

MidAtlantic Engineering Partners

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Project # APR-2203

OPERATIONS & MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT FACILITIES FOR HERITAGE AT HOPEWELL 2500 PENNINGTON ROAD

**BLOCK 78, LOT 17
HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY**

PREPARED FOR:

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I. PROJECT OVERVIEW

The proposed project consists of 55 market rate townhomes and one affordable housing apartment building with 12 units along with proposed internal roadways, parking stalls, stormwater management measures and associated grading. The stormwater management basins proposed in this application are sized to accommodate flows from the developed area during the 2, 10 and 100-year storms. The site contains a total of 11.08 acres.

II. RESPONSIBLE PARTIES

The responsible party for the execution of preventive and corrective maintenance of all stormwater management systems to ensure proper functionality shall be the owner of the proposed project, located at Block 78, Lot 17. The maintenance plan and any future revisions shall be recorded upon the deed of record for the property.

The anticipated property owner will be:

American Properties, LLC
517 Route 1 South, Suite 2100
Iselin, NJ 08830
732-283-9700

III. STORMWATER MANAGEMENT SYSTEMS OVERVIEW

In accordance with the NJDEP rules regarding stormwater management, N.J.A.C. 7:8-1.6, the criteria to handle stormwater for major developments is to design acceptable systems that effectively manage the stormwater with respect to applicable regulations regarding water quality, runoff quantity and groundwater recharge. Each of these requirements was considered in a pre vs. post-development runoff analysis, conducted in conjunction with an evaluation of site conditions, local ordinance, and proposed construction specifications. This was done to facilitate designing an appropriate stormwater management system for the proposed site, based on sound engineering principles to maximize water quality and to reduce peak flows offsite per the NJDEP stormwater regulations.

Accordingly, stormwater management analysis in this report consists of: (1) calculating runoff from the 2, 10 and 100-year storm events for the pre and post-development conditions of each drainage area; (2) comparing the results of the pre-developed and post-developed conditions to ensure that an appropriate stormwater management plan has been implemented; and (3) providing a conclusion of the results of the analysis. The analysis demonstrates that the stormwater runoff will not adversely affect the area because of the proposed development of the property. Runoff is analyzed as a total flow at the point of analysis and systems were designed to entirely store and reduce the developed runoff to 50%, 75% and 80% of the 2, 10 and 100-year storm pre-development flows..

The existing pre- and proposed post-development flows were calculated using the USDA Natural Resources Conservation Service methodology, as described in Technical Release 55 -

Urban Hydrology for Small Watersheds (TR-55), dated June 1986. These modeling techniques are incorporated in the HydroCAD 10.00 software package, which was used to analyze the pre and post development flows. All undisturbed areas of the site have been assumed to be in good hydrologic condition, with good cover for the pre-development analysis. Any significant land features and structures that could reduce pre-construction stormwater runoff rates and volumes, including depressions and culverts have been accounted for in the pre-development analysis.

The structural stormwater management measures have been designed to consider the existing site conditions including environmentally critical areas, slopes, depth to seasonally high-water table, soil types and permeability. They have also been designed to be strong, durable and corrosion resistant to minimize maintenance, facilitate maintenance and repairs and ensure proper functioning within the context of their operational requirements.

IV. INSPECTION & MAINTENANCE OVERVIEW

This Stormwater Management Maintenance Plan has two primary components: 1) Scheduled Inspections and 2) Maintenance of the Stormwater Management Systems. Discussions of each component are contained within the text of this plan.

Sample forms, to be completed by a qualified inspector, are also contained in this plan. These forms are meant to be a guide with the minimum amount of information to be reported during regular inspection and maintenance occurrences. A copy of this maintenance manual and site plans shall be kept on file within the management office.

V. SAFETY

Keep safety considerations at the forefront of inspection procedures, at all times. Likely hazards should be anticipated and avoided. Never enter a confined space (outlet structure, manhole, etc.) without proper training or equipment. A confined space should never be entered without at least one additional person present.

If a toxic or flammable substance is discovered, leave the immediate area and contact the local Police Department at 911. Potentially dangerous (e.g., fuel, chemicals, hazardous materials) substances found in the areas must be referred to the local Police Department immediately for response by the Resource Recovery Complex. The emergency contact number is 911.

VI. FIELD INSPECTION EQUIPMENT

It is imperative that the appropriate equipment is taken to the field with the inspector(s). This is to ensure the safety of the inspector and allow the inspections to be performed as efficiently as possible. Below is a list of the equipment that may be necessary to perform the inspections of all Stormwater Management Facilities:

- Protective clothing and boots
- Safety equipment (vest, hard hat, confined space entry equipment)

- Communication equipment
- Operation and Maintenance Manual for the site including stormwater management facility location maps
- Clipboard
- Stormwater Management System Inspection Report Forms
- Manhole Lid Remover
- Shovel

Some of the items identified above need not be carried by the inspector (manhole lid remover, shovel, and confined space entry equipment). However, this equipment should be available in the vehicle driven to the site.

VII. MAINTENANCE/INSPECTIONS

The following summarizes general maintenance items and basin drainage times:

1. Removal of debris and sediment from pipe system;
2. General maintenance and repairs to the outlet structure;
3. Removal of all accumulated debris from the outlet structure trash racks;

VIII. REGULAR MAINTENANCE ITEMS

Regular maintenance items, as itemized in the checklist enclosed as Appendix B includes the following items:

1. Removal and Disposal of Trash and Debris: Immediately following any significant rainfall event, and at least once every 6 months, all trash and debris should be removed from the impoundment area.
2. Sediment Removal and Disposal: Accumulated sediment should be removed before it threatens the operation or storage volume of the facility. Sediment volume should be monitored on a quarterly basis to assure the outlets are not blocked. Disposal of sediment should be in accordance with current Monroe Township standards and regulations of the New Jersey Department of Environmental Protection.

A. Corrective Maintenance

Corrective maintenance should be provided as soon as practicable after a situation that requires attention is reported. Corrective maintenance includes repair of damage caused by vandalism, removal of debris and sediment that threatens the operational capacity of the facility, and corrections of any problems that jeopardize the safety or operation of the facility.

B. Maintenance Inspection

An inspection of the facility should be made a minimum of once every year in order to determine the effectiveness of the maintenance work and the condition of the facility. In addition, an inspection should be made whenever a severe storm warning is issued in order to determine the readiness of the facility.

C. Records

Included in this report as Appendix B are checklists and logs for use by maintenance personnel and inspectors. These should be utilized every time maintenance or inspection is performed on the facility. The reports should be appropriately filed and used to determine the effectiveness of the existing maintenance and inspection schedules. The Report can also be used to update the schedules as necessary to effectively maintain the operational integrity of the facility. The Township Engineer's office must be copied on all reports.

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.

IX. PREVENTATIVE MEASURES TO REDUCE MAINTENANCE COSTS

The most effective way to maintain your underground infiltration facility is to prevent debris from entering the facility in the first place. Key points to consider in your maintenance program include:

- Educate property owners/residents to be aware of how they can help reduce maintenance costs.
- Keep properties, streets and gutters, and parking lots free of trash, debris, and lawn clippings.
- Sweep paved surfaces and put the sweepings back on the lawn.
- Re-vegetate disturbed and bare areas to maintain vegetative stabilization.
- Clean out the upstream components of the storm drainage system, including inlets, storm sewers and outfalls.

X. CORRECTIVE RESPONSE TO EMERGENCY CONDITIONS

The parties responsible for the stormwater management facilities should be well prepared to respond to emergencies and take necessary corrective action to prevent emergencies from happening. The following is a discussion of emergency response and emergency prevention.

Emergency Response

Below is a list of potential emergency conditions related to the infiltration basins and their appurtenances. In the case of any emergency, dial 911 immediately.

- Accidental or Intentional Vehicular or Pedestrian Entry – The initial response to any emergency is to call 911. Be prepared to give the exact location, by street address, of the emergency location. Flow in a infiltration basin can be very strong especially near the outlet structure. Only trained personnel should enter a full infiltration basin to attempt a rescue.
- Hazardous Waste Spill - The initial response to any emergency is to call 911. Inform the dispatcher that the emergency involves a hazardous waste spill. The dispatcher will contact the Monmouth County Health Department. Follow the directions of the emergency responders upon their arrival. Do not go near the infiltration basin nor allow anyone to go near the infiltration basin or spill area. A hazardous spill of liquid chemicals that occurs within the property will likely drain to the infiltration basins onsite.
- Flooding – If a infiltration basin appears to be approaching a condition of flooding or overflow, contact the police by dialing 911. Do not attempt to unclog a blockage in the system to remedy the problem. Follow the directions of the emergency responders upon their arrival.
- Downed Power Lines - The initial response to any emergency is to call 911. Be prepared to give the exact location, by street address, of the emergency location. Keep a safe distance from any standing water. At a safe distance, stop vehicular and pedestrian traffic from approaching the area of the downed power line.

Emergency Prevention

Below is a list of measures that can be taken to help to prevent emergency situations from happening at the onsite infiltration basins.

- Outlet Works Cleaning – Flooding at the infiltration basins is typically caused by clogging at the outlet structure. The outlet structures should be maintained in accordance with the schedule above.
- Tree Pruning – Periodically inspect tree branches that could impact power lines. Contact JCP&L for tree pruning in the vicinity of power lines.

APPENDIX A

- SMALL SCALE BIORETENTION BASIN MAINTENANCE

Small Scale BioRetention Basin Maintenance

Preventative and Corrective Maintenance

Proper and timely maintenance is important for continuous, effective function of the rain garden. Access to the rain garden from surrounding lawn areas should be maintained at all times. The following maintenance actions are required to keep the rain garden functioning properly.

Watering

Water is essential for the survival of a newly installed rain garden. The garden should be watered regularly during the first three months and as needed throughout the future in times of drought. Plants should be watered every day for the first week they are in the ground and then once a week after that, unless there is substantial rainfall. In hot weather or times of drought, the rain garden will need water one to two times a week to prevent the loss of plants, even if the garden is already established.

Weeding

Remove unwanted weeds from the garden by hand. Pull them from the base of the weed to remove the roots. As the garden becomes established, the rain garden plants will spread and out-compete unwanted weeds.

Mulching

Mulch is used to prevent weeds and retain moisture in the rain garden. During the first year the garden is growing, maintain a 3-inch layer of mulch between plants. As the rain garden plants spread and become denser, you may find mulching the garden more difficult. Mulching beyond the first year is optional. Please be careful not to excessively mulch the garden, and keep mulch away from any drain inlets and outlets.

Inspecting and Cleaning Inlets/Outlets

Inspect the rain garden's inlets monthly, and be sure to remove any leaves, trash, or debris that may prevent water from passing through. Observe the inlet during rainstorms to make sure stormwater is flowing into the rain garden. After rainstorms, please check the garden to be sure drainage outlet paths are clear and that water is not ponding for more than 48 hours. All structural components should be inspected at least once each year.

Mowing

DO NOT mow or use a line-trimmer inside of the rain garden. This damages the plants and can destroy the rain garden.

Vegetation and Plantings

During rain garden establishment, vegetation should be inspected bi-weekly. Vegetated areas must be inspected at least once each year for erosion, scour, and unwanted growth. Unwanted growth should be removed from the rain garden. Remove and replace any dead plants in the garden as needed.

Pruning

Prune overgrown material in the garden annually when the plants are dormant. Remove dead plant material and deadhead flowers. This will encourage dense, new vegetative growth.

Drainage

The rain garden is to be inspected twice each year to determine if permeability of the bed has decreased. The rain garden is designed to infiltrate all stormwater runoff within 48 hours. No standing water should be visible 48-72 hours after a storm event. If standing water remains in the rain garden after 72 hours, corrective actions will be needed.

Equipment, tools, and supplies

No specialized equipment is needed for routine rain garden maintenance. A garden shovel, rake, pruning shears, and water hose are all that is required to keep the rain garden working and healthy.

Maintenance Schedule

Each month and following storm events, the rain garden should be inspected. It is recommended that photographs be taken during inspections to document conditions.

Estimated Costs

Regular maintenance activities can be completed by the property owner at no additional cost. Below are estimated costs for plants and materials that may be needed as the rain garden matures and develops:

Replacement perennial plantings (1 gallon pots)	\$7.00 - \$10.00/plant
Replacement shrub plantings (3 gallon pots)	\$25.00 - \$40.00/plant
Triple-shredded hardwood mulch	\$15.00 - \$25.00/cubic yard

Maintenance and Inspection Checklist

In addition to the schedule, a maintenance and inspection checklist is attached to assist with documenting the condition, function, and establishment of the rain garden. In addition to completing the form, it is recommended that photos be taken and kept on file.

Inspection Ports

Inspection ports must be located at the upstream and downstream ends of the perforated section of the network of pipes and extend above the surface of the soil bed. The inspection port exterior must be covered in such a way as to prevent the migration of material into the structure. The depth of runoff generated by the maximum design storm must be marked on all inspection ports and those levels included in the design report and maintenance plan.

Basin No	Basin Bottom Elevation	100-Year Water Surface Elevation
1	200.00	203.63
2	201.00	203.71

APPENDIX B

- BASIN INSPECTION CHECKLISTS
- BASIN MAINTENANCE CHECKLIST
- BASIN MAINTENANCE LOG

Basin Inspection Checklist

Name of Facility:	
Location:	
Date of Inspection:	
Weather:	

Embankments and Side Slopes

Facility Item	O.K. ⁱ	Routine ⁱⁱ	Urgent ⁱⁱⁱ	Comments ^{iv}
A. Vegetation				
B. Linings				
C. Erosion				
D. Settlement				
E. Sloughing				
F. Trash and Debris				
G. Seepage				
H. Aesthetics				
I. Other				

Basin Invert

Facility Item	O.K.	Routine	Urgent	Comments
A. Vegetation				
B. Erosion				
C. Settlement				
D. Standing Water				
E. Trash and Debris				
F. Seepage				
G. Aesthetics				
H. Other				

Low Flow Channels

Facility Item	O.K.	Routine	Urgent	Comments
A. Vegetation				
B. Linings				
C. Erosion				
D. Settlement				
E. Standing Water				
F. Trash and Debris				
G. Sediment				
H. Other				

Basin Inspection Checklist

Inlet Structure

Facility Item	O.K.	Routine	Urgent	Comments
A. Condition of Structure				
B. Erosion				
C. Trash and Debris				
D. Sediment				
E. Aesthetics				
F. Other				

Outlet Structure

Facility Item	O.K.	Routine	Urgent	Comments
A. Condition of Structure				
B. Erosion				
C. Trash and Debris				
D. Sediment				
E. Trash Rack				
F. Aesthetics				
G. Other				

Emergency Spillway

Facility Item	O.K.	Routine	Urgent	Comments
A. Vegetation				
B. Lining				
C. Erosion				
D. Settlement				
E. Trash and Debris				
F. Other				

Perimeter

Facility Item	O.K.	Routine	Urgent	Comments
A. Vegetation				
B. Erosion				
C. Fences and Gates				
D. Trash and Debris				
E. Aesthetics				
F. Other				

Basin Inspection Checklist

Access Roads

Facility Item	O.K.	Routine	Urgent	Comments
A. Vegetation				
B. Road Surface				
C. Fences and Gates				
D. Erosion				
E. Aesthetics				
F. Other				

Miscellaneous

Facility Item	O.K.	Routine	Urgent	Comments
A. Effectiveness of Existing Maintenance Program				
B. Dam Inspection				
C. Potential Mosquito Habitats				
D. Mosquitoes				

Remarks:

Basin Inspection Checklist

Name of Facility:	
Location:	
Date of Inspection:	
Weather:	

Preventive Maintenance

Grass Cutting

Facility Item	Required	Completed	Location, Comments and Special Instructions
A. Basin Invert			
B. Embankment			
C. Side Slopes			
D. Perimeter			
E. Access Areas			
F. Other			

Grass Maintenance

Facility Item	Required	Completed	Location, Comments and Special Instructions
A. Fertilizing			
B. Re-Seeding			
C. De-Thatching			
D. Aeration			
E. Pest Control			
F. Other			

Vegetative Cover

Facility Item	Required	Completed	Location, Comments and Special Instructions
A. Fertilizing			
B. Pruning			
C. Pest Control			
D. Removal			
E. Other			

Basin Inspection Checklist

Trash and Debris Removal

Facility Item	Required	Completed	Location, Comments and Special Instructions
A. Invert			
B. Side Slopes			
C. Perimeter Areas			
D. Outlet / Trash Rack			
E. Access Areas			
F. Inlets			
G. Other			

Sediment Removal

Facility Item	Required	Completed	Location, Comments and Special Instructions
A. Inlets			
B. Outlet			
C. Invert			
D. Other			

Mosquito Habitat Removal

Facility Item	Required	Completed	Location, Comments and Special Instructions
A. Inlets			
B. Outlets			
C. Low Flow Channel			
D. Invert			
E. Other			

Other Preventative Maintenance

Facility Item	Required	Completed	Location, Comments and Special Instructions
A. Gates / Fences			
B.			
C.			
D.			

Basin Inspection Checklist

Corrective Maintenance

Facility Item	Required	Completed	Location, Comments and Special Instructions
A. Removal of Debris and Sediment			
B. Structural Repairs			
C. Slope Repairs			
D. Embankment Repairs			
E. Pond Maintenance			
F. Dewatering			
G. Mosquito Control			
H. Erosion Repair			
I. Fence / Gate Repair			
J. Elimination of Trees/Brush			
K. Elimination of Burrows			
L. Snow and Ice Removal			
M. Other			

Aesthetic Maintenance

Facility Item	Required	Completed	Location, Comments and Special Instructions
A. Graffiti Removal			
B. Grass Trimming			
C. Weeding			
D. Other			

Remarks:

Basin Maintenance Log

Name of Facility:

Location:

Preventive Maintenance

Grass Cutting

Facility Item	Date						
A. Basin Invert							
B. Embankment							
C. Side Slopes							
D. Perimeter							
E. Access Areas							
F. Other							

Grass Maintenance

Facility Item	Date						
A. Fertilizing							
B. Re-Seeding							
C. De-Thatching							
D. Aeration							
E. Pest Control							
F. Other							

Vegetative Cover

Facility Item	Date						
A. Fertilizing							
B. Pruning							
C. Pest Control							
D. Removal							
E. Other							

Basin Maintenance Log

Trash and Debris Removal

Facility Item	Date						
A. Invert							
B. Side Slopes							
C. Perimeter Areas							
D. Outlet / Trash Rack							
E. Access Areas							
F. Inlets							
G. Other							

Sediment Removal

Facility Item	Date						
A. Inlets							
B. Outlet							
C. Invert							
D. Other							

Mosquito Habitat Removal

Facility Item	Date						
A. Inlets							
B. Outlets							
C. Low Flow Channel							
D. Invert							
E. Other							

Other Preventative Maintenance

Facility Item	Date						
A. Gates / Fences							
B.							
C.							
D.							

Basin Maintenance Log

Corrective Maintenance

Facility Item	Date						
A. Removal of Debris and Sediment							
B. Structural Repairs							
C. Slope Repairs							
D. Embankment Repairs							
E. Pond Maintenance							
F. Dewatering							
G. Mosquito Control							
H. Erosion Repair							
I. Fence / Gate Repair							
J. Elimination of Trees/Brush							
K. Elimination of Burrows							
L. Snow and Ice Removal							
M. Other							

Aesthetic Maintenance

Facility Item	Date						
A. Graffiti Removal							
B. Grass Trimming							
C. Weeding							
D. Other							

Remarks:

ⁱ The item checked is in good condition, and the maintenance program is adequate.

ⁱⁱ The item checked requires attention, but does not present an immediate threat to the facility function or other facility components.

ⁱⁱⁱ The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.

^{iv} Provide explanation and details if column 2 or 3 is checked.

APPENDIX C

- CORRECTIVE AND PREVENTATIVE MAINTENANCE COST ESTIMATE

Corrective and Preventative Maintenance Cost Estimate

Ref.	Description	Frequency (per year)	Cost	Total
Corrective Maintenance Activities				
1	Trash/Debris removal from site	4	\$800.00	\$3,200.00
2	Trash/Debris removal from Inlets	4	\$200.00	\$800.00
3	Sediment Removal from Basin	1	\$2,000.00	\$2,000.00
4	Structure Repair – If required (basin outlet structures)	1	\$2,000.00	\$2,000.00
Preventative Maintenance Activities				
5	Lawn/Vegetation Maintenance	12	\$500.00	\$6,000.00
6	Revegetate Bare Surfaces	2	\$200.00	\$400.00

Annual Maintenance Cost: \$14,400.00

APPENDIX D

- PERVIOUS PAVING SYSTEM FIELD MANUAL

Pervious Paving System

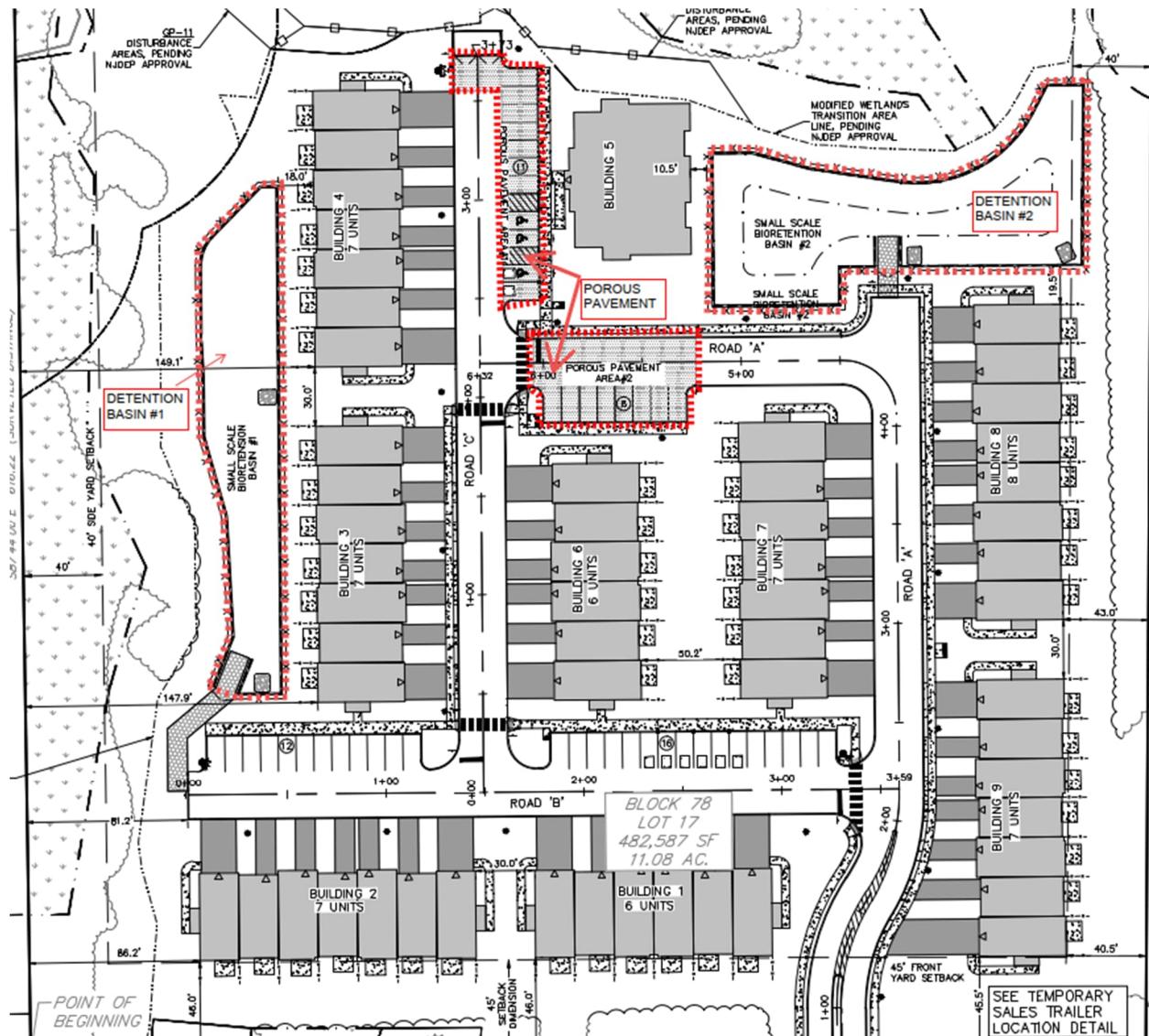
Development Name: Heritage at Hopewell

Township, County: Hopewell Township, Mercer County

Location of Basin#1 N:413,181'; E:536,042'

Location of Basin#2 N:413,331'; E:535,737'

Location Description: Overall site of the development, near Pennington Road-NJSH RT 31



Location Map

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Pervious Pavement System Overview

Functionality

Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving. This increased infiltration occurs either through the paving material itself or through void spaces between individual paving blocks known as pavers.

Pervious paving systems are divided into two general types. Each type depends primarily upon the nature of the pervious paving surface course and the presence or absence of a runoff storage bed beneath the surface course. Porous paving and permeable paver with storage bed systems treat the stormwater quality design storm runoff through storage and infiltration. Therefore, these systems have adopted TSS removal rates similar to infiltration structures. The adopted TSS removal rate for each type of pervious paving system is from 80%.

Pervious paving systems are used to reduce runoff rates and volumes from paved, on-grade surfaces such as patios, walkways, driveways, fire lanes, and parking spaces. Pervious paving systems with runoff storage beds achieve these reductions through storage of runoff and eventual infiltration into the subgrade soils. Through this infiltration process, these types of pervious paving systems also achieve stormwater quality requirements.

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

The pervious pavement system shall fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of the porous pavement failure. It may also contribute to mosquito breeding and other health and safety issues. At no time shall there be ponding on the surface of the pavement.

Basic Design Information

Hydrology Design Targets

1. The system is porous pavement with storage bed.
2. This system is NOT designed to infiltrate.
3. The design drain time is 72 hours.
4. The elevation of the seasonal high water table of this pavement area was observed 11/28/22 at EL. 19.1 feet.
5. The TSS removal rate is 80%.

Hydraulic Design Targets

1. This system is designed to treat the runoff from the Water Quality Design Storm which generates 2,047 cubic feet of runoff. The peak flow entering the system is 0.89 cubic feet per second.
2. The invert elevation of the overflow outlet is at EL. 22.53 feet.

System Configuration Targets

1. The system has no pretreatment.
2. The depth of uniformly graded coarse aggregate in the storage bed is 17 inches.
3. The top of the system porous pavement.

Critical Maintenance Features

1. Avoid sand or silt onto the porous pavement area.
2. Sweep and vacuum the porous pavement area often to prevent clog.
3. Do not apply sealant to cracks or entire surface.

Visual Aid for Pervious Paving System Inspection



Issue: **Ponding in porous paving areas**

Corrective Action: **Check the permeability rate of the surface and contaminated with sediment.**

Preventative Action: **Routine inspection and surface cleaning, if necessary.**

Reference Documents

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

- As-built Drawings with Drainage Plans (Appendix D)
- Soil Boring Logs (Appendix E)
- Landscaping Plan (Appendix F)
- Liner Specifications and Maintenance Manual (Appendix G)
- Maintenance Manual (Appendix H)

Inspection Checklist / Maintenance Actions Pervious Pavement 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

Component No. Component Name	For Inspector		For Maintenance Crew
	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
A Pavement Surface (Porous Pavement)	1 Standing water is present after the design drain time The observed drain time is approximately _____ hours. Excessive sediment or mud accumulation on top of the pavement	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. If excessive sediment is present, the system may be clogged - Sweep the surface - Power wash (at 45 degree angle to the top) - Vacuum the surface - Excavate to inspect the storage bed for clogging, replace the storage bed material if it is severely clogged - Check the permeability rate of the subsoil Work Order # _____
	2 Cracking, subsidence, spalling, or other damage to the pavement	Y N	Repair according to the manufacturer's procedures and material. See Reference Documents section. Work Order # _____
	3 Weeds or other vegetation on the porous pavement	Y N	Remove the vegetation
Note:			

Component No. Component Name	For Inspector			For Maintenance Crew
	Inspection Item and Inspection Item No.		Result	Preventative / Corrective Maintenance Actions
B Vegetation	1 Vegetation is overgrown		Y__ N__	Remove the vegetation Work Order # _____
C Outlet	1 Clogged overflow outlet		Y__ N__	Clear and remove sediment
	2 Discharge pipe apron is eroded or scoured		Y__ N__	Restabilize the discharge riprap apron 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	A – Pavement Surface (Porous Pavement)	
	B – Outlet	
	C – Vegetation	

Debris, sediment, and trash are handled onsite.

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

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

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 No.** _____, **Component No.** _____ **Inspection Item No.** _____
4. **Required Actions**

Actions	Planned Date	Date Completed

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.

APPENDIX E

- PERVIOUS PAVEMENT MAINTENANCE

Pervious Paving Systems Maintenance

Regular and effective maintenance is crucial to ensure effective pervious paving system performance; in addition, maintenance plans are required for all stormwater management facilities on a major development. In addition to the manufacturer's maintenance requirements, there are a number of required elements in all maintenance plans, pursuant to N.J.A.C. 7:8-5.8; these are discussed in more detail in Chapter 8: Maintenance of Stormwater Management Measures. Furthermore, maintenance activities are required through various regulations, including the New Jersey Pollutant Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A. Specific maintenance requirements for pervious paving systems are presented below; these requirements must be included in the maintenance plan for pervious paving systems.

General Maintenance

- Failure to correctly maintain a pervious paving system will shorten its lifespan or result in system failure; therefore, the maintenance plan must ensure proper training of personnel and include the special equipment necessary in accordance with the industry's or manufacturer's requirements.
- The surface course must be inspected, at least once annually, for cracking, subsidence, spalling, erosion, deterioration and unwanted vegetation. Remedial measures must be taken as soon as possible. Herbicides must not be applied.
- The surface course of a pervious paving system must be vacuum swept, not power swept, at least four times per year. Vacuum sweeping must be followed by either air blowing or high pressure power washing performed in accordance with the specifications recommended for the particular type of system. All dislodged material must be promptly removed.
 - The first annual maintenance must be performed in the spring.
 - Maintenance must additionally be performed in the autumn, after the fallen leaves are collected and removed.
- Each spring, after the last snow or ice event, the infiltration rate of the surface course must be tested in accordance with the methods of either ASTM C1701 or C1781, as corresponds to the post-construction test performed for the system. At least 3 locations must be tested. One of the locations must be in an area where sediment is most likely to be deposited, such as, but not limited to, a parking lot entrance. The other test locations must be evenly spaced across the system surface. The locations and results obtained must be recorded in the maintenance plan for future reference and compared to the as-built testing results as a metric for determining if a system requires corrective action. The chart provided below shows the approximate infiltration rate based upon the time it takes to infiltrate either 8 or 40 pounds of water specified in the above-cited tests. This chart should be included in the maintenance plan for future reference. The infiltration rate, I , is based upon the following calculation:

$$I = (K * M) / (D2 * t), \text{ where}$$

$$K = 126,870 \text{ in-lbs}$$

$$M = \text{water mass, lbs}$$

D = ring diameter = 12 inches
 t = time, in seconds

Test Methods Per ASTM C1701 or C1781		
Time to Infiltrate the Specified Amount of Water (seconds)	Approximate Surface Infiltration Rate (inches per hour)	
	$M = 8$ lbs	$M = 40$ lbs
30	235	1175
60	118	587
100	70.5	352
200	35.2	176
350	20.1	100.7
360	19.6	97.9
380	18.5	92.7
900	7.8	39.2
1760	4.0	20.0
1910	3.7	18.5
3600	2.0	9.8
5400	1.3	6.5
5470	1.3	6.4
6000	1.2	5.9

Take note that should the test be performed with a different quantity of water, the values in the chart above cannot be used.

- Corrective action must be immediately taken to restore the infiltration capacity of the pervious paving system under the following scenarios:
 - Standing water is observed on the surface course; or
 - The testing methods above show an infiltration rate of 20 inches per hour or less for a system designed for quantity control or 6.4 or less for a system designed for water quality control only.
- If mud or sediment is tracked onto the surface course, it must be removed as soon as possible. Removal should take place when all runoff has drained from the surface course.
- Disposal of debris, trash, sediment and other waste material must be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations.

- Under no circumstances may any sealants or coatings be applied to pervious paving systems, except for those approved by the manufacturer to improve surface course resistance to de-icing chemicals or refresh traffic striping.
- Over the lifetime of the surface course, no more than 10% of its surface area may be patched with impervious material such as bituminous asphalt or concrete. All patching must be recorded in the maintenance manual for future reference to prevent exceedance of this maximum.

Storage Bed Drain Time

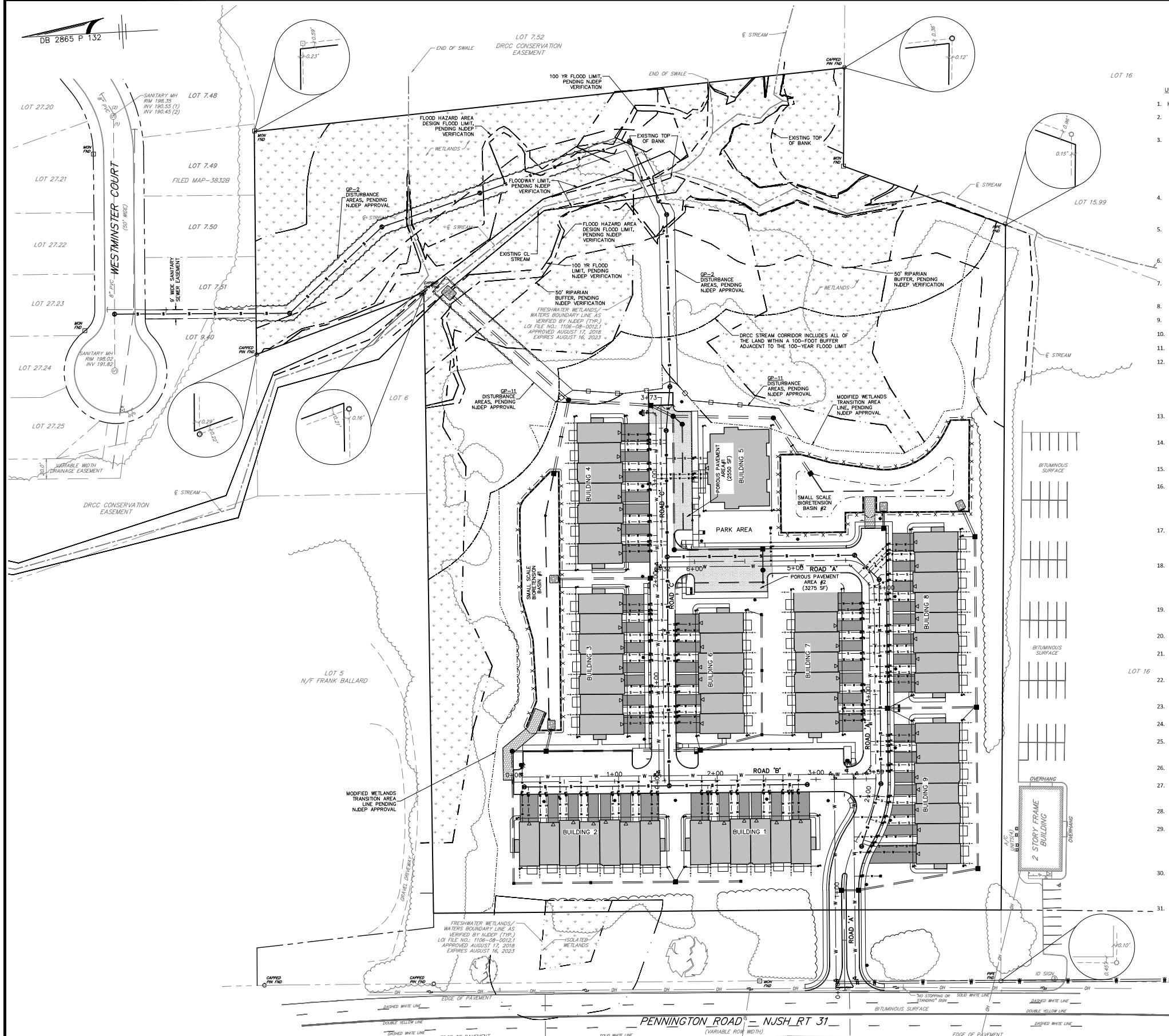
- The approximate drain time for the maximum design storm runoff volume below the top of the surface course must be indicated in the maintenance manual.
- If the actual drain time is significantly different from the design drain time, the components and groundwater levels must be evaluated and appropriate measures taken to return the pervious paving system to minimum and maximum drain time requirements.
- If the system fails to drain the maximum design storm volume within 72 hours, corrective action must be taken.

Cold Weather Maintenance

- Care must be taken when removing snow from the surface course; pervious paving surface courses may be damaged by snowplows or loader buckets set too low to the ground or not equipped with a rubber blade guard. Sand, grit or cinders may not be used on surface courses for snow/ice control.
- De-icing chemicals may not be used on pervious concrete less than one year old.
- De-icers containing magnesium chloride, calcium magnesium acetate or potassium acetate may never be used on pervious concrete.

APPENDIX F

- SITE MAPS



LEGEND

- EXISTING BOUNDARY
- EXISTING CURB
- PROPOSED CURB
- EXISTING BUILDING
- PROPOSED BUILDING
- PROPOSED SIGN
- PROPOSED BACKPACK
- EXISTING ELEV.
- PROPOSED FENCELINE
- 100'-YR WATER SURFACE ELEV.
- 50'-RIPARIAN BUFFER
- FLOOD HAZARD LIMIT
- 100'-YR FLOOD LIMIT
- EXISTING TOP OF BANK
- EXISTING STREAM CL.
- DRCC 100 FT BUFFER CORRIDOR
- BASIN BOTTOM
- PROPOSED RETAINING WALL

40 20 0 40 80 120
30 10
GRAPHIC SCALE
1 inch = 40 feet

MICHIGAN
Engineering Services, Inc.
Engineering, Architecture, Land Surveying

2023 DRAFTS 08/08/2023
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Certificate of Authorization No. 20230808184000
Louis L. Ziegler, P.E., F.N.E., G.N.E., G.N.S.
William J. Parkhill II, P.E.

Sheet Number
9 OF 23

DRAWN BY:	IAB	CHECKED BY:	JMF	RELEASED BY:	
DATE:	07/26/23	HORIZONTAL SCALE:	1-40	VERTICAL SCALE:	N/A
PROJECT No.:	AFR-2203				
DRAWING NAME:	05-Utility				
REVISIONS:	20/11/23				
DATE:					

PRELIMINARY/FINAL MAJOR SITE PLAN
HERITAGE AT HOPEWELL
BLOCK 17, LOT 17
250 PENNINGTON ROAD
OVERALL UTILITY PLAN

SITUATED IN
HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY

DRAWN BY:	IAB	REVISIONS:	IAB
DATE:	07/26/23	REVISIONS:	DRW
PROJECT No.:	AFR-2203	REVISIONS:	BY CHECKED BY
DRAWING NAME:	05-Utility	REVISIONS:	
REVISIONS:		DATE:	

William J. Parkhill II, P.E.
Date: 05/12/2023
PROFESSIONAL DESIGNER
N.J. Reg. No. 000252800

Utility Notes

- Horizontal Datum: NAD 83 Vertical Datum: NAVD 88
- All contractors must call the New Jersey One Call System (800-272-1000) in accordance with the Underground Facilities Control Act Law prior to any subsurface activity.
- Attention to the contractor is directed to the fact that the approximate locations of known utility structures and facilities (including but not limited to sanitary sewers, storm sewers, potable water lines and appurtenances, natural gas lines, electric, telephone and CATV lines and underground storage tanks) that may be encountered within and adjacent to the limits of the work are shown on the plans. The accuracy and completeness of this information is not guaranteed by the engineer, and the contractor is advised to verify in the field all the facts concerning the location of these utilities or other construction obstacles prior to construction. The contractor shall notify the engineer, in writing, prior to construction, of any discrepancies which may affect the project design.
- Contractor to perform test pits to verify existing utility depths, sizes and locations prior to connecting proposed sewer and water mains to existing sewer and water mains. The contractor shall notify the engineer in writing of any conflicts so that design modifications can be made if necessary.
- All construction shall conform to any applicable federal, state and local regulations. Contractor has sole responsibility for site safety and to conform to and abide by all current OSHA standards or regulations. Safe construction practices remain the obligation of the contractor. The contractor shall obtain all applicable federal, state and local permits prior to construction.
- See MEP/Architectural plans for all utility connections to building. All utility connections shall be reviewed & verified by the contractor prior to start of site construction.
- Shop drawings and product catalog information for all water and sanitary sewer structures, conduits, materials, and appurtenances, to be provided to the project engineer for review and approval prior to purchasing.
- All utility service connections to buildings to be located underground.
- Pipe lengths indicated are measured center to center of each structure.
- All sanitary and drainage structures shall be precast concrete unless otherwise specified.
- Refer to water and sanitary sewer technical specifications for material, installation and testing requirements.
- Unless otherwise indicated:
 - RCP shall be Class 3 wall, bell and spigot type with O-ring gaskets.
 - HDPE pipes shall be ADS N-12 with soil tight joints or approved equal.
 - DIP water main shall be Class S2 cement-lined ductile iron pipe (polyethylene encasement).
 - Sanitary sewer mains and laterals shall be PVC SDR-35, push on, gasketed joint (ASTM-D334).
- All new water mains and services shall be installed with a minimum of 4 feet of cover (relative to proposed grade) over the pipe to prevent freezing.
- All new sanitary sewer mains and laterals shall be installed with a minimum of 3 feet of cover (relative to proposed grade) over the pipe to prevent freezing.
- 4" sanitary sewer laterals shall be sloped at 1:48 (2.1%). 6" laterals shall be sloped at 1:96 (1.05%).
- A 10-ft. horizontal distance shall separate water mains and sanitary sewer mains. Where such separation is not possible, the water mains and sanitary sewer mains shall be installed in separate trenches with the water main at least 18 inches above the sewer main. Where such vertical separation is not possible, the sewer main shall be constructed with watertight joints for a distance of 10 feet in either direction of the water main (N.J.A.C. 7:10-11.7(d-5)).
- Adequate structural support of sewers and water lines at all points of crossing shall be provided to prevent excessive deflection, settlement or damage. The crossings shall be arranged such that the joints in the pipes are equidistant and as far apart as possible from the other pipe.
- Where utilities cross beneath existing / proposed water mains or storm and sanitary sewers, the utility contractor shall provide adequate structural support by installing select backfill from the utility to the spring line of the water main or sewer. Select backfill shall be clean sand or NIDOT soil-9 compacted to 95% of the modified proctor aggregate type density ASTM D-698 Method D. It shall extend a minimum of 10 feet each way from the centerline of the crossing.
- Electrical transformer pad specifications, conduit locations and installation to be coordinated with electric company prior to installation.
- Sump pump and foundation drain collection systems to be provided for residential units.
- If the extension of water mains is required, the spacing and location of hydrants will comply with the fire standards of the water purveyor and shall be approved by the township engineer and fire official.
- Electric, telephone, CATV and all other wire-served utility extensions and services shall be installed underground with standards established by the servicing utility company and approved by the township engineer.
- All easements for public purposes shall be dedicated to the township, unless otherwise noted.
- Structural calculations for any oversized drainage structures and the outlet structures should be provided.
- All sanitary sewer facilities on streets where multi-family unit buildings are located shall be privately owned and maintained by the property owner.
- All sanitary sewer facilities on streets not dedicated to the Township shall be privately owned and maintained by the property owner.
- All sanitary sewer lateral cleanouts shall have two way tee-wyes to allow for cleaning, as well as TV inspection equipment to navigate in both directions, toward the main as well as to buildings.
- There shall be no plantings over sanitary sewer lines.
- During the construction, manholes shall remain plugged, using mechanical plugs, isolating all construction site sanitary lines from South Brunswick's sanitary sewer collection system. Prior to plug removal, any water in sanitary sewer lines or manholes shall be pumped out and properly disposed of at a NJDEP approved facility. Copies of all invoices for wastewater disposal shall be forwarded to the Utility Department. Plugs shall remain in place until the Utilities Department approves removal.
- Prior to issuance of cleanouts, all sanitary sewer lines are to be cleaned, followed by a professional video inspection. The video inspection shall show pipe footages and manhole numbers. The camera shall have the ability to pan, showing all pipe joints. A copy of the video inspection shall be provided to the Utility Department for review.
- As-Built Plans shall be provided to the Utilities Department on AutoCAD disc.

DRAWN BY:	IAB	REVISIONS:	IAB
DATE:	07/26/23	REVISIONS:	DRW
PROJECT No.:	AFR-2203	REVISIONS:	BY CHECKED BY
DRAWING NAME:	05-Utility	REVISIONS:	
REVISIONS:		DATE:	

