basic Training**
    - Purposes and Functions of BMPs
        - NJDEP Stormwater BMP Manual, Chapter Nine: Structural Stormwater Management Measures
            - Chapter 9.8 Small-Scale Infiltration Basins
            - More training information is available at NJ Stormwater.org (http://www.nj.gov/dep/stormwater/training.htm)
    - Vegetation Care
        - NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping *(provides information on vegetation and landscaping for stormwater management measures)*
        - https://www.njstormwater.org/bmp_manual/NJ_SWBMP_7.pdf
    - Field Manual Usage Training
        - See Field Manuals attached to this Maintenance Plan
    - Equipment and Tools Operation Training
        - Owner should attach any Equipment or tool manufacturer's Operation & Maintenance Manual which is used in preventative or corrective maintenance
    - The owner or the owner's designated personnel or contractor shall be responsible to identify all applicable local, state, and federal laws and regulations, and the safety instructions provided by the equipment or device manufacturers associated with required preventative and corrective maintenance activities including but not limited to:
        - OSHA Training
        - Equipment or tool manufacturer's Operation & Maintenance Manual

II. Training Records

Training attendance sheets should be attached by the responsible party after each training.

Annual Evaluation of the Effectiveness of the Plan

As per N.J.A.C. 7:8-5.8(g), the person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

The responsible party should evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The items to evaluate may include, but not limited to,

- Whether the inspections have been performed as scheduled;
- Whether the preventive maintenance has been performed as scheduled;
- Whether the frequency of preventative maintenance needs to increase or decrease;
- Whether the planned resources were enough to perform the maintenance;
- Whether the repairs were completed on time;
- Whether the actual cost was consistent with the estimated cost;
- Whether the inspection, maintenance, and repair records have been kept.

If actual performance of those items has been deviated from the maintenance plan, the responsible party should find the causes and implement solutions in a revised maintenance plan.

Annual Evaluation Records

Evaluator(s)	Date of Evaluation	Decision
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)

Documents

Transfer Agreement

As per N.J.A.C. 7:8-5.8(b), if the maintenance plan identifies a person other than the developer as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.

Deed

As per N.J.A.C. 7:8-5.8(d), if the person responsible for maintenance is not a public agency, the maintenance plan and any future revisions shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.

As-Built Drawings with Drainage Plans

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), as-built construction plans of the stormwater management measure and copies of pertinent construction documents, such as laboratory test results, permits, and completion certificates should be included in this Maintenance Plan.

Landscaping Plan for the Stormwater Management Measures

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if there is a Landscaping Plan for the stormwater management measures, it should be included in this Maintenance Plan.

Permeability Test/Infiltration Test Report

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if a permeability test or infiltration test is required and available, the reports for pre-construction and post-construction testing should be included in this Maintenance Plan.

Soil Boring Logs

As per NJDEP BMP Manual Ch.8 (Feb., 2004), if any soil borings were taken prior to construction, a copy of the soil boring logs should be included in this Maintenance Plan.

Local, State, Federal Permits

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), local, state, or federal permits related to the stormwater management measures for this development should be included in this Maintenance Plan. See Cost Estimate Section of This Maintenance Plan for more information.
The requirement to obtain State permits depends on specific circumstances, such as, but not limited to, the specific design of the stormwater management measures, the maintenance actions, the access and disturbance, the disposal methods, the location of disposal, the method to empty a basin, the method to dredge the basin, the pollutants in the basin, the damages to the basin, and the method to repair the basin.

Check Maintenance Guidance in NJDEP Stormwater Management Website for details and links to the relevant permits and program areas (http://www.njstormwater.org).

Safety Regulations and Requirements

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), all local ordinances and state and federal regulations regarding occupational safety should be included in this Maintenance Plan.

Devices/Tools/Equipment Operation and Maintenance Manual and Warranties

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), maintenance, repair, and replacement instructions for specialized, proprietary, and nonstandard equipment, tools, supplies, manufacturers' product instructions, and user manuals should be included in this Maintenance Plan.

Part II- Field Manuals

Attachment of Field Manuals
for Stormwater Management Measures on this Site

As per N.J.A.C. 7:8-5.8(b)&(e), preventative and corrective maintenance shall be performed to maintain the function of stormwater management measures, including repair or replacement of the structure; removal of sediment, debris or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; repair or replacement of non-vegetated linings, and removal of rodent/wildlife and repair/restoration to damaged affected areas caused by them.

Each Field Manual attached to this Maintenance Plan is a separate document pertaining to one specific stormwater management measure, and should be used by inspections and maintenance crews in order to carry out the maintenance work required by N.J.A.C. 7:8-5.8(e).

Field Manual for Rain Gardens (Bioretention Systems #1- #4)
Field Manual for Infiltration Areas (Small-Scale Infiltration Basins #5-#6)

Maintenance Logs and Inspection Records

As per N.J.A.C. 7:8-5.8(e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure(s), including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

The responsible party shall maintain a record of all maintenance actions performed, including:

- Inspection checklists from each performed inspection
- Preventative maintenance logs
- Corrective maintenance logs, including work orders
- Other maintenance records

Bioretention System Overview

Functionality
Bioretention systems are used to remove a wide range of pollutants, such as suspended solids, nutrients, metals, hydrocarbons, and bacteria from stormwater runoff. They can also be used to reduce peak runoff rates and increase stormwater infiltration when designed as a multi-stage, multi-function facility.

A bioretention system can be configured as either a bioretention basin or a longer, narrower bioretention swale. In general, a bioretention basin has a flat bottom while a bioretention swale may have sloping bottom. Runoff storage depths above the soil bed surface are typically shallow. The TSS removal rate for bioretention systems is 80 or 90 percent, depending upon the thickness of the soil planting bed and the type of vegetation grown in the bed.

Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.

Type of BMP – Dry Basin / Infiltration
A bioretention system is a type of **dry** basin. Dry basins must fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of basin failure. It may also contribute to mosquito breeding and other health and safety issues. The design drain time shall be closely monitored to ensure that potential failure is recognized early.

A bioretention system with infiltration can also be designed for extended detention, in which case it will attenuate peak flows from storms larger than the Water Quality Design Storm.

Basic Design Information

Hydrology Design Targets

1. The bioretention system is designed as an online system.
2. The design drain time for each bioretention system is the following:
   - Rain Garden #1: 19.00 hours
   - Rain Garden #2: 32.70 hours
   - Rain Garden #3: 15.42 hours
   - Rain Garden #4: 4.14 hours

3. The elevation of the seasonal high water table ranges from elevation 130.16 to 131.42 according to on soil testing dated 10/13/2023. Therefore, the seasonal high water table is at least 2' below the elevation of the bottom of all bioretention systems.
4. This system is designed with a subsoil permeability rate of 4.224 inches/hour.

Hydraulic Design Targets

Design parameters for 100-year storm

	Rain Garden #1	**Rain Garden #2**	**Rain Garden #3**	**Rain Garden #4**
Rainfall Depth (inches)	8.55" In 24 hours	8.55" In 24 hours	8.55" In 24 hours	8.55" In 24 hours
Runoff Volume (acre feet)	0.205	0.305	0.166	0.141
Peak Flow Rate (cfs)	2.72	4.04	2.07	1.84
Water Surface Elevation (feet)	137.34	138.45	137.23	135.57

Basin Configuration Targets

1. Outlet Information:
   - Rain Garden #1

Outlet Type	**Dimensions**	**Invert Elevation**
Infiltration	Basin Bottom Surface Area	134.50

   - Rain Garden #2

Outlet Type	**Dimensions**	**Invert Elevation**
Infiltration	Basin Bottom Surface Area	135.00

   - Rain Garden #3

Outlet Type	**Dimensions**	**Invert Elevation**
Infiltration	Basin Bottom Surface Area	135.00

- Rain Garden #4

Outlet Type	Dimensions	Invert Elevation
Infiltration	Basin Bottom Surface Area	135.00
Emergency Overflow Spillway	3’ Wide	136.90

2. The vegetation type to be used in this bioretention system is (site-tolerant grasses, terrestrial forested community). A Landscaping Plan is included in the Reference Documents section of this field manual.

Critical Maintenance Features

1. No heavy equipment on the basin surface.
2. Remove vegetation strictly in accordance with the landscaping plan.
3. Grass clippings shall be collected from the basin and properly disposed.
4. keep the appearance of the basin aesthetic

Reference Documents (Located at end of this section)

Documents to be placed in this field manual should include the following:

- As-built Drawings with Drainage Plans
- Soil Boring Logs
- Permeability Test (Pre-construction)
- Permeability Test (Post-construction)
- Landscaping Plan

Small-Scale Infiltration Basin Overview

Functionality
Small-scale infiltration basins are stormwater management systems constructed with highly permeable components designed to both maximize the removal of pollutants from stormwater and to promote groundwater recharge. Pollutants are treated through settling, filtration of the runoff through and biological and chemical activity within, the components. The total suspended solids (TSS) removal rate is 80%.Small-scale infiltration basins are constructed in areas of highly permeable soil that provide temporary storage of stormwater runoff and can help to reduce increases in both the peak rate and total volume of runoff caused by land development. Pollutants in runoff are treated through the processes of filtration through and biological and chemical activity within the soil.

Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.

Type of BMP – Dry Stormwater Management Measure / Infiltration Only
A small-scale infiltration basin is a type of **dry** stormwater management measure. Dry stormwater management measures must fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of failure. It may also contribute to mosquito breeding and other health and safety issues. The design drain time shall be closely monitored to ensure that potential failure is recognized early.

Basic Design Information

Hydrology Design Targets

5. The bioretention system is designed as an online system.
6. The design drain time for each bioretention system is the following:
    - Infiltration Area #5: 14.86 hours
    - Infiltration Area #6: 19.07 hours

    The elevation of the seasonal high water table ranges from elevation 130.16 to 131.42 according to on soil testing dated 10/13/2023. Therefore, the seasonal high water table is at least 2' below the elevation of the bottom of all small-scale infiltration basin systems.
7. This system is designed with a subsoil permeability rate of 4.224 inches/hour.

Hydraulic Design Targets

Design parameters for 100-year storm

	Infiltration Area #5	**Infiltration Area #6**
Rainfall Depth (inches)	8.55" In 24 hours	8.55" In 24 hours
Runoff Volume (acre feet)	0.153	0.032
Peak Flow Rate (cfs)	2.03	0.42
Water Surface Elevation (feet)	137.58	135.75

Basin Configuration Targets

1. Outlet Information:
    - Infiltration Area #5

Outlet Type	**Dimensions**	**Invert Elevation**
Infiltration	Basin Bottom Surface Area	136.00
Emergency Overflow Spillway	20' Wide	137.80

    - Infiltration Area #6

Outlet Type	**Dimensions**	**Invert Elevation**
Infiltration	Basin Bottom Surface Area	135.00

2. The vegetation type to be used in this bioretention system is (site-tolerant grasses, terrestrial forested community). A Landscaping Plan is included in the Reference Documents section of this field manual.

Critical Maintenance Features

1. No heavy equipment on the basin surface.
2. Remove vegetation strictly in accordance with the landscaping plan.
3. Grass clippings shall be collected from the basin and properly disposed.
4. keep the appearance of the basin aesthetic

Reference Documents

Documents to be placed in this field manual should include the following:

- As-built Drawings (or specifications if a manufactured dry well is used) with Drainage Plans
- Operation and Maintenance Manual
- Permeability Test (Pre-construction)
- Permeability Test (Post-construction)
- Fabric Specifications and Maintenance Information

Visual Aid for Dry Type Stormwater Basin Inspection

(Note: Basins shown here include various types of dry basins, not limited to the category of basin in this field manual.)

Issue:	**The inlet is not properly drained, assuming it has not rained within 72 hours.**
Corrective Action:	**Clear and remove sediment. Check whether the water table is at or above the bottom of the forebay. Also check the permeability of the underlying soil, if necessary.**
Preventative Action:	**Routine inspections and removal of sediment from the forebay.**

Issue:	**The vegetation loss and the blackish soil may indicate frequent inundation.**
Corrective Action:	**Check the permeability rate of the soil and the water table elevation. Replace the soil if necessary.**
Preventative Action:	**Routine inspection and tilling/aeration, if necessary.**

Issue:	**The channel has excessive accumulation of sediment and debris. The outflow orifice is clogged by a trash bag and debris. Note that there is no trash rack installed.**
Corrective Action:	**Check the permeability rate of the soil and the water table elevation. Replace the soil if necessary.**
Preventative Action:	**Routine inspection and cleaning.**

Inspection Checklist / Maintenance Actions
Bioretention System / Small-Scale Infiltration System

Checklist (circle one)**:** Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. _____ Inspection Date: _____

Date of most recent rain event: _____

Rain Condition (circle one):
Drizzle / Shower / Downpour / Other _____

Ground Condition (circle one):
Dry / Moist / Ponding / Submerged / Snow accumulation

The inspection items and preventative/corrective maintenance actions listed below represent general requirements. The responsible party shall adjust the items and actions to better meet the conditions of the site, the specific design targets, and the requirements of regulatory authorities.

	For Inspector			For Maintenance Crew
B Basin Bed	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours.	Y__ N__	Recheck to determine if there is standing water after 72 hours If standing water is present longer than 5 days, report to mosquito commission. Remove any sediment buildup Check the soil permeability Till the soil bed with rotary tiller or disc harrow Replace the planting soil, if necessary Work Order # _____
	2	Excessive sediment, silt, or trash accumulation on basin bed	Y__ N__	Clean pretreatment system Remove silt, sediment, and trash
	3	Erosion or channelization is present	Y__ N__	Check whether the flow bypass or diversion device is clogged Re-grade the infiltration bed Work Order # _____
	4	Animal burrows/rodents are present	Y__ N__	Pest control Work Order # _____
Note:				

	For Inspector			For Maintenance Crew
B Basin Bed	5	Uneven bed	Y__ N__	Use light equipment to resurface the bed Work Order # _____
	6	Evidence of sinkholes or subsidence	Y__ N__	Monitor for sinkhole development
C Vegetation	1	Large spot(s) showing bare soil	Y__ N__	Vegetative cover must be maintained at 85%. Revegetate the entire basin if 50% or more vegetation has been lost. Check Landscaping plan for guidance (if available) Work Order # _____
	2	Invasive plants are present	Y__ N__	Remove the invasive plants and restore the vegetation in accordance with the landscaping plan Work Order # _____
	3	The vegetation in the basin has been mowed or removed	Y__ N__	Revegetate the system in accordance with the vegetation plan Work Order # _____ Note: The vegetation in a bioretention system should **not** be mowed or removed
Note:				

	For Inspector			For Maintenance Crew
D Bioretention System Embankment and Side Slopes	1	Signs of erosion, soil slide or bulges, seeps and wet spots, loss of vegetation, or erosion on the basin slope	Y__ N__	Check for excessive overland runoff flow through the embankment. Check for any sink hole development Direct the overland runoff to the forebay or pretreatment area Restabilize the bank Work Order # _____
	2	Overgrown perimeter vegetation	Y__ N__	Mow the vegetation on the perimeter of the embankment Work Order # _____ Note: Mowing of vegetation should only take place in the area **outside** the basin. Dense vegetation must be maintained in the basin.
Note:				

	For Inspector			For Maintenance Crew
F Emergency Spillway	1	Trees or excessive vegetation present	Y__ N__	Remove trees and roots, and restore berms if necessary Work Order #_____
	2	Damaged structure	Y__ N__	Repair Work Order #_____
G Miscellaneous	1	Fence: broken or eroded parts	Y__ N__	Repair or replace Work Order #_____
	2	Gate: missing gate or lock	Y__ N__	Repair or replace Work Order #_____
	3	Sign/plate: tiled, missing, or faded	Y__ N__	Repair or replace Work Order #_____
	4	Excessive or overgrown vegetation blocking access to the basin	Y__ N__	Clear, trim, or prune the vegetation to allow access for inspection and maintenance Work Order #_____
Note:				

Follow Up Items (Component No. / Inspection Item No.):

_____

Associated Work Orders: # _____, # _____, # _____, # _____, # _____

_____	_____	_____
Inspector Name	**Signature**	**Date**

Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.

File this checklist in the Maintenance Log after performing maintenance.

Preventative Maintenance Record

Corresponding Checklist No. _____
Component No._____, Inspection Item No._____

Work Logs

Activities	Components	Date Completed
Sediment/debris removal **Sediment removal should be taken place when the basin is thoroughly dry.**	A1/A2/A3 – Pretreatment	
	B – Basin Bed	
	D – Bioretention System Embankment and Side Slopes	
	E – Outlet	
Vegetation removal	A1/A2/A3 – Pretreatment	
	B – Basin Bed	
	D – Basin Embankment and Side Slopes	
	E – Outlet	
	F – Emergency Spillway	
(List additional tasks, if applicable)		

Vegetation is removed by _____ (type of equipment) with minimum disruption to the remaining vegetation.

All use of fertilizers, pesticides, mechanical treatments, and other means to ensure optimum vegetation health must not compromise the intended purpose of the stormwater management measure. The fertilizer applied is _____ (type), and _____ (quantity per usage) is applied _____ (frequency of use).

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member:_____/_____ Date: _____
(name/ signature)

Supervisor:_____/_____ Date: _____
(name/ signature)

File this Preventative Maintenance Record in the Maintenance Log after performing maintenance.

Corrective Maintenance Record

1. **Work Order # _____ Date Issued _____**

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist _____, Component No. _____ , Inspection Item No._____.**

4. **Required Actions**

Actions	Planned Date	Date Completed
Restabilize side slope (indicate location)		
Remove Sediment		
Revegetate		
Additional Items:		

5. **Responsible person(s):**
   _____

6. **Special requirements**
   - Time of the season or weather condition :_____
   - Tools/equipment:_____
   - Subcontractor (name or specific type):_____

Approved by _____/_____ Date _____
(name/signature)

Verification of completion by _____/_____ Date _____
(name/signature)

File this Corrective Maintenance Record in the Maintenance Log after performing maintenance.

GLOUCESTER COUNTY DEPARTMENT OF HEALTH
APPLICATION FOR PERMIT TO CONSTRUCT/ALTER/REPAIR AN INDIVIDUAL SUBSURFACE SEWAGE DISPOSAL SYSTEM
APPLICATION SHALL BE SUBMITTED ELECTRONICALLY TO CME FOR REVIEW BY DESIGN ENGINEER
SepticReviews@cmeusa1.com and jalexander@cmeusa1.com
PAYMENT SHALL BE SUBMTTED TO GCHD (CHECK OR MONEY ORDER ONLY)
ONSITE INSPECTIONS MUST BE SCHEDULED VIA EMAIL: GCHD@CMEUSA1.COM
MUNICIPALITY _____Elk Twp_____

Form 2b - Soil Log and Interpretation: Lot ____1____ Block ___143____

1. Log Number___TP1_____ Method (Check One): ____xx____ Profile Pit _____ Boring

Existing Grade Elevation: _____
2. Soil Log
Depth — Munsel Color Name and Symbol; Estimated Textural Class; (inches) Estimated Volume % Coarse Fragment, If Present;
Structure:
Top-Bottom — Moist or Dry Consistence; Mottling--Abundance, Size and Contrast, If Present

0" – 12" 10YR 4/3 Sandy loam, Sub-angular blocky, Friable

12" – 31" 7.5YR 6/4 fine Loamy sand, Sub-angular blocky, Friable

31" – 44" 7.5YR 6/6 Sandy clay loam, Sub-angular blocky, slightly Firm

44" – 81" 7.5YR 6/6 Sandy clay loam, Angular blocky, Firm (HR) with 35% gravel

81" – 95" 7.5YR 5/4 Sandy clay loam, Angular blocky, Firm (HR) with Common, Medium, Distinct 5YR 5/6 mottles @ 86"

95" – 107" 7.5YR 5/4 Sandy clay loam, Angular blocky, slightly Firm, with 10% gravel

107" – 121" 7.5YR 5/4 Sandy loam, Sub-angular blocky, Friable, with 15% gravel

121" – 150" 7.5YR 7/2 fine Loamy sand, Single grain, Loose

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3. Ground Water Observations:
Seepage-Indicate Depth N/E
Pit /Boring Flooded--Depth after_____ Hours

4. Soil Limiting Zones (Check Appropriate Categories):
Fractured Rock Substratum - Depth to Top
Massive Rock Substratum - Depth to Top
Excessively Coarse Horizon - Depth Top to Bottom
Excessively Coarse Substratum - Depth to Top
Hydraulically Restrictive Horizon - Depth Top to Bottom 44" – 95"
Hydraulically Restrictive Substratum - Depth to Top
Perched Zone of Saturation - Depth Top to Bottom
Regional Zone of Saturation - Depth to Top 86"

5. Soil Suitability Classification: IIIHR

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58: 10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7: 14-8.

Signature of Site Evaluator _____
Date _____10/13/2023_____

Signature of Professional Engineer _____ License # GE28106

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MUNICIPALITY _____Elk Twp_____

Form 2b - Soil Log and Interpretation: Lot ____1____ Block ____143____

1. Log Number____TP2_____ Method (Check One): _____xx_____ Profile Pit _____ Boring

Existing Grade Elevation: _____

2. Soil Log
Depth — Munsel Color Name and Symbol; Estimated Textural Class; (inches) Estimated Volume % Coarse Fragment, If Present;
Structure:
Top-Bottom — Moist or Dry Consistence; Mottling--Abundance, Size and Contrast, If Present

0" – 11" 10YR 4/3 Sandy loam, Sub-angular blocky, Friable

11" – 50" 7.5YR 6/4 Sandy clay loam, Sub-angular blocky, Friable, with 10% gravel

50" – 71" 7.5YR 6/6 Sandy clay loam, Angular blocky, Firm (HR) with 30% gravel

71" – 93" 7.5YR 6/6 Sandy loam, Sub-angular blocky, Friable, with 40% gravel
with Common, Medium, Distinct 5YR 5/6 mottles @ 87"

93" – 144" 7.5YR 7/3 fine Loamy sand, Angular blocky, Friable

---

3. Ground Water Observations:
Seepage-Indicate Depth N/E
Pit /Boring Flooded--Depth after_____ Hours

4. Soil Limiting Zones (Check Appropriate Categories):
Fractured Rock Substratum - Depth to Top
Massive Rock Substratum - Depth to Top
Excessively Coarse Horizon - Depth Top to Bottom
Excessively Coarse Substratum - Depth to Top
Hydraulically Restrictive Horizon - Depth Top to Bottom 50" – 71"
Hydraulically Restrictive Substratum - Depth to Top
Perched Zone of Saturation - Depth Top to Bottom
Regional Zone of Saturation - Depth to Top 87"

5. Soil Suitability Classification: IIHR

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58: 10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7: 14-8.

Signature of Site Evaluator _____
Date _____10/13/2023_____

Signature of Professional Engineer_____ License # 6E28106

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MUNICIPALITY _____Elk Twp_____

Form 2b - Soil Log and Interpretation: Lot ____1____ Block ____143_____

1. Log Number____TP3_____ Method (Check One): _____xx_____ Profile Pit _____ Boring

Existing Grade Elevation: _____

2. Soil Log

Depth Structure: Top-Bottom	Munsel Color Name and Symbol; Estimated Textural Class; (inches) Estimated Volume % Coarse Fragment, If Present; Moist or Dry Consistence; Mottling--Abundance, Size and Contrast, If Present

0" – 14" 10YR 4/3 Sandy loam, Sub-angular blocky, Friable

14" – 59" 7.5YR 6/4 Sandy clay loam, Sub-angular blocky, Friable, with 10% gravel

59" – 68" 7.5YR 7/2 fine Loamy sand, Single grain, Loose, with 15% gravel

68" – 84" 7.5YR 5/4 Sandy loam, Sub-angular blocky, Friable, with 35% gravel

84" – 102" 7.5YR 5/8 Sandy clay loam, Sub-angular blocky, Friable, with 25% gravel
with Common, Medium, Distinct 5YR 5/6 mottles @ 85"

102" – 144" 7.5YR 5/8 Sandy loam, Sub-angular blocky, Friable, with 25% gravel

---

3. Ground Water Observations:
Seepage-Indicate Depth N/E
Pit /Boring Flooded--Depth after_____ Hours

4. Soil Limiting Zones (Check Appropriate Categories):
Fractured Rock Substratum - Depth to Top
Massive Rock Substratum - Depth to Top
Excessively Coarse Horizon - Depth Top to Bottom
Excessively Coarse Substratum - Depth to Top
Hydraulically Restrictive Horizon - Depth Top to Bottom
Hydraulically Restrictive Substratum - Depth to Top
Perched Zone of Saturation - Depth Top to Bottom
Regional Zone of Saturation - Depth to Top 85"

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58: 10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7: 14-8.

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Date _____10/13/2023_____

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MUNICIPALITY _____Elk Twp_____

Form 2b - Soil Log and Interpretation: Lot ____1____ Block ____143____

1. Log Number____TP4_____ Method (Check One): _____xx_____ Profile Pit _____ Boring

Existing Grade Elevation: _____
2. Soil Log
Depth — Munsel Color Name and Symbol; Estimated Textural Class; (inches) Estimated Volume % Coarse Fragment, If Present;
Structure:
Top-Bottom — Moist or Dry Consistence; Mottling--Abundance, Size and Contrast, If Present

0" – 7" 10YR 4/3 Sandy loam, Sub-angular blocky, Friable

7" – 29" 7.5YR 6/4 Sandy loam, Sub-angular blocky, Friable

29" – 42" 7.5YR 6/4 Sandy clay loam, Sub-angular blocky, Friable

42" – 60" 7.5YR 6/6 Loamy sand, Sub-angular blocky, Friable, with 10% gravel

60" – 87" 7.5YR 5/4 Sandy loam, Sub-angular blocky, Friable, with 25% gravel
with Common, Medium, Distinct 5YR 5/6 mottles @ 84"

87" – 105" 7.5YR 7/3 fine Loamy sand, Angular blocky, Friable, with 25% gravel

105" – 125" 7.5YR 7/3 fine Loamy sand, Single grain, Loose

125" – 150" 7.5YR 7/1 fine Sand, Single grain, Loose

---

3. Ground Water Observations:
Seepage-Indicate Depth N/E
Pit /Boring Flooded--Depth after_____ Hours

4. Soil Limiting Zones (Check Appropriate Categories):
Fractured Rock Substratum - Depth to Top
Massive Rock Substratum - Depth to Top
Excessively Coarse Horizon - Depth Top to Bottom
Excessively Coarse Substratum - Depth to Top
Hydraulically Restrictive Horizon - Depth Top to Bottom
Hydraulically Restrictive Substratum - Depth to Top
Perched Zone of Saturation - Depth Top to Bottom
Regional Zone of Saturation - Depth to Top 84"

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58: 10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7: 14-8.

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MUNICIPALITY _____Elk Twp_____

Form 2b - Soil Log and Interpretation: Lot ____1____ Block ____143____

1. Log Number____TP5_____ Method (Check One): _____xx_____ Profile Pit _____ Boring

Existing Grade Elevation: _____
2. Soil Log
Depth — Munsel Color Name and Symbol; Estimated Textural Class; (inches) Estimated Volume % Coarse Fragment, If Present;
Structure:
Top-Bottom — Moist or Dry Consistence; Mottling--Abundance, Size and Contrast, If Present

0" – 8" 10YR 4/3 Sandy loam, Sub-angular blocky, Friable

8" – 21" 7.5YR 6/4 Sandy loam, Sub-angular blocky, Friable

21" – 37" 7.5YR 7/2 Loamy sand, Sub-angular blocky, Friable

37" – 77" 7.5YR 5/8 Sandy clay loam, Angular blocky, slightly Firm, with 15% gravel

77" – 97" 7.5YR 5/4 Sandy clay loam, Sub-angular blocky, slightly Firm, with 25% gravel
with Common, Medium, Distinct 5YR 5/6 mottles @ 82"

97" – 117" 7.5YR 6/4 fine Loamy sand, Sub-angular blocky, Friable

117" – 144" 7.5YR 7/1 fine Sand, Single grain, Loose

---

3. Ground Water Observations:
Seepage-Indicate Depth N/E
Pit /Boring Flooded--Depth after_____ Hours

4. Soil Limiting Zones (Check Appropriate Categories):
Fractured Rock Substratum - Depth to Top
Massive Rock Substratum - Depth to Top
Excessively Coarse Horizon - Depth Top to Bottom
Excessively Coarse Substratum - Depth to Top
Hydraulically Restrictive Horizon - Depth Top to Bottom
Hydraulically Restrictive Substratum - Depth to Top
Perched Zone of Saturation - Depth Top to Bottom
Regional Zone of Saturation - Depth to Top 82"

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58: 10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7: 14-8.

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MUNICIPALITY _____Elk Twp_____

Form 2b - Soil Log and Interpretation: Lot ____1____ Block ___143_____

1. Log Number___TP6_____ Method (Check One): _____xx_____ Profile Pit _____ Boring

Existing Grade Elevation: _____

2. Soil Log
Depth — Munsel Color Name and Symbol; Estimated Textural Class; (inches) Estimated Volume % Coarse Fragment, If Present;
Structure:
Top-Bottom — Moist or Dry Consistence; Mottling--Abundance, Size and Contrast, If Present

0" – 8" 10YR 4/3 Sandy loam, Sub-angular blocky, Friable

8" – 42" 7.5YR 6/6 Sandy clay loam, Angular blocky, Friable, with 10% gravel

42" – 83" 7.5YR 7/3 fine Loamy sand, Single grain, Loose
with Common, Medium, Distinct 5YR 5/6 mottles @ 80"

83" – 130" 7.5YR 7/1 fine Sand, Single grain, Loose

130" – 144" 7.5YR 6/4 Loamy sand, Sub-angular blocky, Friable

---

3. Ground Water Observations:
Seepage-Indicate Depth N/E
Pit /Boring Flooded--Depth after_____ Hours

4. Soil Limiting Zones (Check Appropriate Categories):
Fractured Rock Substratum - Depth to Top
Massive Rock Substratum - Depth to Top
Excessively Coarse Horizon - Depth Top to Bottom
Excessively Coarse Substratum - Depth to Top
Hydraulically Restrictive Horizon - Depth Top to Bottom
Hydraulically Restrictive Substratum - Depth to Top
Perched Zone of Saturation - Depth Top to Bottom
Regional Zone of Saturation - Depth to Top 80"

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58: 10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7: 14-8.

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Date _____10/13/2023_____

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Form 2b - Soil Log and Interpretation: Lot ____1____ Block ____143____

1. Log Number____TP7_____ Method (Check One): _____xx_____ Profile Pit _____ Boring

Existing Grade Elevation: _____

2. Soil Log
Depth — Munsel Color Name and Symbol; Estimated Textural Class; (inches) Estimated Volume % Coarse Fragment, If Present;
Structure:
Top-Bottom — Moist or Dry Consistence; Mottling--Abundance, Size and Contrast, If Present

0" – 10" 10YR 4/3 Sandy loam, Sub-angular blocky, Friable

10" – 29" 7.5YR 6/6 Sandy clay loam, Sub-angular blocky, Friable

29" – 61" 7.5YR 6/6 fine Loamy sand, Single grain, Loose

61" – 135" 7.5YR 7/1 fine Sand, Single grain, Loose
with Common, Medium, Distinct 5YR 5/6 mottles @ 82"

Pit discontinued due to collapse / cave-in

---

3. Ground Water Observations:
Seepage-Indicate Depth N/E
Pit /Boring Flooded--Depth after_____ Hours

4. Soil Limiting Zones (Check Appropriate Categories):
Fractured Rock Substratum - Depth to Top
Massive Rock Substratum - Depth to Top
Excessively Coarse Horizon - Depth Top to Bottom
Excessively Coarse Substratum - Depth to Top
Hydraulically Restrictive Horizon - Depth Top to Bottom
Hydraulically Restrictive Substratum - Depth to Top
Perched Zone of Saturation - Depth Top to Bottom
Regional Zone of Saturation - Depth to Top 82"

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58: 10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7: 14-8.

Signature of Site Evaluator _____
Date _____10/13/2023_____

Signature of Professional Engineer _____ License # 6E28106

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MUNICIPALITY _____Elk Twp_____

Form 2b - Soil Log and Interpretation: Lot ____1____ Block ____143____

1. Log Number____TP8_____ Method (Check One): _____xx_____ Profile Pit _____ Boring

Existing Grade Elevation: _____

2. Soil Log
Depth — Munsel Color Name and Symbol; Estimated Textural Class; (inches) Estimated Volume % Coarse Fragment, If Present;
Structure:
Top-Bottom — Moist or Dry Consistence; Mottling--Abundance, Size and Contrast, If Present

0" – 8" 10YR 4/3 Sandy loam, Sub-angular blocky, Friable

8" – 34" 7.5YR 6/6 Sandy clay loam, Angular blocky, Friable, with 15% gravel

34" – 76" 7.5YR 6/6 Sandy loam, Sub-angular blocky, Friable

76" – 91" 7.5YR 7/3 fine Loamy sand, Single grain, Loose
with Common, Medium, Distinct 5YR 5/6 mottles @ 79"

91" – 135" 7.5YR 7/1 fine Sand, Single grain, Loose

Pit discontinued due to collapse / cave-in

3. Ground Water Observations:
Seepage-Indicate Depth N/E
Pit /Boring Flooded--Depth after _____ Hours

4. Soil Limiting Zones (Check Appropriate Categories):
Fractured Rock Substratum - Depth to Top
Massive Rock Substratum - Depth to Top
Excessively Coarse Horizon - Depth Top to Bottom
Excessively Coarse Substratum - Depth to Top
Hydraulically Restrictive Horizon - Depth Top to Bottom
Hydraulically Restrictive Substratum - Depth to Top
Perched Zone of Saturation - Depth Top to Bottom
Regional Zone of Saturation - Depth to Top 79"

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58: 10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7: 14-8.

Signature of Site Evaluator _____
Date _____10/13/2023_____

Signature of Professional Engineer _____ License # GE28106

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP1
Voorhees, NJ 08043	Elk Township	Horizon 95"-107"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: A Date Collected: 10/13/2023

2. Material Tested: Fill: X Test in Native Soil - Indicate Depth: 102"

3. Type of Sample: Undisturbed: X Disturbed

4. Sample Dimensions
   - Inside Radius of Sample Tube, R, in cm: 1.905
   - Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   - Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 145.59
   - Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   - Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.68

6. Standpipe Used: x No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   - At the Beginning of Each Test Interval, H1: 3.0
   - At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	43.05	43.08
0.00	43.28	43.46
0.00	43.42	43.70

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x ———/——— x 3/	43.70	x ln(3/2)
k= 1.67			

10. Defects in the Sample (Check appropriate items):

x None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP1
Voorhees, NJ 08043	Elk Township	Horizon 95"-107"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: B Date Collected: 10/13/2023

2. Material Tested: ____ Fill: X Test in Native Soil - Indicate Depth: 102"

3. Type of Sample: ____ Undisturbed X Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm: 1.905
   Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 147.61
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.70

6. Standpipe Used: x No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1: 3.0
   At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	45.39	45.65
0.00	45.56	45.94
0.00	46.03	46.04

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x ---------/--------- x 3/	46.04	x ln(3/2)
k= 1.59			

10. Defects in the Sample (Check appropriate items):

x None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP2
Voorhees, NJ 08043	Elk Township	Horizon 71"-93"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: A Date Collected: 10/13/2023

2. Material Tested: ____ Fill: X Test in Native Soil - Indicate Depth: 86"

3. Type of Sample: ____ Undisturbed: X Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm: 1.905
Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 146.59
Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.69

6. Standpipe Used: ___x___ No _____ Yes
Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
At the Beginning of Each Test Interval, H1: 3.0
At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	13.00	13.01
0.00	13.04	13.06
0.00	13.20	13.34

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x ---------/--------- x 3/	13.34	x ln(3/2)
k= 5.47			

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP2
Voorhees, NJ 08043	Elk Township	Horizon 71"-93"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: B Date Collected: 10/13/2023

2. Material Tested: [ ] Fill [X] Test in Native Soil - Indicate Depth: 86"

3. Type of Sample: [ ] Undisturbed [X] Disturbed

4. Sample Dimensions
   Inside Radius of Sample Tube, R, in cm: 1.905
   Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 145.48
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.68

6. Standpipe Used: x No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1: 3.0
   At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	12.48	12.80
0.00	13.15	13.25
0.00	13.42	13.69

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x --------/-------- x 3/ 13.69 x ln(3/2)

k= 5.33

10. Defects in the Sample (Check appropriate items):

x None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP3
Voorhees, NJ 08043	Elk Township	Horizon 102"-144"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: A Date Collected: 10/13/2023

2. Material Tested: ____ Fill: X Test in Native Soil - Indicate Depth: 114"

3. Type of Sample: ____ Undisturbed: X Disturbed

4. Sample Dimensions
   - Inside Radius of Sample Tube, R, in cm: 1.905
   - Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   - Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 145.37
   - Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   - Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.67

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   - At the Beginning of Each Test Interval, H1: 3.0
   - At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	12.46	12.77
0.00	12.53	12.88
0.00	13.08	13.14

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x ---------/--------- x 3/	13.14	x ln(3/2)
k= 5.56			

10. Defects in the Sample (Check appropriate items):

___x___ None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP3
Voorhees, NJ 08043	Elk Township	Horizon 102"-144"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: B Date Collected: 10/13/2023

2. Material Tested: ____ Fill: X Test in Native Soil - Indicate Depth: 114"

3. Type of Sample: ____ Undisturbed: X Disturbed

4. Sample Dimensions
   - Inside Radius of Sample Tube, R, in cm: 1.905
   - Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   - Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 147.06
   - Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   - Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.69

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   - At the Beginning of Each Test Interval, H1: 3.0
   - At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	12.12	12.20
0.00	12.14	12.23
0.00	12.32	12.53

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x --------/-------- x 3/	12.53	x ln(3/2)	
k= 5.82				

10. Defects in the Sample (Check appropriate items):

___x___ None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP4
Voorhees, NJ 08043	Elk Township	Horizon 42"-60"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: A Date Collected: 10/13/2023

2. Material Tested: [ ] Fill [X] Test in Native Soil - Indicate Depth: 51"

3. Type of Sample: [ ] Undisturbed [X] Disturbed

4. Sample Dimensions
   Inside Radius of Sample Tube, R, in cm: 1.905
   Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 150.01
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.73

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1: 3.0
   At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	5.59	5.99
0.00	6.01	6.01
0.00	6.01	6.01

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x ---------/--------- x 3/	6.01	x ln(3/2)
k= 12.14			

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP4
Voorhees, NJ 08043	Elk Township	Horizon 42"-60"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: B Date Collected: 10/13/2023

2. Material Tested: [ ] Fill [X] Test in Native Soil - Indicate Depth: 51"

3. Type of Sample: [ ] Undisturbed [X] Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm: 1.905
   Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube	152.15
Sample Volume (L x 2.54 cm/inch x 3.14R²), cc	86.83
Bulk Density (Sample Wt./Sample Volume), grams/cc	1.75

6. Standpipe Used: ____x____ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:

At the Beginning of Each Test Interval, H1	3.0
At the End of Each Test Interval, H2	2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	5.40	5.67
0.00	5.52	5.87
0.00	5.57	5.96

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x --------/-------- x 3/	5.96	x ln(3/2)
k= 12.25			

10. Defects in the Sample (Check appropriate items):

____x___ None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP5
Voorhees, NJ 08043	Elk Township	Horizon 97"-117"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: A Date Collected: 10/13/2023

2. Material Tested: ____ Fill: X Test in Native Soil - Indicate Depth: 108"

3. Type of Sample: ____ Undisturbed: X Disturbed

4. Sample Dimensions
   - Inside Radius of Sample Tube, R, in cm: 1.905
   - Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   - Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 146.26
   - Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   - Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.68

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   - At the Beginning of Each Test Interval, H1: 3.0
   - At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	5.20	5.33
0.00	5.36	5.59
0.00	5.52	5.87

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x --------/-------- x 3/	5.87	x ln(3/2)
k= 12.44			

10. Defects in the Sample (Check appropriate items):

___x___ None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP5
Voorhees, NJ 08043	Elk Township	Horizon 97"-117"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: B Date Collected: 10/13/2023

2. Material Tested: [ ] Fill [X] Test in Native Soil - Indicate Depth: 108"

3. Type of Sample: [ ] Undisturbed [X] Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm: 1.905
   Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 145.53
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.68

6. Standpipe Used: x No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1: 3.0
   At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	5.15	5.26
0.00	5.45	5.74
0.00	5.56	5.93

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x ---------/--------- x 3/	5.93	x ln(3/2)
k= 12.31			

10. Defects in the Sample (Check appropriate items):
x None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP6
Voorhees, NJ 08043	Elk Township	Horizon 42"-83"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: A Date Collected: 10/13/2023

2. Material Tested: ____ Fill: X Test in Native Soil - Indicate Depth: 63"

3. Type of Sample: ____ Undisturbed: X Disturbed

4. Sample Dimensions
   Inside Radius of Sample Tube, R, in cm: 1.905
   Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 151.53
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.75

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1: 3.0
   At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	5.24	5.39
0.00	5.48	5.81
0.00	6.02	6.04

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x --------/-------- x 3/	6.04	x ln(3/2)

k= 12.09

10. Defects in the Sample (Check appropriate items):

___x___ None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP6
Voorhees, NJ 08043	Elk Township	Horizon 42"-83"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: B Date Collected: 10/13/2023

2. Material Tested: [ ] Fill [X] Test in Native Soil - Indicate Depth: 63"

3. Type of Sample: [ ] Undisturbed [X] Disturbed

4. Sample Dimensions
   Inside Radius of Sample Tube, R, in cm: 1.905
   Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 145.35
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.67

6. Standpipe Used: x No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1: 3.0
   At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	5.19	5.31
0.00	5.42	5.69
0.00	5.58	5.97

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x --------/-------- x 3/	5.97	x ln(3/2)
k= 12.23			

10. Defects in the Sample (Check appropriate items):

x None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP7
Voorhees, NJ 08043	Elk Township	Horizon 29"-61"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: A Date Collected: 10/13/2023

2. Material Tested: ____ Fill: X Test in Native Soil - Indicate Depth: 48"

3. Type of Sample: ____ Undisturbed X Disturbed

4. Sample Dimensions
   Inside Radius of Sample Tube, R, in cm: 1.905
   Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 146.49
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.69

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1: 3.0
   At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	5.30	5.50
0.00	5.31	5.51
0.00	5.49	5.81

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x ---------/--------- x 3/	5.81	x ln(3/2)
k= 12.56			

10. Defects in the Sample (Check appropriate items):

___x___ None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP7
Voorhees, NJ 08043	Elk Township	Horizon 29"-61"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: B Date Collected: 10/13/2023

2. Material Tested: ____ Fill: X Test in Native Soil - Indicate Depth: 48"

3. Type of Sample: ____ Undisturbed: X Disturbed

4. Sample Dimensions
   - Inside Radius of Sample Tube, R, in cm: 1.905
   - Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   - Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 147.19
   - Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   - Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.70

6. Standpipe Used: x No ____ Yes
   Indicate internal Radius, cm ____

7. Height of water Level above Rim of Test Basin in inches:
   - At the Beginning of Each Test Interval, H1: 3.0
   - At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	5.27	5.45
0.00	5.30	5.50
0.00	5.52	5.87

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x --------/-------- x 3/	5.87	x ln(3/2)
k= 12.42			

10. Defects in the Sample (Check appropriate items):

x None ____ Cracks ____ Worm Channels ____ Root Channels

____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

____ Dry Soil ____ Smeering ____ Compactation

____ Other---Specify____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP8
Voorhees, NJ 08043	Elk Township	Horizon 34"-76"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: A Date Collected: 10/13/2023

2. Material Tested: [ ] Fill [X] Test in Native Soil - Indicate Depth: 60"

3. Type of Sample: [ ] Undisturbed [X] Disturbed

4. Sample Dimensions
   Inside Radius of Sample Tube, R, in cm: 1.905
   Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 147.64
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.70

6. Standpipe Used: x No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1: 3.0
   At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	12.25	12.42
0.00	12.27	12.45
0.00	12.38	12.63

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x --------/-------- x 3/	12.63	x ln(3/2)
k= 5.78			

10. Defects in the Sample (Check appropriate items):

____x____ None _____Cracks _____Worm Channels _____Root Channels

_____ Soil/Tube Contact _____Large Gravel _____Large Roots

_____ Dry Soil _____Smeering _____Compactation

_____ Other---Specify_____

South Jersey Engineers LLC	Tristate Engineering	Sample Date: 10/13/23
P.O. Box 1406	Douglass Street	Stormwater - TP8
Voorhees, NJ 08043	Elk Township	Horizon 34"-76"

MUNICIPALITY: Elk Township

Form 3b. Tube Permeameter Test Data

1. Test Number: 1 Replicate Letter: B Date Collected: 10/13/2023

2. Material Tested: ____ Fill: X Test in Native Soil - Indicate Depth: 60"

3. Type of Sample: ____ Undisturbed: X Disturbed

4. Sample Dimensions
   - Inside Radius of Sample Tube, R, in cm: 1.905
   - Length of Sample, in inches: 3

5. Bulk Density Determination (Disturbed Samples Only):
   - Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube: 149.24
   - Sample Volume (L x 2.54 cm/inch x 3.14R²), cc: 86.83
   - Bulk Density (Sample Wt./Sample Volume), grams/cc: 1.72

6. Standpipe Used: x No ____ Yes
   Indicate internal Radius, cm ____

7. Height of water Level above Rim of Test Basin in inches:
   - At the Beginning of Each Test Interval, H1: 3.0
   - At the End of Each Test Interval, H2: 2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, End of Test Interval, T2 (min.sec)	Length of Test Interval, T, (min)
0.00	12.26	12.43
0.00	12.49	12.82
0.00	13.15	13.26

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr	x ---------/-------- x 3/	13.26	x ln(3/2)
k= 5.51			

10. Defects in the Sample (Check appropriate items):

x None ____ Cracks ____ Worm Channels ____ Root Channels

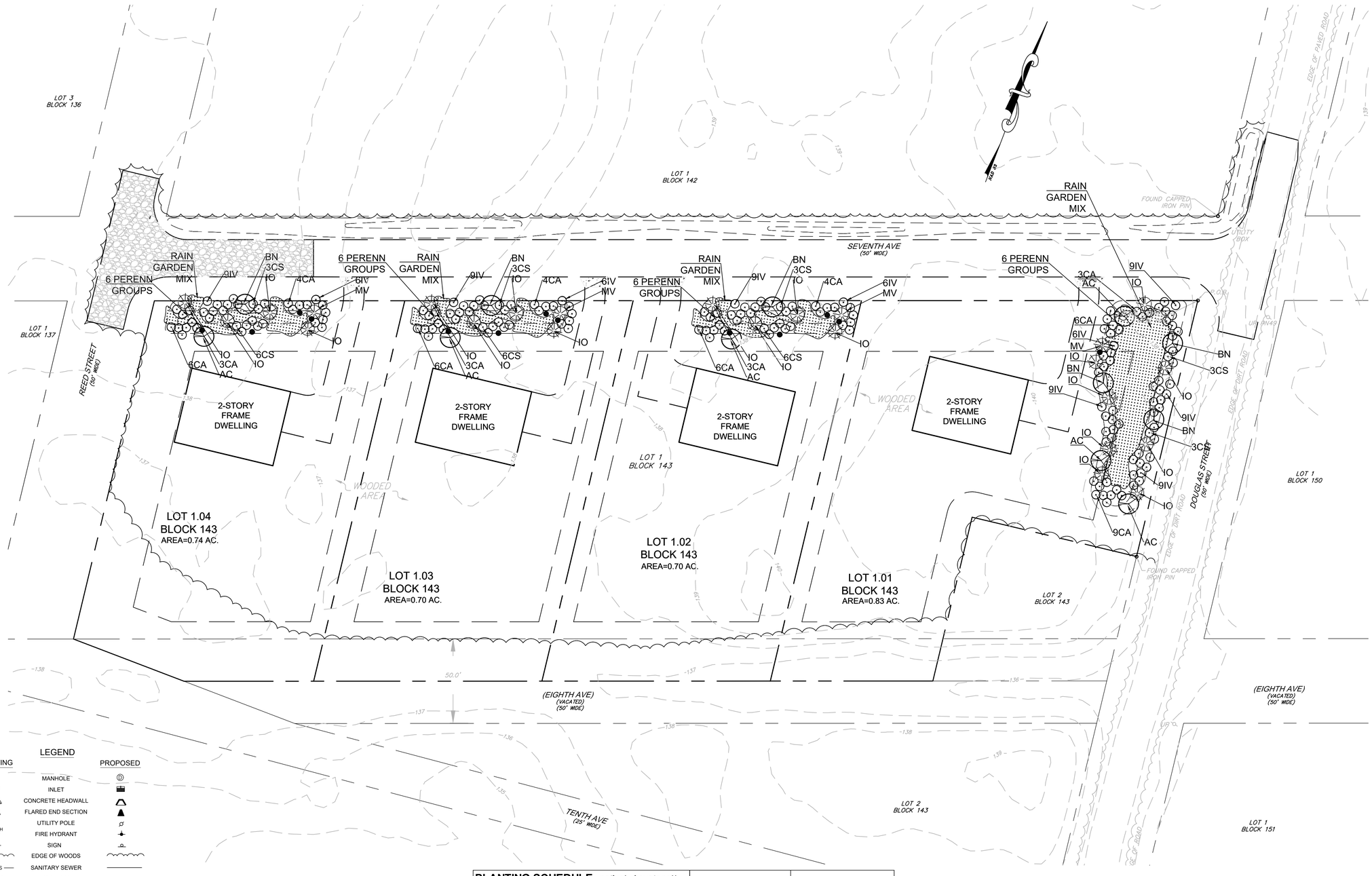
____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

____ Dry Soil ____ Smeering ____ Compactation

____ Other---Specify____

PLANTING NOTES

1. *A COMPLETE LIST OF PLANTS, INCLUDING A SCHEDULE OF QUANTITIES, SIZES, AND OTHER REQUIREMENTS IS SHOWN ON THE PLANT SCHEDULE. IN THE EVENT THAT DISCREPANCIES OCCUR BETWEEN THE QUANTITIES OF PLANTS INDICATED IN THE PLANT LIST AND THOSE INDICATED ON THE PLAN, THE PLANT QUANTITIES INDICATED ON THE PLAN SHALL GOVERN.*
2. *ANY PLANT SCHEDULE MODIFICATIONS SHALL BE SUBJECT TO THE APPROVAL BY THE TOWNSHIP REPRESENTATIVE OR PROJECT LANDSCAPE ARCHITECT PRIOR TO THE PRECONSTRUCTION MEETING REQUEST TO BE MADE IN WRITING TO AUTHORITY.*
3. *ALL PLANTS SHALL BE TYPICAL OF THEIR SPECIES OR VARIETY. ALL PLANTS SHALL HAVE NORMAL, WELL DEVELOPED BRANCHES AND VIGOROUS ROOT SYSTEMS. THEY SHALL BE FREE FROM DEFECTS, DISFIGURING KNOTS, ABRASIONS OF THE BARK, SUNSCALD INJURIES, PLANT DISEASES, INSECT EGGS, BORERS, AND ALL OTHER FORMS OF INFECTIONS. ALL PLANT MATERIAL SHALL BE THOROUGHLY WETTED WITH AN ANTI-TRANSPARANT UPON DELIVERY OF MATERIAL TO THE SITE. ALL EVERGREEN MATERIAL SHALL BE RESPRAYED PRIOR TO THE FIRST WINTER BY THE OWNER.*
4. *SIZE AND GRADING STANDARDS SHALL CONFORM TO ANSI #1, OR BETTER AND SHALL BE GUARANTEED FOR A PERIOD OF 2 YEARS AFTER ACCEPTANCE BY THE OWNER. AS REQUIRED BY ORDINANCE, "ALL PLANT MATERIAL NOT SURVIVING FOR A PERIOD OF (2) TWO YEARS SHALL BE REPLACED WITH THE EQUIVALENT SIZE AND SPECIES."*
5. *ALL PLANTS SHALL BE PACKED, TRANSPORTED AND HANDLED WITH THE UTMOST CARE TO INSURE ADEQUATE PROTECTION AGAINST INJURY AND DEHYDRATION. EACH SHIPMENT SHALL BE CERTIFIED TO BE FREE FROM DISEASES AND INFESTATION. ANY INSPECTION CERTIFICATES REQUIRED BY LAW TO THIS EFFECT SHALL ACCOMPANY EACH SHIPMENT INVOICE OR ORDER OF STOCK AND ON ARRIVAL.*
6. *NO PLANT MATERIAL SHALL BE PLANTED BY THE CONTRACTOR UNTIL IT IS INSPECTED AND APPROVED BY THE LANDSCAPE ARCHITECT OR HIS AGENT AT THE SITE. THE LANDSCAPE ARCHITECT OR HIS REPRESENTATIVE SHALL BE THE SOLE JUDGE OF THE QUALITY AND ACCEPTABILITY OF THE MATERIALS. ALL REJECTED MATERIALS SHALL BE IMMEDIATELY REPLACED WITH ACCEPTABLE MATERIAL AT NO ADDITIONAL COST.*
7. *SHADE AND EVERGREEN PLANTS SHALL BE FIELD ADJUSTED TO MAINTAIN A MINIMUM HORIZONTAL SEPARATION OF 10 FEET FROM ANY SEWER MAIN OR STORM SEWER.*
8. *SHADE AND EVERGREEN TREES SHALL BE PLANTED AT LEAST TWO (2) FEET FROM ANY CURBING, PAVING OR SIDEWALK. WHENEVER POSSIBLE THIS DIMENSION SHOULD BE INCREASED TO FOUR (4) FEET.*
9. *PLANTING MIXTURE SHALL CONSIST OF ACCEPTANCE NATURAL TOPSOIL AND 10% BY WEIGHT OF STA-CERTIFIED COMPOST, THOROUGHLY MIXED. ONLY ADD ORGANIC FERTILIZER AND ONLY AFTER SOIL TEST IS PERFORMED BY YOUR LOCAL EXTENSION SERVICE WITH TYPE AND QUANTITY RECOMMENDATIONS.*
10. *WHERE APPLICABLE, PEAT MOSS FOR PLANTING MEDIUM SHALL BE IMPORTED CANADIAN SPHAGNUM PEAT MOSS, BROWN, LOW IN CONTENT OF WOODY MATERIAL AND BE FREE OF MINERAL CONTENT HARMFUL TO PLANT LIFE.*
11. *CONTRACTOR SHALL SCALE PLANT LOCATIONS FROM PLANS AND STAKE LOCATIONS ON SITE FOR APPROVAL BY THE LANDSCAPE ARCHITECT OR HIS AGENT.*
12. *ALL SEEDED AREAS THAT DO NOT SHOW A PROMPT UNIFORM GERMINATION SHALL BE RESEEDED BY THE LANDSCAPE CONTRACTOR AT INTERVALS OF 45-60 DAYS, UNTIL A GOOD GROWTH IS ESTABLISHED OVER THE ENTIRE LAWN AREA.*
13. *ALL PLANT BEDS SHALL BE MULCHED WITH THREE (3) INCHES OF SHREDDED HARDWOOD MULCH OR OTHER MATERIAL APPROVED BY THE LANDSCAPE ARCHITECT. THE LIMIT OF THIS MULCH FOR TREES SHALL BE THE AREA OF THE PIT AND FOR SHRUBS AND BEDS, THE ENTIRE SHRUB OR BED AREAS AS INDICATED ON THE PLAN. DO NOT CREATE MULCH PYRAMIDS, SEE PLANTING DETAIL FOR MULCH APPLICATION.*
14. *ALL PLANTING BEDS SHALL BE ROTOTILLED TO A DEPTH OF TEN (10) INCHES PRIOR TO ANY PLANTING. ALL STONES, WIRE, CONCRETE AND UNSUITABLE MATERIALS SHALL BE REMOVED.*
15. *PLANTING BEDS SHALL BE THOROUGHLY EXCAVATED, AND BACKFILLED WITH THE PLANT MIXTURE DESCRIBED IN # ABOVE. ALL PAVEMENT SUBBASE AND UNSUITABLE MATERIAL SHALL BE REMOVED FROM THE ISLAND PLANTING BEDS UNTIL VIRGIN SOIL IS REPLACED.*
16. *IT IS UNDERSTOOD THAT THE OWNER SHALL ASSUME RESPONSIBILITY FOR WATERING ALL PLANT MATERIAL AND LAWN AREAS BEYOND THE GUARANTEE PERIOD COMMENCING WITH THE DATE OF INITIAL ACCEPTANCE.*
17. *THE CONTRACTOR SHALL BECOME RESPONSIBLE FOR VERIFYING LOCATIONS OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES BEFORE EXCAVATING.*
18. *ANY AND ALL IRRIGATION SYSTEMS SHALL CONTAIN A RAIN SENSOR. IT IS RECOMMENDED THAT IF PLANTING BEDS ARE IRRIGATED, DRIP IRRIGATION IS PREFERRED.*
19. *ALL EVERGREEN TREES SHALL BE CONICAL IN SHAPE UNLESS OTHERWISE NOTED. CONICAL SHALL MEAN THE PLANT SHALL HAVE A WIDER BASE, (5:3 RATIO) AT A MINIMUM AND TAPER TO THE TOP. PLANT LEADER SHALL BE NO LONGER THAN 12 INCHES. CONICAL SHALL ALSO IMPLY A FULL SHAPE FROM THE BOTTOM OF PLANT (6-12" FROM ROOT BALL) TO TOP LEADER. REFER TO ANSI 260-1996, 4.1.2.5 TYPE 5- CONE TYPE.*
20. *SPECIMEN PLANT MATERIAL SHALL MEAN FOR EVERGREEN SPECIES: EXCEPTIONALLY HEAVY, WELL SHAPED PLANTS WHICH HAVE BEEN TRIMMED TO FORM A PERFECTLY SYMETRICAL, TIGHTLY KNIT PLANT.*
21. *FOR CONICAL AND EVERGREEN PLANT MATERIAL AVERAGE HEIGHT SHALL BE MEASURED FROM THE UPPER LIMIT OF BRANCH WHORL AND MIDPOINT OF LEADER.*
22. *ALL EVERGREEN TREES MUST BE SLIGHTLY SHEARED*



LEGEND

EXISTING		PROPOSED
○	MANHOLE	Ⓓ
□	INLET	
	CONCRETE HEADWALL	
△	FLARED END SECTION	▲
	UTILITY POLE	
FH	FIRE HYDRANT	
	SIGN	
	EDGE OF WOODS	
S	SANITARY SEWER	
ST	STORM DRAIN	
W	WATER MAIN	
WV	GATE VALVE	
	TEE	
	PLUG(CAP)	
00	CONTOUR LINE	00
00X00	GRADE	00X00
N/A	MEET EXISTING GRADE	(00X00)
TC38.50	TOP OF CURB ELEVATION	TC38.50
BC38.00	GUTTER ELEVATION	BC38.00
H	HANDICAP RAMP	H
=====	CURB	
- - - - -	EDGE OF PAVEMENT	
N/A	CONCRETE	
TB#1	SOIL BORING	N/A

LANDSCAPE LEGEND

- SHADE TREE
- EVERGREEN TREE
- SHRUBS
- ORNAMENTAL TRESS

PLANTING SCHEDULE: native* - keystone**			Lane/Court	
KEY	BOTANICAL NAME	COMMON NAME	QTY	SIZE/ROOTS/REMARKS
STORMWATER BASINS, BUFFER AREAS & BUFFER PLANTS IN RAIN GARDEN - ie.,IG+,MV+,IV+,VN+,IO+				
TREES				
AC**	Amelanchier X grandiflora	SERVICEBERRY	6	MT 4-5'ht., #15 CONTAINER
BN**	Betula nigra 'Dura Heat'	RIVER BIRCH	6	MT 4-5'ht., #15 CONTAINER
EVERGREEN TREES				
IO*	Ilex opaca	AMERICAN HOLLY	20	5-6'HT.,B&B
MV*	Magnolia virginiana	SWEETBAY MAGNOLIA	4	6-7'HT.,B&B
SHRUBS/PERENNIALS				
CA*	Clethra alnifolia 'Ruby Spice'	SUMMERSWEET	57	#3 CAN
CS*	Sambucus canadensis 'Adam	AMERICAN ELDER	33	#5 CAN
IV*	Ilex verticillata 'Maryland Beauty & 'Jim Dandy'	WINTERBERRY HOLLY	87	#5 CAN (IV): 80% MARYLAND BEAUTY-20% JIM DANDY (VN): 80% WINTERTHUR-20%BRANDY WINE

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

DESIGNED: JR	DRAWN: DC	CHECKED: JAM
DATE SIGNED:		REVISIONS NO. DATE:

JOSEPH A. MANCINI

New Jersey Professional Engineer
Lic. No. 24GE04579300

LANDSCAPING PLAN

7TH AVENUE AND DOUGLAS STREET
BLOCK 143, LOT 1
ELK TOWNSHIP
GLOUCESTER COUNTY, NEW JERSEY

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SCALE:	DATE:	PROJECT NO.	SHEET:
1" = 30'	01/19/2024	23-105 CHENG	5 OF 9