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STORMWATER MANAGEMENT REPORT
FOR
NEW PROFESSIONAL BUILDING

BLOCK 47 LOTS 2, 3, 5 & 6
#175 HIGHWAY 36

HAZLET TOWNSHIP
MONMOUTH COUNTY, NEW JERSEY

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1.0 INTRODUCTION

The subject property is known and designated as Lots 2, 3, 5 & 6 in Block 47, Hazlet Township, situated along the northerly side of NJ State Highway Route No. 36 and the easterly side of Monro Avenue. The site is an existing developed property with a 2-story building and paved driveway and parking areas. The applicant is proposing to demolish and remove the existing building and existing site improvements then construct a new 2-story building and new driveway and parking area on the subject property. The site is gently sloping where runoff from the existing front yard areas drains toward the street and into existing established drainage patterns; and runoff from the rear yard drains toward the back of the property and offsite into existing established drainage patterns.

This report has been prepared to support the applicant's application for site plan review and to address stormwater management considerations according to HazletTownship's development regulations.

LOT COVERAGE COMPUTATIONS

Total Tract Area = 35,2528 Sf = 0.809 Ac.

Existing Lot Coverage

Existing Building Footprint Area (to be removed) =	1,858 sf
Existing Driveway & Parking Area (to be removed)=	13,182 sf
Existing Walkway Footprint Areas (to be removed)=	600 sf
Total Existing Impervious Coverage =	15,640 sf = 44.4 %

Proposed Lot Coverage

Proposed Building Footprint Area =	4,900 sf
Proposed Driveway & Parking Area =	11,190 sf
Proposed Walkway & Conc. Footprint Areas =	2,625 sf
Total Proposed Impervious Lot Coverage =	18,715 sf = 53.1 %

Proposed Change in Impervious Coverage = 18,715 sf (prop) – 15,640 sf (exist) = 3,075 sf.

Proposed Area of Disturbance = 34,244 sf = 0.79 Ac.

The scope of the project does not propose more than ¼ acre of new impervious coverage nor more than 1 acre of total land disturbance, therefore it does not trigger the minimum threshold requirements to be considered "major development" according to the NJ Department of Environmental Protection rules for Stormwater Management at NJAC 7:8-5 et seq.

The stormwater management design for the project includes providing roof leaders and downspouts around the perimeter of the new building addition with a pipe system that will collect and convey runoff from the new rooftop area to an underground seepage pit on the lot. As demonstrated in this report, the seepage pit ensures that the increase in stormwater runoff volume from pre-construction to post-construction is infiltrated for the 2-year storm. And, the seepage pit provides stormwater storage volume to ensure that stormwater runoff leaving the site for post-construction runoff hydrographs for the 2, 10, and 100-year storms do not exceed at any point in time the pre-construction runoff hydrographs for the same event.

With the scope of the project as redevelopment of existing improvements on an existing building lot in a long-established highway corridor, the impacts on stormwater runoff quality are negligible and additional water quality control measures are not required for the project.

2.0 STORMWATER MANAGEMENT METHODOLOGY & DESIGN

The stormwater management methodology and design for this project provides for an accounting of the pre-construction and post-construction land use and lot coverage within the contributory drainage area; documenting soils types and information from the NRCS Soil Survey data for Monmouth County NJ; documenting the runoff coefficients and time of concentration (tc) for the contributory drainage area; determining the peak rate of runoff for the 2-year, 10-year, and 100-year storm events for each of the drainage areas studied; comparing the results for the pre-construction and post-construction conditions; and documenting compliance with the NJ Department of Environmental Protection rules for Stormwater Management promulgated at NJAC 7:8-5 et seq. The NJ Department of Environmental Protection Stormwater Management rules require design and performance standards for projects that NJDEP considers "major development", which are those projects that disturb more than one acre or increase impervious surface by one-quarter acre or more. These design and performance standards cover water quantity control; water quality control, groundwater recharge control, and soil erosion and sediment control measures for the project. The rules also indicate that to the maximum extent practicable, the design and performance standards shall be met by incorporating non-structural management strategies into the design.

The project is considered infill development within an existing long-established highway corridor. The area surrounding the project site is also developed with a mixture of residential dwellings and commercial buildings.

The stormwater management measures proposed for the site have been designed to meet the water quantity control; water quality control (where necessary), groundwater recharge control, and soil erosion and sediment control measures for the project as set forth in the Stormwater Management Rules promulgated by NJ Department of Environmental Protection at NJAC 7:8-5 et seq and the following guidelines:

- USDA Soil Conservation Service – Urban Hydrology for Small Watersheds - Technical Release 55

- NJDEP – Surface Water Quality Standards – N.J.A.C. 7:9B
- NJDEP – Stormwater and Nonpoint Source Pollution Control – Best Management Practices Manual
- NJ Residential Site Improvement Standards – N.J.A.C. 5:21
- NJ State Soil Conservation Committee – Standards for Soil Erosion and Sediment Control in New Jersey
- USDA – Natural Resources Conservation Service in cooperation with the New Jersey Agricultural Experiment Station – Soil Survey of Monmouth County
- Land Use and Zoning Ordinance for Middletown Township.

Several non-structural stormwater management strategies have been implemented into the design of the site to reduce the impacts of the project and its stormwater runoff on the surrounding environment. The following list demonstrates the strategies employed at the project site:

- The project may be considered infill development in a previously developed area of the site, where there are no areas on the subject property within the anticipated limits of work that are particularly susceptible to erosion or sediment loss;
- Proposed impervious surface area is minimized when comparing the pre-development condition to the proposed development condition, to the maximum permissible lot coverage requirements for the zone district;
- All of the reconstruction activity will occur on lands previously disturbed or on previously improved areas; which serves to minimize new land disturbance including clearing and grading and serves to limit new soil compaction;
- Open areas, maintained lawns and landscape areas will remain on the subject property after development, which serves to break up or disconnect the flow of runoff over impervious surfaces;
- There are no changes anticipated in the time of concentration from pre-construction to post-construction conditions;
- Preventative source controls at drainage inlets, where applicable, helps to keep floatable debris away from the existing drainage system and promotes public awareness;

- Site design features including soil erosion and sediment control measures will be implemented throughout the site during construction activity to minimize or prevent discharge of debris or sediment into existing municipal drainage systems; and
- Soil erosion and sediment control measures include standards for establishing vegetation after land disturbance in accordance with the requirements established under the Soil Erosion and Sediment Control Act and rules.

3.0 SOILS DESCRIPTION

The U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS), in cooperation with the New Jersey Agricultural Experiment Station, has prepared a Soil Survey for Monmouth County, New Jersey. This soils survey contains data regarding soils and shallow subsurface conditions throughout Monmouth County, including the project site in Middletown Township. A review of the Soil Survey map indicates that the site contains the following soils:

Soil Symbol	Soil Name	Hydrologic Soil Group
KhhB	Klej Loamy Sands, Urban Land Complex	A

The Natural Resource Conservation Service has provided information on their website to create a custom Soil Resource Report for the project site. This data documents the Soils Map and the information that it contains; and the map unit descriptions with information on the soil types found at the subject property.

Klej Urban Land Complex soil types are Hydrologic Soils Group A. The soils in this classification are typically comprised of sandy loam to loamy sand, and are typically 6.0 % clay, 87.6 % sand, and 6.4 % silt. The soils are typically considered to be K-4 sandy loam, with a measured permeability range of 6 to 20 inches per hour.

4.0 DRAINAGE AREA STUDY

Pre-construction and post-construction runoff peak flows and hydrographs were developed for the subject property as noted below. Pre-Development and post-development peak flows were generated for the 2, 10, and 100-year storms using the Rational Method with the following formula:

$$Q = C \times i \times A$$

where;

Q = peak discharge, cfs

C = runoff coefficient

i = rainfall intensity, inches per hour, with incremental time of concentration for each storm events; (taken from NJ Residential Site Improvement Standards, NJAC 7:5-21-7.2 Figure 7.2 Rainfall Intensity Curves)

A = tributary drainage area, Ac

Pre-Development Tract Area = 35,252 sf = 0.809 Ac.

Existing Impervious Area = 15,640 sf = 0.359 Ac

Existing Open Space Area = 19,612 sf = 0.450 Ac

Composite Runoff Coefficient, C

$$C = \frac{(0.359 \times 0.99) + (0.450 \times 0.20)}{0.809} = 0.55$$

Rainfall Intensity, i

i_2 = 4.3 in/hr (tc = 10 min)

i_{10} = 5.8 in/hr (tc = 10 min)

i_{100} = 8.0 in/hr (tc = 10 min)

Pre-development Stormwater Runoff, Qpre

Q_2 = 0.55 x 4.3 x 0.809 = 1.91 cfs

Q_{10} = 0.55 x 5.8 x 0.809 = 2.58 cfs

Q_{100} = 0.55 x 8.0 x 0.809 = 3.56 cfs

Pre-development Stormwater Volume, Vpre

The pre-development volume of runoff is determined for this project by applying the peak rate of runoff to a simple hydrograph and then taking the area under the hydrograph curve as follows:

Vpre = 30 min x ½ x 60s/min x Qpre cfs

V_{2pre} = 30 x ½ x 60 x 1.91 = 1,719 cf

V_{10pre} = 30 x ½ x 60 x 2.58 = 2,322 cf

V_{100pre} = 30 x ½ x 60 x 3.56 = 3,204 cf

Post-Development Tract Area = 35,252 sf = 0.809 Ac.

Proposed Impervious Area = 18,715 sf = 0.430 Ac

Proposed Remaining Open Space Area = 16,537 sf = 0.379 Ac

Composite Runoff Coefficient, C

$$C = \frac{(0.430 \times 0.99) + (0.379 \times 0.20)}{0.809} = 0.62$$

Rainfall Intensity, i

i_2 = 4.3 in/hr (tc = 10 min)

i_{10} = 5.8 in/hr (tc = 10 min)

i_{100} = 8.0 in/hr (tc = 10 min)

Post-development Stormwater Runoff, Q

Q_2 = 0.62 x 4.3 x 0.809 = 2.16 cfs

Q_{10} = 0.62 x 5.8 x 0.809 = 2.91 cfs

Q_{100} = 0.62 x 8.0 x 0.809 = 4.01 cfs

Total Anticipated Increase in Stormwater Runoff

Q_2 = 2.16 cfs (post) – 1.91 cfs (pre) = 0.25 cfs

Q_{10} = 2.91 cfs (post) – 2.58 cfs (pre) = 0.33 cfs

Q_{100} = 4.01 cfs (post) – 3.56 cfs (pre) = 0.45 cfs

As shown, there are only imperceptible differences between post-development un-attenuated stormwater runoff and pre-development stormwater runoff. These differences shall be stored and attenuated within the new seepage pit to be constructed on the lot.

Post-development Stormwater Volume, Vpost

Similarly, the post-development volume of runoff is determined for this project by applying the peak rate of runoff to a simple hydrograph and then taking the area under the hydrograph curve as follows:

Vpost = 30 min x ½ x 60s/min x Qpost cfs

V_{2post} = 30 x ½ x 60 x 2.16 = 1,944 cf

V_{10post} = 30 x ½ x 60 x 2.91 = 2,619 cf

$V_{100post}$ = 30 x ½ x 60 x 4.01 = 3,609 cf

Minimum Required Storage Volume, Vreq

Vreq = Vpost – Vpre

$Vreq_{2}$ = 1,944 cf – 1,719 cf = 225 cf

$Vreq_{10}$ = 2,619 cf – 2,322 cf = 297 cf

$Vreq_{100}$ = 3,609 cf – 3,204 cf = 405 cf

Rule of thumb suggests the minimum storage volume to be 1.25 inches x the net increase in impervious area, which tabulates to be:

Min. Vol. = 1.25 inches x 3,075 sf incr. x 1 ft/12 in = 320 cf.

5.0 SEEPAGE PIT VOLUME COMPUTATIONS

The seepage pit selected for this project is one 9'-0"L x 4'-10"W x 71-1/2"D, 2-piece H20 Dry Well Recharge Tank to be set on a 12" thk clean crushed stone bed and surrounded with 2'-0" wide 1" to 2" clean crushed stone, all wrapped with filter fabric material.

Volume of seepage pit

$$\mathbf{Vp = L \times W \times H}$$

Where;

Vp = available storage volume in seepage pit, cubic feet

L = inside length = 8'-0"

W = inside width = 3'-10"

h = height of tank = 71-1/2"

Vp = 8.0 x 3.83 x 5.96 = 182.0-cf per pit

(182.0 cf x 7.48 gallons/cf = 1,360 gallons)

Volume in stone around seepage pit

$$\mathbf{Vs = Vr(L \times W \times h_1)_{Base} + Vr((L \times W \times h_2) - Vp)_{Sides}}$$

Where;

Vs = available storage volume in stone surrounding seepage pit, cubic feet

Vr = void ratio for 2" clean stone = 0.3

L = length of stone base and sides = 13'-0"

W = width of stone base and sides = 8'-10"

h_1 = height of stone base = 1'-0"

h_2 = height of stone sides = 6'-0"

Vs = 0.3(13.0 x 8.83 x 1.0)+0.3((13.0 x 8.83 x 6.00) – 182.0) = 200.0-cf per pit

(200.0 cf x 7.48 gallons/cf = 1,494 gallons)

Total Available Storage Volume,

Vt = (Vp + Vs) = 182.0 + 200.0 = 382.0 cf

(382.0 cf per pit x 7.48 gallons/cf = 2,857 gallons)

The seepage pit provides stormwater recharge to the ground as the primary means of discharge. The project-specific soils data indicates site soils to be K-4 sandy loam with a measured permeability rate in the range of 6 to 20 inches per hour. The release flow rate is set in the context of this report to be 3 inches per hour, which provides for a factor of safety of two from the low end of the permeability range, in order to provide for some conservative measure in the computations. The release flow rate is estimated based on the available storage volume in the chambers and surrounding stone as follows:

Seepage Pit

Q_{out} = (Vt ÷ H) x 10 in/hr ÷ 12 in/ft =

(382 cf/pit ÷ 5.96 ft) x (3 in/hr) ÷ (12 in/ft) = 16.0 cf/hr

TIME TO DRAIN

The total estimated time to drain the seepage pit is calculated as follows:

Total height in seepage pit = 6’-0”

Calculated release flow rate, 3.0 in/hr

Time to drain, Td = 6.0 ft ÷ 3.0 in/hr = 24.0 hrs < 72 hrs, OK.

6.0 GROUNDWATER RECHARGE

As demonstrated above, the site will maintain or provide for more groundwater recharge after constructing the new drainage systems compared to the existing condition. Stormwater runoff from the increased impervious coverage is recharged to the ground for the two-year storm event.

7.0 SOIL EROSION AND SEDIMENT CONTROL

In accordance with the Soil Erosion and Sediment Control Act, soil erosion measures were incorporated into the design and are graphically depicted on the Soil Erosion and Sediment Control Plans for the project. These measures include, but are not limited to:

- Sediment Barriers and Silt Fences
- Stabilized Construction Access
- Topsoil Stockpiles with silt fence protection and temporary vegetative cover
- Storm Sewer Inlet Protection
- Temporary and Permanent Stabilization.

8.0 CONCLUSION

Comparison of the total peak rate of stormwater runoff from the existing conditions and the total peak rate of stormwater runoff from the proposed conditions indicates that there are only imperceptible differences expected for each storm event studied. These differences in runoff are not significant and are stored and attenuated within the proposed seepage pit to be installed on the lot. Therefore post-construction stormwater runoff will not impact existing drainage patterns downstream of the project site differently than existing conditions.

A soil erosion and sediment control plan will be implemented for the project, in conformance with the Stormwater Management rules at NJAC 7:8-5.4.

The stormwater management goals for the project have been met to the maximum extent practicable by incorporating non-structural stormwater management strategies into the design. Therefore, the stormwater runoff quantity, groundwater recharge, water quality and erosion control goals for the project have been met in accordance with the Stormwater Management Rules promulgated by NJ Department of Environmental Protection at NJAC 7:8-5 et seq.

APPENDIX A

SEEPAGE PIT MANUFACTURER'S DETAIL

APPENDIX B

STORMWATER FACILITY
OPERATIONS AND MAINTENANCE MANUAL

SEEPAGE PIT MAINTENANCE PLAN

The seepage pit installation is a self-operating system that will function any time there is flow in the storm drainage collection system. The seepage pit will continue to capture rooftop and yard area runoff effectively up to the deign capacity even during extreme rainfall events when the design capacity may be exceeded. Runoff captured and conveyed to the seepage pit will continue to be stored and recharged to the ground during and after the storm event even when the design capacity is exceeded.

The frequency of cleaning depends on the generation of trash and debris and sediments in the tributary drainage area. Cleanout and preventative maintenance schedules will be determined based on operating experience on an "only as-needed" basis. The unit should be periodically inspected to determine the amount of accumulated sediment and debris and to ensure that the cleanout frequency is adequate for the intended operating purpose. The recommended cleanout of sediment and solids within the storage bed sumps should occur at less than 20% of the sump capacity.

Access to the seepage pit is available by the yard drain inlet on top of the system.

Recommendations:

New Installation – Check the condition of the unit after every rainfall event for the first 30 days. The visual inspection should ascertain that the unit is functioning properly (no blockages or obstructions to inlet for example), measuring the amount of sediment or solid materials that have accumulated in the sump, if any. Remove any debris, branches, or leaf litter from the yard grate.

Ongoing Operation – The unit should be inspected after heavy rainfall events. Floatable debris should be removed and the sump should be cleaned if there is any accumulation of sediment. Remove any debris, branches, or leaf litter from the yard grate.

The seepage pit is a confined space environment. No one but properly trained personnel possessing the necessary safety equipment should enter the unit to perform particular maintenance and/or inspection activities beyond normal procedures. Inspections of the internal components can, in most cases, be accomplished by observations from the ground surface.

Records of Operation and Maintenance

A written operation and maintenance log is not required for this installation. As the seepage pit unit is privately owned and privately maintained, it is up to the homeowner to determine whether operation and maintenance records should be kept.

MAINTENANCE SCHEDULE

JANUARY: Maintenance inspection. Any debris or accumulated sediment in the area of the storage beds shall be removed.

April: Maintenance inspection. Any debris or accumulated sediment in the area of the storage beds shall be removed.

May to November: Grass cutting of lawn and maintenance of yard area above storage beds may be conducted regularly as needed. All clippings shall be removed during or immediately after the mowing process and shall be removed by bag attachment to the mower, hand raking, or leaf vacuum. All clippings shall be disposed of off-site and are not to be left in the area of the storage beds or in a manner where the clippings may enter or clog the operation of the recharge system.

July: Maintenance inspection. Any debris or accumulated sediment in the area of the storage beds shall be removed.

October : Maintenance inspection. Any debris or accumulated sediment in the area of the storage beds shall be removed.

In addition to the above schedule, the seepage pit shall be inspected after every major storm event. Any debris or obstructing objects shall be removed to insure proper operation.

If sediment is at a depth greater than 6” vacuum or manually remove sediment within chambers according to the manufacturer’s maintenance guidelines as outlined above.

If the time to drain the systems becomes noticeably longer than the calculated timeframes listed above for major storm events, or if there is noticeable damage or indication that the storage beds are not functioning properly, corrective maintenance shall be scheduled and conducted as necessary to fix the problem.