# STORMWATER MANAGEMENT REPORT

# Block 14301 – Lots 4 & 7-10 Monroe Township, Gloucester County, New Jersey

Prepared for:

Wood Management, LLC 749 Mullica Hill Road Mullica Hill, NJ 08062

December 7, 2020

Prepared by:

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### PROJECT SUMMARY

The applicant, Wood Management, LLC currently owns Block 14301, Lots 4 and 7-10, which includes approximately  $58\pm$  acres of land within Monroe Township, Gloucester County, New Jersey, which is located within the Business Park (BP) District. Lots 7-9 currently contain a single-family residence as well as wooded areas and some cleared areas with stockpiles of mulch, sand, topsoil, firewood, etc. Existing Lot 4 is currently used for farming and composting. Existing Lot 10 is located is currently a retail building with storage, stormwater management and an area used for mulch manufacturing. North of the site is an existing airport, which include Airport Drive and east of the project is Tuckahoe Road, which fronting on Tuckahoe Road opposite the site is an existing church and single-family residences.

Site improvements for the project consist of 8 proposed self-storage buildings to be located on existing lots 8 and 9 as well as vehicle storage, which will be located on the rear portion of Lot 7. The applicant is proposing to construct an access drive that extends from the existing retail center on Lot 10 through the site to Airport Drive to the north, which will provide access to the vehicle and self-storage areas. A stormwater management basin is also proposed for the improvements and will be located at the rear of lots 7 and 8. The existing residence, which is located on Lot 7, will be subdivided and remain on its own lot along Tuckahoe Road.

This Stormwater Management Report was developed to demonstrate compliance with the requirements of the Monroe Township Land Use Regulations, Gloucester County Land Development Regulations, New Jersey Department of Environmental Protection (NJDEP) at N.J.A.C. 7:8 and the Standards for Soil Erosion and Sediment Control in New Jersey.

#### PRE-DEVELOPMENT CONDITIONS

#### SURFACE COVER/DEVELOPMENT:

The existing project area is mostly wooded areas with some gravel/stone areas with stockpiles. The project drainage area that will be analyzed will be the area that includes the main development, which will be surrounded with a proposed berm. The total area that will be analyzed is approximately 14.2 acres.

#### **TOPOGRAPHY:**

There is a high point located at the northeast area of the proposed area to be developed. The elevation at this location is approximately 164 feet above mean sea level (AMSL). Topography gently slopes away from this area towards the southwest. The lowest elevation is at approximately 146 feet AMSL.

#### **SOIL CONDITIONS:**

Based on information provided in the United States Department of Agriculture, Soil Conservation Service, Soil Survey of Gloucester County, New Jersey, soils within the project area are identified as Aura sandy loam (AugB), Downer loamy sand (DocB) and Woodstown-Glassboro complex (WokA). The Soil Survey classifies these soils as hydrologic group 'B'. Subsurface soil investigations were performed within the project limits on September 7, 2018 and November 2, 2020 for evaluation of general subsurface conditions. Please see the soil test pit data and soil testing information found in Appendix H.

#### **HYDROLOGIC CONDITIONS:**

Under pre-developed conditions, stormwater runoff from the project area flows in two drainage areas in the proposed development area, the first one from the northeast to the southwest, which is identified as Pre DA-1. Pre DA-2 is located at the north end of the site and discharges to the north of the site at Airport Drive. The overall drainage areas total 14.2 acres for the proposed development area. There is also a third (Pre DA-3) area of 1.28 acres that is outside the proposed development.

A summary of the pre-developed peak run-off rates for this watershed is included in Appendix A. Predeveloped drainage area calculations and hydrographs are included in Appendix A. A brief summary of the results is as follows:

Watershed	2 yr. Storm	10 yr. Storm	100 yr. Storm
Pre DA-1	2.22 cfs	8.61 cfs	26.87 cfs
Pre DA-2	0.06 cfs	0.29 cfs	1.04 cfs
Pre DA-3	0.26 cfs	1.26 cfs	4.06 cfs

#### **POST-DEVELOPMENT CONDITIONS**

#### SURFACE COVER/DEVELOPMENT:

The project proposes construction of 8 storage units totaling 76,800 SF, with a vehicle storage area, drive aisles and access areas, stormwater management facilities and other pertinent site improvements. Construction of the new development will result in a reduction in the existing on-site wooded area. Portions of the property not included in the drainage area map will not be disturbed as part of the project and shall remain in their current state. Stormwater management facilities shall be provided within the project limits for the provision of water quantity, quality and recharge control.

#### **TOPOGRAPHY:**

Topography in the project area will be altered as a result of the proposed development, but will be designed to keep the run-off directed in the same general direction. Grading for the developed on-site areas shall be designed so that surface drainage flows to a proposed stormwater management basin. Topography for areas outside the project area shall remain the same as exists in the pre-development condition.

### HYDROLOGIC CONDITIONS:

Stormwater from the developed site will all be directed into a proposed stormwater management basin located in the southwest corner of the proposed development area. Pre-DA areas 1 and 2 (Post DA-1) will be combined into one post developed drainage area and will be directed to the basin via grading and a system of stormwater management swales and a pipe network. Post DA-2, which is the same as Pre DA-3, will also be routed to the proposed basin. Additionally, the outfall from the Basin will discharge to an existing area to the south of the proposed basin area. This stormwater management facility is proposed as an infiltration basin for collection, treatment and attenuation of surface run-off prior to discharge.

Post-developed drainage area calculations and hydrographs are included in Appendix B. A summary of the peak run-off rates to the proposed stormwater management basins are included in Appendix B. A brief summary is as follows:

Watershed	2 yr. Storm	10 yr. Storm	100 yr. Storm
Post DA-1	15.60 cfs	27.39 cfs	50.85 cfs
Post DA-2	0.26 cfs	1.26 cfs	4.06 cfs

#### **DESIGN METHODOLOGY**

### HYDROLOGIC AND HYDRAULIC CALCULATIONS:

The design, construction, and maintenance of stormwater management facilities proposed for the project

will be in accordance with the Monroe Township Land Use Regulations, Gloucester County Land Development Regulations and the Standards for Soil Erosion and Sediment Control in New Jersey. Calculations for pre-development and post-development discharge comparative analysis were prepared using the SCS TR-55 methodology for the 2, 10 and 100 year frequency, 24 hour storm. In accordance with the recommendations of the NJDEP Stormwater Best Management Practices Manual, hydrographs for the impervious and pervious areas within each on-site watershed have been computed separately. The impervious areas consist of all gravel (access drive, parking areas) and concrete surfaces (storage buildings) which are connected to the proposed stormwater collection systems. The pervious areas are comprised of open space and wooded areas. Analysis and design of the stormwater pipe collection systems were prepared using the Rational Method for the 100 year storm.

#### **CALCULATION SOFTWARE:**

The calculations included within this report include hydrologic analysis by HydroCad 10.0. The HydroCad software was used to develop pre-developed and post-developed runoff hydrographs for comparison based on the U.S. Department of Agriculture Soil Conservation Service Technical Release 55 (SCS TR-55) methodology, considering the DelMarVa unit hydrograph for all watersheds. Hydraflow<sup>™</sup> Storm Sewers software by Intelisolve, Inc. was utilized to analyze and design the pipe collection systems using the Rational Method.

#### **RUNOFF COEFFICIENT AND CURVE NUMBER VALUES:**

As described above, soil classifications for use in establishing runoff curve numbers (CN) for each drainage area were taken from the *United States Department of Agriculture, Soil Conservation Service, Soil Survey of Gloucester County, New Jersey.* Evaluation of these maps indicated that the soils within the project area should be analyzed as hydrologic soil group 'B', as defined within the U.S. Department of Agriculture Soil Conservation Service Manual "Urban Hydrology for Small Watersheds", v. 1986. Calculations assume woods and open space in good condition for the pre-developed and post-developed conditions.

Runoff CN values for developing SCS TR-55 hydrographs for the various cover conditions within each watershed were assigned to various surfaces as follows:

Ground Cover	CN Value
Impervious Areas (All Soils)	98
Woods – Good Condition ('B' Soils)	55
<50% Grass Cover – Poor Condition ('B' Soils)	79
Gravel Surface (Milled Areas) ('B' Soils)	96

Runoff coefficients for collection system calculations via the Rational Method were obtained from Table 7.1 of the Residential Site Improvement Standards as follows:

Ground Cover	<u>C Value</u>
Paved Areas/Streets & Roads (All Soils)	0.99
Open Space – Fair Condition ('B' Soils)	0.45
Woods – Fair Condition ('B' Soils)	0.34

### **PIPE FLOW CALCULATIONS:**

Pipe flow calculations have been performed utilizing the Rational Method for estimating run-off to each inlet within the project area. The Manning equation was utilized to study proposed pipe capacities and velocities. Associated calculations determining peak run-off for each drainage area and substantiating capacity to convey peak runoff are provided within the post developed calculations. Determination of the hydraulic grade line (water surface) within the stormwater collection systems are also provided within the pipe flow calculations to demonstrate the anticipated water surface will not extend above the grate/rim elevation of storm structures. The system is designed to convey the 100 year storm so that all run-off is conveyed to the basin.

#### STORMWATER MANAGEMENT BASIN DESIGN:

The proposed stormwater management system for the project area will include the installation of one (1) stormwater basin. Stormwater will be redirected per the proposed grading, but will basically follow the existing flow path. The stormwater management facility is proposed as an infiltration basin with extended detention.

#### Basin

The proposed Basin will be an infiltration basin with extended detention located to the west of the proposed improvements. This basin is designed in accordance with Chapter 9.5 of the BMP Manual with the basin bottom elevation more than 2.5 feet above the seasonal high groundwater elevation to avoid impacts from fluctuations in the static groundwater table. The TSS removal rate is 80% in accordance with the BMP. The peak storage capacity of Basin #1 is approximately 5.206 ac-ft during the 100 -year storm event. Emergency discharge will be provided via a grassed spillway and directed toward the rear of the property, which is owned by the applicant.

Rainfall Event	<b>Basin Inflow</b>	<b>Basin Outflow</b>	Water Surface	Peak Storage
2 year Storm	15.84 cfs	0.28 cfs	147.03 ft.	2.360 ac-ft
10 year Storm	28.33 cfs	4.91 cfs	147.71 ft.	3.198 ac-ft
100 year Storm	53.66 cfs	10.23 cfs	149.39 ft.	5.428 ac-ft

#### **RUNOFF RATE REDUCTION:**

The stormwater management regulations of the NJDEP require that the post-development peak runoff from the disturbed areas of the project be reduced below pre-development rates based on the SCS TR-55 method of stormwater runoff estimation for a 24 hour storm distribution under the 2, 10, and 100 year design storm frequencies. Required reductions are 50%, 75%, and 80% respectively of pre-development peak rates. For the project, three discharge points from the developed portions of the site were analyzed which must comply with the NJDEP rate reduction requirements. A summary of the peak run-off rates comparing the pre-developed rates and total discharge from the project area is as follows:

Storm Event	Pre- Developed Peak Rate (Pre DA-1)	Required Reduction	Reduced Rate (Pre DA-1)	Pre- Developed Peak Rate (DA-3)	Total Allowed (Reduced Rate for DA- 1 & 2)	Post-Developed Peak Rate
2 year	2.22 cfs	50%	1.11 cfs	0.26 cfs	1.37 cfs	0.28 cfs
10 year	8.61 cfs	75%	6.46 cfs	1.26 cfs	7.72 cfs	4.91 cfs
100 year	26.87 cfs	80%	21.50 cfs	4.06 cfs	25.56 cfs	10.23 cfs

### WATER QUALITY:

In order to comply with NJDEP requirements for water quality, measures for addressing and improving water quality of stormwater discharge from the project area have been incorporated into the stormwater management design. Surface run-off from the new impervious areas of the site will be conveyed to the proposed stormwater management basin. Run-off from the water quality design storm shall be treated through infiltration. This treatment process provides the requisite TSS removal rate for the water quality design storm, as specified in the NJDEP Stormwater Best Management Practices Manual. Calculations demonstrating compliance with the applicable water quality requirements of the NJDEP are provided in Appendix C.

The adopted removal rate for infiltration basins per Table 4-1 of the New Jersey Stormwater Best

Management Practices Manual (NJSBMP Manual) is 80% removal of TSS. All rates are evaluated for the Water Quality Design Storm (1.25"/2-hour duration storm event).

The basin is designed with an infiltration area and 6-inch thick sand bottom to provide infiltration and recharge of the water quality design storm. The adopted TSS Removal Ratio for an infiltration structure from Table 4.1 of the NJSBMP Manual = 80%. Since the entire water quality design storm volume (0.531 ac-ft) is retained and infiltrated within Basin #1, 80% TSS removal is achieved.

#### **GROUNDWATER RECHARGE**

NJDEP groundwater recharge requirements have been accommodated in the proposed stormwater management design. Groundwater recharge requirements, in the form of the NJGRS spreadsheet, are included in Appendix D. The proposed infiltration basins will provide sufficient capacity to store and recharge the deficit in the average annual recharge volume calculated in the NJGRS spreadsheet based on the area of proposed impervious coverage for the new site improvements directed to the basin. The NJGRS spreadsheet was given the bottom area, depth, and contributory impervious area for the combined infiltration facilities and the spreadsheet calculated the effective depth necessary to accommodate the total Post Development Annual Recharge Deficit of 127,412 cubic feet. The effective depth was then compared to the design depth to confirm sufficient infiltration capacity was provided.

Per the NJ Stormwater Management Regulations (N.J.A.C. 7:8), 100% of the site's average annual predeveloped groundwater recharge volume must be maintained after development. For groundwater recharge, the infiltration area at the bottom of proposed Basin #1 has been selected with the following dimensions:

Basin #1

Infiltration Capacity =	1.103 ac.ft volume of Basin #1 below elevation 148.29
Depth =	2.0 ft. or 24 inches
Bottom Area =	47,757± square feet
Sand Bed Depth =	6 inches
Depth to $SHWT =$	$\geq$ 2.5 ft.

Utilizing the New Jersey Groundwater Recharge Spreadsheet (NJGRS), infiltration structures with a combined bottom area of 47,757 square feet located approximately 72 inches below existing grade must have a minimum depth of 3 inches to meet the annual BMP recharge requirements for the site. Since the proposed infiltration area of Basin #1 has a proposed depth of  $3\pm$  inches, recharge requirements for the project have been satisfied. In addition, the volumes of the infiltration area in the basin is sufficient to store the entire water quality design storm volume directed to the basin (1.103 ac.-ft.).

An infiltration rate of 4.4 inches/hour has been utilized for Basin #1 which is equivalent to the  $\frac{1}{2}$  of the average rate obtained from laboratory testing of the in-situ subsurface soils. The routing results indicate Basin #1 will drain within 4.9 hours after the time of peak storage for the water quality design storm and 13.97 hours for the 100-year (largest) design storm event, which are both less than the required 72 hours.

### NONSTRUCTURAL STORMWATER MANAGEMENT STRATEGIES

The stormwater management design incorporates nonstructural stormwater strategies to the maximum extent practicable in accordance with the requirements of NJAC 7:8-5.3. The strategies are as follows:

1. The proposed improvements are located on site and are as remote as possible from the existing

state open waters. In addition, the improvements are located so that the surface run-off is contained and will have little chance of causing erosion into the nearby water bodies.

- 2. The proposed driveway and parking lot will be constructed of gravel. In addition, the surface run-off is directed through swales and a sediment forebay prior to flowing into the basin. The forebay, in particular, will help to keep trash and spills from contaminating the main infiltration basins.
- 3. A note has been added to the plans requiring that only low ground pressure vehicles be utilized in the construction of the basins and proposed vegetated areas in order to maintain ground water recharge in those areas.
- 4. Fertilizer application rates are specified in accordance with the Soil Erosion and Sediment Control Standards of New Jersey and those recommended by the local Soil Conservation District.

### SOIL EROSION AND SEDIMENT CONTROL

A comprehensive and coordinated sediment control program will be implemented throughout the construction of the project in accordance with the New Jersey Soil Erosion and Sediment Control Act (Chapter 251, P.L. 1975), which will minimize the disturbance from the stormwater runoff, retard non-point pollution from sediment, and conserve and protect the environmental resources of the State. The Soil Erosion and Sediment Control Plan, as proposed, will be reviewed by the Gloucester County Soil Conservation District for plan certification approval in accordance with New Jersey State requirements.

In accordance with the Standards for Soil Erosion and Sediment Control in New Jersey, conduit outlet protection for all new stormwater outfalls and stable discharge through basin emergency spillways shall be provided. Off-site stability shall be provided by limiting the overall post-developed peak flow at or below pre-developed conditions and demonstrating compliance with the reductions in post-developed discharges for the 2 yr. and 10 yr. storm events. For determination of off-site stability, infiltration within stormwater management basin cannot be considered. The following table summarizes the post-developed discharges from the basin without infiltration and the resulting peak flow rate at the corresponding analysis points when compared to the pre-developed peak flow rate.

Condition	2 yr.	10 yr.
(Pre-Developed)	2.54 cfs	10.16 cfs
Basin 1 (Post-Developed)	0.32 cfs	8.18 cfs

Calculations for the design of conduit outlet protection, emergency spillway stability and the discharges from the basins without infiltration are included in Appendix F.

### **CONCLUSION**

The proposed stormwater management facilities have been designed to minimize the impact to the natural drainage features of the surrounding land uses. Based on the analysis, the project as proposed will have no significant detrimental impact on existing downstream drainage systems. The proposed reduction of run-off rates below pre-developed rates at the overall points of analysis will comply with the NJDEP stormwater requirements. Provisions for groundwater recharge will mitigate loss of pervious land surface areas by allowing groundwater to recharge within stormwater management facilities. Providing groundwater recharge will maintain the health of the nearby water courses and aquifers. Water quality improvements implemented through the proposed basin will preserve the overall water quality of stormwater discharges from the project area.

FIGURES

APPENDIX A PRE-DEVELOPED CALCULATIONS 2 YR. STORM 10 YR. STORM 100 YR. STORM



# Area Listing (all nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
1.540	96	Gravel surface, HSG B (Pre DA-3, Pre-DA 1)
0.070	98	Unconnected roofs, HSG B (Pre DA-3, Pre-DA 1)
5.880	55	Woods, Good, HSG B (Pre DA-2, Pre DA-3, Pre-DA 1)
7.990	58	Woods/grass comb., Good, HSG B (Pre DA-2, Pre DA-3, Pre-DA 1)
15.480	61	TOTAL AREA

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# Soil Listing (all nodes)

Area	Soil	Subcatchment
(acres)	Group	Numbers
0.000	HSG A	
15.480	HSG B	Pre DA-2, Pre DA-3, Pre-DA 1
0.000	HSG C	
0.000	HSG D	
0.000	Other	
15.480		TOTAL AREA

Pre-Dev	
Prepared by DEWBERRY	
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# Ground Covers (all nodes)

HSG-A	HSG-B	HSG-C	HSG-D	Other	Total (acres)	Ground	Subcatchment
0.000	1 540	0.000	0.000	0.000	1 5 4 0		
0.000	1.340	0.000	0.000	0.000	1.340	Graver Surface	Pre-DA 1
0 000	0 070	0 000	0.000	0.000	0 070	Unconnected roofs	Pre DA-3
0.000	0.010	0.000	0.000	0.000	0.010		Pre-DA 1
0.000	5.880	0.000	0.000	0.000	5.880	Woods, Good	Pre DA-2,
							Pre DA-3,
							Pre-DA 1
0.000	7.990	0.000	0.000	0.000	7.990	Woods/grass comb., Good	Pre DA-2,
							Pre DA-3,
							Pre-DA 1
0.000	15.480	0.000	0.000	0.000	15.480	TOTAL AREA	

Pre-Dev	
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Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Pre DA-2: Pre DA-2	Runoff Area=0.570 ac 0.00% Impervious Runoff Depth=0.35" Flow Length=385' Tc=22.8 min CN=57 Runoff=0.06 cfs 0.016 af
Subcatchment Pre DA-3: Pre DA-3	Runoff Area=1.280 ac 3.91% Impervious Runoff Depth=0.42" Flow Length=155' Tc=9.2 min UI Adjusted CN=59 Runoff=0.26 cfs 0.044 af
Subcatchment Pre-DA 1: Pre DA-1	Runoff Area=13.630 ac 0.15% Impervious Runoff Depth=0.49" Flow Length=740' Tc=25.8 min CN=61 Runoff=2.22 cfs 0.556 af
Link Pre 1: Pre 1	Inflow=2.27 cfs 0.573 af Primary=2.27 cfs 0.573 af
Link Total Pre: Total Pre	Inflow=2.47 cfs 0.617 af Primary=2.47 cfs 0.617 af
Total Dupoff Area	45 490 co. Dunoff Valumo 0.647 of Average Dunoff Donth 0.49"

Total Runoff Area = 15.480 ac Runoff Volume = 0.617 af Average Runoff Depth = 0.48" 99.55% Pervious = 15.410 ac 0.45% Impervious = 0.070 ac

### Summary for Subcatchment Pre DA-2: Pre DA-2

Runoff = 0.06 cfs @ 12.68 hrs, Volume= 0.016 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs NOAA 24-hr C 2 Yr Rainfall=3.31"

Area (	(ac) C	N Desc	cription				
0.2	210 5	5 Woo	ds, Good,	HSG B			
0.3	0.360 58 Woods/grass comb., Good, HSG B						
0.5	0.570 57 Weighted Average						
0.5	570	100.	00% Pervi	ous Area			
Тс	Length	Slope	Velocity	Capacity	Description		
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
6.2	70	0.0300	0.19		Sheet Flow,		
					Grass: Short n= 0.150 P2= 3.30"		
10.6	30	0.0100	0.05		Sheet Flow,		
					Woods: Light underbrush n= 0.400 P2= 3.30"		
2.4	100	0.0200	0.71		Shallow Concentrated Flow,		
					Woodland Ky= 5.0 fps		
3.6	185	0.0150	0.86		Shallow Concentrated Flow,		
					Short Grass Pasture Kv= 7.0 fps		
	005	<b>T</b> - ( - 1			·		

22.8 385 Total

### Subcatchment Pre DA-2: Pre DA-2



### Summary for Subcatchment Pre DA-3: Pre DA-3

Runoff = 0.26 cfs @ 12.28 hrs, Volume= 0.044 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs NOAA 24-hr C 2 Yr Rainfall=3.31"

_	Area (	(ac) C	CN Ad	Descrip	tion	
	0.1	750	55	Woods,	Good, HSC	3 B
	0.4	420	58	Woods/	grass comb	o., Good, HSG B
	0.0	050	98	Unconn	ected roofs	, HSG B
_	0.0	060	96	Gravels	surface, HS	G B
	1.2	280	60 59	Weighte	ed Average	, UI Adjusted
	1.2	230		96.09%	Pervious A	rea
	0.0	050		3.91% l	mpervious <i>l</i>	Area
	0.0	050		100.00%	6 Unconneo	cted
	_				<b>.</b> .	- · · · ·
	IC	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	8.2	100	0.0300	0.20		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.30"
	1.0	55	0.0350	0.94		Shallow Concentrated Flow,
_						Woodland Kv= 5.0 fps

9.2 155 Total

### Subcatchment Pre DA-3: Pre DA-3



### Summary for Subcatchment Pre-DA 1: Pre DA-1

Runoff = 2.22 cfs @ 12.63 hrs, Volume= 0.556 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs NOAA 24-hr C 2 Yr Rainfall=3.31"

Area (	(ac) C	N Des	cription		
4.9	920	55 Wo	ods, Good,	HSG B	
0.0	020	98 Unc	connected r	oofs, HSG	В
1.4	480 9	96 Gra	vel surface	, HSG B	
7.2	210	58 Wo	ods/grass o	omb., Goo	d, HSG B
13.0	630 (	61 We	ahted Aver	ade	
13.0	610	99.8	35% Pervio	us Area	
0.0	020	0.15	5% Impervi	ous Area	
0.0	020	100	.00% Unco	nnected	
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	'
11.5	100	0.0130	0.15		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.30"
1.2	57	0.0130	0.80		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
4.5	253	0.0350	0.94		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
2.2	120	0.0170	0.91		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
6.4	210	0.0120	0.55		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
25.8	740	Total			

### Subcatchment Pre-DA 1: Pre DA-1



# Summary for Link Pre 1: Pre 1

Inflow Area	a =	14.200 ac,	0.14% Impervious, I	Inflow Depth = 0.4	8" for 2 Yr event
Inflow	=	2.27 cfs @	12.63 hrs, Volume=	0.573 af	
Primary	=	2.27 cfs @	12.63 hrs, Volume=	• 0.573 af, 1	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs



### Link Pre 1: Pre 1

# Summary for Link Total Pre: Total Pre

Inflow Ar	rea =	15.480 ac,	0.45% Impervious, In	flow Depth = 0.48"	for 2 Yr event
Inflow	=	2.47 cfs @	12.59 hrs, Volume=	0.617 af	
Primary	=	2.47 cfs @	12.59 hrs, Volume=	0.617 af, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

# Link Total Pre: Total Pre



Pre-Dev	NOAA 24-hr C	10
Prepared by DEWBERRY		
HydroCAD® 10.00-19 s/n 05953 © 2016 HydroCAD Software Solutions LLC	)	

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Yr Rainfall=5.11"

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Pre DA-2: Pre DA-2	Runoff Area=0.570 ac 0.00% Impervious Runoff Depth=1.16" Flow Length=385' Tc=22.8 min CN=57 Runoff=0.29 cfs 0.055 af
Subcatchment Pre DA-3: Pre DA-3	Runoff Area=1.280 ac 3.91% Impervious Runoff Depth=1.30" Flow Length=155' Tc=9.2 min UI Adjusted CN=59 Runoff=1.26 cfs 0.138 af
Subcatchment Pre-DA 1: Pre DA-1	Runoff Area=13.630 ac 0.15% Impervious Runoff Depth=1.44" Flow Length=740' Tc=25.8 min CN=61 Runoff=8.61 cfs 1.631 af
Link Pre 1: Pre 1	Inflow=8.90 cfs 1.686 af Primary=8.90 cfs 1.686 af
Link Total Pre: Total Pre	Inflow=9.74 cfs 1.824 af Primary=9.74 cfs 1.824 af
Total Pupoff Area	- 15 490 ac Bunoff Volume - 1 924 of Average Bunoff Depth - 1 41"

Total Runoff Area = 15.480 ac Runoff Volume = 1.824 af Average Runoff Depth = 1.41" 99.55% Pervious = 15.410 ac 0.45% Impervious = 0.070 ac

## Summary for Subcatchment Pre DA-2: Pre DA-2

Runoff = 0.29 cfs @ 12.45 hrs, Volume= 0.055 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs NOAA 24-hr C 10 Yr Rainfall=5.11"

Area (	ac) C	N Desc	cription			
0.2	210 5	5 Woo	ds, Good,	HSG B		
0.、	U.360 58 Woods/grass comb., Good, HSG B					
0.5	0.570 57 Weighted Average					
0.5	570	100.	00% Pervi	ous Area		
Тс	Lenath	Slope	Velocitv	Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)		
6.2	70	0.0300	0.19		Sheet Flow,	
					Grass: Short n= 0.150 P2= 3.30"	
10.6	30	0.0100	0.05		Sheet Flow,	
					Woods: Light underbrush n= 0.400 P2= 3.30"	
2.4	100	0.0200	0.71		Shallow Concentrated Flow,	
					Woodland Ky= 5.0 fps	
3.6	185	0.0150	0.86		Shallow Concentrated Flow.	
0.0			0.00		Short Grass Pasture Kv= 7.0 fps	
	005	<b>T</b> . ( . )			·	

22.8 385 Total

### Subcatchment Pre DA-2: Pre DA-2



### Summary for Subcatchment Pre DA-3: Pre DA-3

Runoff = 1.26 cfs @ 12.21 hrs, Volume= 0.138 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs NOAA 24-hr C 10 Yr Rainfall=5.11"

	Area (	(ac) C	N Ad	j Descrip	tion	
	0.	750	55	Woods,	Good, HSC	G B
	0.4	420	58	Woods/	grass comb	o., Good, HSG B
	0.0	050	98	Unconn	ected roofs	, HSG B
_	0.0	060	96	Gravels	surface, HS	G B
	1.2	280	60 59	Weighte	ed Average	, UI Adjusted
	1.:	230		96.09%	Pervious A	rea
	0.0	050		3.91% l	mpervious <i>i</i>	Area
	0.0	050		100.00%	% Unconneo	cted
	-		<u></u>		<b>o</b>	
	IC	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	8.2	100	0.0300	0.20		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.30"
	1.0	55	0.0350	0.94		Shallow Concentrated Flow,
_						Woodland Kv= 5.0 fps

9.2 155 Total

### Subcatchment Pre DA-3: Pre DA-3



### Summary for Subcatchment Pre-DA 1: Pre DA-1

Runoff = 8.61 cfs @ 12.47 hrs, Volume= 1.631 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs NOAA 24-hr C 10 Yr Rainfall=5.11"

Area	(ac) C	N Des	cription		
4.	920	55 Woo	ods, Good,	HSG B	
0.	020	98 Unc	onnected r	oofs, HSG	В
1.4	480 9	96 Grav	vel surface	, HSG B	
7.	210	58 Woo	ods/grass o	omb., Goo	d, HSG B
13.	630 (	51 Wei	ahted Aver	ade	
13.	610	99.8	5% Pervio	us Area	
0.	020	0.15	% Impervi	ous Area	
0.	020	100	00% Unco	nnected	
Тс	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	'
11.5	100	0.0130	0.15		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.30"
1.2	57	0.0130	0.80		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
4.5	253	0.0350	0.94		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
2.2	120	0.0170	0.91		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
6.4	210	0.0120	0.55		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
25.8	740	Total			

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Hydrograph Runoff 8.61 cfs 9 NOAA 24-hr C 8-10 Yr Rainfall=5.11" 7-Runoff Area=13.630 ac Runoff Volume=1.631 af 6-Flow (cfs) Runoff Depth=1.44" 5-Flow Length=740' 4-Tc=25.8 min 3-CN=61 2-1 0-0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 Time (hours)

### Subcatchment Pre-DA 1: Pre DA-1

# Summary for Link Pre 1: Pre 1

Inflow Are	a =	14.200 ac,	0.14% Impervious,	Inflow Depth = $1.4$	42" for 10 Yr event
Inflow	=	8.90 cfs @	12.47 hrs, Volume	= 1.686 af	
Primary	=	8.90 cfs @	12.47 hrs, Volume	= 1.686 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs



### Link Pre 1: Pre 1

# Summary for Link Total Pre: Total Pre

Inflow A	rea =	15.480 ac,	0.45% Impervious,	Inflow Depth = $1.4$	41" for 10 Yr event
Inflow	=	9.74 cfs @	12.44 hrs, Volume	= 1.824 af	
Primary	=	9.74 cfs @	12.44 hrs, Volume	= 1.824 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

# Link Total Pre: Total Pre



Pre-Dev	NOAA 24-hr C	100 Yr Rair	nfall=8.71"
Prepared by DEWBERRY		Printed	12/7/2020
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Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Pre DA-2: Pre DA-2	Runoff Area=0.570 ac 0.00% Impervious Runoff Depth=3.52" Flow Length=385' Tc=22.8 min CN=57 Runoff=1.04 cfs 0.167 af
Subcatchment Pre DA-3: Pre DA-3	Runoff Area=1.280 ac 3.91% Impervious Runoff Depth=3.76" Flow Length=155' Tc=9.2 min UI Adjusted CN=59 Runoff=4.06 cfs 0.401 af
Subcatchment Pre-DA 1: Pre DA-1	Runoff Area=13.630 ac 0.15% Impervious Runoff Depth=3.99" Flow Length=740' Tc=25.8 min CN=61 Runoff=26.87 cfs 4.537 af
Link Pre 1: Pre 1	Inflow=27.90 cfs 4.704 af Primary=27.90 cfs 4.704 af
Link Total Pre: Total Pre	Inflow=30.59 cfs 5.105 af Primary=30.59 cfs 5.105 af
Total Runoff Area	= 15.480 ac Runoff Volume = 5.105 af Average Runoff Depth = 3.96"

Fotal Runoff Area = 15.480 acRunoff Volume = 5.105 afAverage Runoff Depth = 3.96"99.55% Pervious = 15.410 ac0.45% Impervious = 0.070 ac

### Summary for Subcatchment Pre DA-2: Pre DA-2

Runoff = 1.04 cfs @ 12.39 hrs, Volume= 0.167 af, Depth= 3.52"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs NOAA 24-hr C 100 Yr Rainfall=8.71"

Area (	(ac) C	N Desc	cription				
0.2	0.210 55 Woods, Good, HSG B						
0.3	0.360 58 Woods/grass comb., Good, HSG B						
0.5	570 5	7 Weig	ghted Aver	age			
0.5	570	100.	00% Pervi	ous Area			
Tc	Length	Slope	Velocity	Capacity	Description		
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
6.2	70	0.0300	0.19		Sheet Flow,		
					Grass: Short n= 0.150 P2= 3.30"		
10.6	30	0.0100	0.05		Sheet Flow,		
					Woods: Light underbrush n= 0.400 P2= 3.30"		
2.4	100	0.0200	0.71		Shallow Concentrated Flow,		
					Woodland Kv= 5.0 fps		
3.6	185	0.0150	0.86		Shallow Concentrated Flow,		
					Short Grass Pasture Kv= 7.0 fps		
	205	Tatal					

22.8 385 Total

### Subcatchment Pre DA-2: Pre DA-2



### Summary for Subcatchment Pre DA-3: Pre DA-3

Runoff = 4.06 cfs @ 12.19 hrs, Volume= 0.401 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs NOAA 24-hr C 100 Yr Rainfall=8.71"

	Area (	(ac) C	CN /	Adj	Descript	ion	
	0.	750	55		Woods,	Good, HSC	ЭВ
	0.4	420	58		Woods/g	grass comb	o., Good, HSG B
	0.0	050	98		Unconne	ected roofs	, HSG B
	0.0	060	96		Gravel s	surface, HS	G B
	1.2	280	60	59	Weighte	d Average,	, UI Adjusted
	1.2	230			96.09%	Pervious A	rea
	0.0	050			3.91% Ir	npervious /	Area
	0.0	050			100.00%	6 Unconnec	cted
	т.	1	01			0	Description
	IC	Length	Sic	ppe	Velocity	Capacity	Description
_	(min)	(feet)	(†t	t/ft)	(ft/sec)	(cfs)	
	8.2	100	0.03	300	0.20		Sheet Flow,
							Grass: Short n= 0.150 P2= 3.30"
	1.0	55	0.03	350	0.94		Shallow Concentrated Flow,
_							Woodland Kv= 5.0 fps
			_				

9.2 155 Total

# Subcatchment Pre DA-3: Pre DA-3



### Summary for Subcatchment Pre-DA 1: Pre DA-1

Runoff = 26.87 cfs @ 12.42 hrs, Volume= 4.537 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs NOAA 24-hr C 100 Yr Rainfall=8.71"

Area (	(ac) C	N Des	cription		
4.9	920	55 Woo	ods, Good,	HSG B	
0.0	020	98 Unc	onnected r	oofs, HSG	В
1.4	480	96 Grav	vel surface	, HSG B	
7.2	210	58 Woo	ods/grass o	omb., Goo	d, HSG B
13.	630	61 Wei	ahted Aver	ade	
13.	610	99.8	5% Pervio	us Area	
0.0	020	0.15	% Impervi	ous Area	
0.0	020	100.	00% Unco	nnected	
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	·
11.5	100	0.0130	0.15		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.30"
1.2	57	0.0130	0.80		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
4.5	253	0.0350	0.94		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
2.2	120	0.0170	0.91		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
6.4	210	0.0120	0.55		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
25.8	740	Total			

Hydrograph 30 Runoff 26.87 cfs 28 NOAA 24-hr C 26 100 Yr Rainfall=8.71" 24 22 Runoff Area=13.630 ac 20 Runoff Volume=4.537 af 18 (cts) 16<sup>-1</sup> Runoff Depth=3.99" Flow Length=740' 12 Tc=25.8 min 10 CN=61 8 6 4 2 0-0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 Time (hours)

### Subcatchment Pre-DA 1: Pre DA-1

# Summary for Link Pre 1: Pre 1

Inflow Are	ea =	14.200 ac,	0.14% Impervious,	Inflow Depth = 3	.98" for 100 Yr event
Inflow	=	27.90 cfs @	12.42 hrs, Volume	= 4.704 af	
Primary	=	27.90 cfs @	12.42 hrs, Volume	= 4.704 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs



### Link Pre 1: Pre 1

# Summary for Link Total Pre: Total Pre

Inflow Ar	rea =	15.480 ac,	0.45% Impervious,	Inflow Depth = 3	.96" for 100 Yr event
Inflow	=	30.59 cfs @	12.40 hrs, Volume	= 5.105 af	
Primary	=	30.59 cfs @	12.40 hrs, Volume	= 5.105 af,	, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

# Link Total Pre: Total Pre



APPENDIX B POST-DEVELOPED CALCULATIONS 2 YR. STORM 10 YR. STORM 100 YR. STORM


## Area Listing (all nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
5.920	79	<50% Grass cover, Poor, HSG B (Post-DA 1)
0.060	96	Gravel surface, HSG B (Post DA-2)
6.080	98	Paved parking, HSG B (Post-DA 1)
1.810	98	Unconnected roofs, HSG B (Post DA-2, Post-DA 1)
1.190	55	Woods, Good, HSG B (Post DA-2, Post-DA 1)
0.420	58	Woods/grass comb., Good, HSG B (Post DA-2)
15.480	86	TOTAL AREA

## Soil Listing (all nodes)

Area	Soil	Subcatchment
(acres)	Group	Numbers
0.000	HSG A	
15.480	HSG B	Post DA-2, Post-DA 1
0.000	HSG C	
0.000	HSG D	
0.000	Other	
15.480		TOTAL AREA

Post-Dev	
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# Ground Covers (all nodes)

 HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
 0.000	5.920	0.000	0.000	0.000	5.920	<50% Grass cover, Poor	Post-DA 1
0.000	0.060	0.000	0.000	0.000	0.060	Gravel surface	Post DA-2
0.000	6.080	0.000	0.000	0.000	6.080	Paved parking	Post-DA 1
0.000	1.810	0.000	0.000	0.000	1.810	Unconnected roofs	Post DA-2,
							Post-DA 1
0.000	1.190	0.000	0.000	0.000	1.190	Woods, Good	Post DA-2,
							Post-DA 1
0.000	0.420	0.000	0.000	0.000	0.420	Woods/grass comb., Good	Post DA-2
0.000	15.480	0.000	0.000	0.000	15.480	TOTAL AREA	

Post-Dev	NOAA 24-hr C 2 Yr Rainfall=3.31"
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Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3 Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Post DA-2: Post DA-2	Runoff Area=1.280 ac 3.91% Impervious Runoff Depth=0.42" ow Length=155' Tc=9.2 min UI Adjusted CN=59 Runoff=0.26 cfs 0.044 af
Subcatchment Post-DA 1: Post DA-1	Runoff Area=14.200 ac 55.21% Impervious Runoff Depth=2.18" Flow Length=945' Tc=25.9 min CN=89 Runoff=15.60 cfs 2.582 af
Pond 1P: Basin Primary=	Peak Elev=147.03' Storage=102,820 cf Inflow=15.84 cfs 2.627 af =0.28 cfs 1.238 af Secondary=0.00 cfs 0.000 af Outflow=0.28 cfs 1.238 af
Total Runoff Area =	15.480 ac Runoff Volume = 2.627 af Average Runoff Depth = 2.04" 49.03% Pervious = 7.590 ac 50.97% Impervious = 7.890 ac

#### Summary for Subcatchment Post DA-2: Post DA-2

Runoff = 0.26 cfs @ 12.28 hrs, Volume= 0.044 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 2 Yr Rainfall=3.31"

_	Area (	(ac) (	CN .	Adj	Descript	tion	
	0.	750	55		Woods,	Good, HSC	€B
	0.4	420	58		Woods/g	grass comb	o., Good, HSG B
	0.0	050	98		Unconne	ected roofs	, HSG B
_	0.0	060	96		Gravel s	surface, HS	G B
	1.:	280	60	59	Weighte	ed Average,	UI Adjusted
	1.:	230			96.09%	Pervious A	rea
	0.0	050			3.91% Ir	mpervious /	Area
	0.0	050			100.00%	6 Unconnec	oted
	Tc	Length	Slo	ppe	Velocity	Capacity	Description
_	(min)	(feet)	(ft	t/ft)	(ft/sec)	(cfs)	
	8.2	100	0.03	300	0.20		Sheet Flow,
							Grass: Short n= 0.150 P2= 3.30"
	1.0	55	0.03	350	0.94		Shallow Concentrated Flow,
_							Woodland Kv= 5.0 fps
	9.2	155	Tota	al			

#### Subcatchment Post DA-2: Post DA-2



#### Summary for Subcatchment Post-DA 1: Post DA-1

Runoff = 15.60 cfs @ 12.41 hrs, Volume= 2.582 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 2 Yr Rainfall=3.31"

(ac) (	N Dese	cription		
.440	55 Woo	ds, Good,	HSG B	
.760	98 Unco	onnected r	oofs, HSG	В
6.080	98 Pave	ed parking	, HSG B	
5.920	79 <509	% Grass co	over, Poor,	HSG B
.200	89 Weig	ghted Aver	age	
6.360	44.7	9% Pervio	us Area	
.840	55.2	1% Imperv	ious Area/	
.760	22.4	5% Uncon	nected	
			•	-
Length	Slope	Velocity	Capacity	Description
(feet)	(ft/ft)	(ft/sec)	(cfs)	
70	0.0300	0.19		Sheet Flow,
				Grass: Short n= 0.150 P2= 3.30"
30	0.0100	0.05		Sheet Flow,
400		0.05		Woods: Light underbrush n= 0.400 P2= 3.30"
100	0.0200	0.35		Shallow Concentrated Flow,
05	0.0450	0.00		Forest W/Heavy Litter KV= 2.5 fps
85	0.0150	0.86		Shart Cross Desture Ky 7.0 fps
100	0.0100	2 02		Shallow Concentrated Flow
100	0.0100	2.03		Daved Ky = 20.3 fps
560	0 0050	4 97	8 78	Pine Channel RCP Round 18"
000	0.0000	4.07	0.70	18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'
				n = 0.011 Concrete pipe, straight & clean
945	Total			
	(ac) 0 .440 .760 .080 .200 .200 .360 .840 .760 Length (feet) 70 30 100 85 100 560 945	(ac)         CN         Desc           0.440         55         Woo           .760         98         Unco           0.080         98         Pave           0.920         79         <509	(ac)         CN         Description           0.440         55         Woods, Good,           760         98         Unconnected r           0.080         98         Paved parking           0.920         79         <50% Grass cd	(ac)         CN         Description           0.440         55         Woods, Good, HSG B           .760         98         Unconnected roofs, HSG B           0.80         98         Paved parking, HSG B           0.920         79         <50% Grass cover, Poor,

0-



0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 Time (hours)

### Subcatchment Post-DA 1: Post DA-1

NOAA 24-hr C 2 Yr Rainfall=3.31"

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## Summary for Pond 1P: Basin

Inflow Area	=	15.480 ac, 5	50.97% Imp	ervious, Inflow	v Depth = 2.	04" for 2 Yr	event
Inflow =	=	15.84 cfs @	12.41 hrs,	Volume=	2.627 af		
Outflow =	=	0.28 cfs @	24.46 hrs,	Volume=	1.238 af,	Atten= 98%,	Lag= 723.5 min
Primary =	=	0.28 cfs @	24.46 hrs,	Volume=	1.238 af		
Secondary =	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3 Peak Elev= 147.03' @ 24.46 hrs Surf.Area= 53,373 sf Storage= 102,820 cf

Plug-Flow detention time= 1,794.0 min calculated for 1.238 af (47% of inflow) Center-of-Mass det. time= 1,669.8 min (2,518.3 - 848.5)

Volume	Invert	Avail.Stor	age Storage	Description
#1	145.00'	321,75	57 cf Custom	Stage Data (Prismatic) Listed below (Recalc)
Elevatio	ຸ Su	rf.Area	Inc.Store	Cum.Store
(teet	)	(sq-ft)	(cubic-feet)	(cubic-feet)
145.00	<b>)</b>	47,757	0	0
146.00	C	50,484	49,121	49,121
147.00	C	53,276	51,880	101,001
148.00	C	56,130	54,703	155,704
149.00	C	59,048	57,589	213,293
150.00	C	62,030	60,539	273,832
150.50	C	63,545	31,394	305,225
150.7	5	68,708	16,532	321,757
Device	Routing	Invert	Outlet Device	es
#1	Primary	145.00'	18.0" Round	IRCP_Round 18"
	-		L= 560.0' RC	CP, rounded edge headwall, Ke= 0.100
			Inlet / Outlet I	Invert= 145.00' / 143.50' S= 0.0027 '/' Cc= 0.900
			n= 0.011 Cor	ncrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	147.50'	42.0" x 48.0"	Horiz. Orifice/Grate C= 0.600
			Limited to we	er flow at low heads
#3	Device 1	145.48'	3.0" Vert. Ori	ifice/Grate C= 0.600
#4	Secondary	149.75'	40.0' long x '	10.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0	0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English	h) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
Primary OutFlow Max=0.28 cfs @ 24.46 hrs HW=147.03' (Free Discharge)				

-2=Orifice/Grate (Controls 0.00 cfs)

-3=Orifice/Grate (Orifice Controls 0.28 cfs @ 5.76 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=145.00' (Free Discharge)

#### Pond 1P: Basin



Post-Dev	NOAA 24-hr C	10 Yr Raiı	nfall=5.11"
Prepared by DEWBERRY		Printed	12/7/2020
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Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3 Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Post DA-2: Post DA	-2 Runoff Area=1.280 ac 3.91% Impervious Runoff Depth=1.30" Flow Length=155' Tc=9.2 min UI Adjusted CN=59 Runoff=1.26 cfs 0.138 af
Subcatchment Post-DA 1: Post DA	Runoff Area=14.200 ac 55.21% Impervious Runoff Depth=3.88" Flow Length=945' Tc=25.9 min CN=89 Runoff=27.39 cfs 4.588 af
Pond 1P: Basin Prima	Peak Elev=147.71' Storage=139,295 cf Inflow=28.33 cfs 4.727 af ary=4.91 cfs 2.916 af Secondary=0.00 cfs 0.000 af Outflow=4.91 cfs 2.916 af
Total Runoff Are	a = 15.480 ac Runoff Volume = 4.727 af Average Runoff Depth = 3.66" 49.03% Pervious = 7.590 ac 50.97% Impervious = 7.890 ac

#### Summary for Subcatchment Post DA-2: Post DA-2

Runoff = 1.26 cfs @ 12.21 hrs, Volume= 0.138 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 10 Yr Rainfall=5.11"

	Area (	(ac) C	N Adj	Descrip	tion	
	0.1	750	55	Woods,	Good, HSC	G B
	0.4	420	58	Woods/	grass comb	o., Good, HSG B
	0.0	050 9	98	Unconn	ected roofs	, HSG B
_	0.0	060	96	Gravel s	surface, HS	G B
	1.2	280 (	50 59	Weighte	ed Average	, UI Adjusted
	1.2	230		96.09%	Pervious A	rea
	0.0	050		3.91% li	mpervious <i>i</i>	Area
	0.0	050		100.00%	6 Unconneo	cted
	-		0		<b>o</b>	
	IC	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	8.2	100	0.0300	0.20		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.30"
	1.0	55	0.0350	0.94		Shallow Concentrated Flow,
_						Woodland Kv= 5.0 fps
	~ ~		<b>T</b>			

9.2 155 Total

#### Subcatchment Post DA-2: Post DA-2



#### Summary for Subcatchment Post-DA 1: Post DA-1

Runoff = 27.39 cfs @ 12.40 hrs, Volume= 4.588 af, Depth= 3.88"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 10 Yr Rainfall=5.11"

_	Area	(ac) C	N Desc	cription				
	0.	440 5	5 Woo	ds, Good,	HSG B			
	1.760 98 Unconnected roofs, HSG B							
	6.	080 9	8 Pave	ed parking	, HSG B			
_	5.	920 7	<u>′9 &lt;50%</u>	% Grass co	over, Poor,	HSG B		
	14.	200 8	9 Weig	ghted Aver	age			
	6.	360	44.7	9% Pervio	us Area			
	7.	840	55.2	1% Imperv	vious Area			
	1.	760	22.4	5% Uncon	nected			
	Тс	Length	Slope	Velocity	Capacity	Description		
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
	6.2	70	0.0300	0.19		Sheet Flow,		
						Grass: Short n= 0.150 P2= 3.30"		
	10.6	30	0.0100	0.05		Sheet Flow,		
						Woods: Light underbrush n= 0.400 P2= 3.30"		
	4.7	100	0.0200	0.35		Shallow Concentrated Flow,		
						Forest w/Heavy Litter Kv= 2.5 fps		
	1.7	85	0.0150	0.86		Shallow Concentrated Flow,		
						Short Grass Pasture Kv= 7.0 fps		
	0.8	100	0.0100	2.03		Shallow Concentrated Flow,		
	4.0	500	0.0050	4.07	0.70	Paved Kv= 20.3 fps		
	1.9	560	0.0050	4.97	8.78	Pipe Channel, RCP_Round 18"		
						18.0° Kound Area= 1.8 st Perim= 4.7° r= 0.38°		
_						n= 0.011 Concrete pipe, straight & clean		
	25.9	945	Iotal					



#### Subcatchment Post-DA 1: Post DA-1

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## Summary for Pond 1P: Basin

Inflow Area	=	15.480 ac, 5	0.97% Impe	ervious, Inflo	w Depth = 3.0	66" for 10 Y	'r event
Inflow	=	28.33 cfs @	12.39 hrs,	Volume=	4.727 af		
Outflow	=	4.91 cfs @	14.15 hrs,	Volume=	2.916 af,	Atten= 83%,	Lag= 105.5 min
Primary	=	4.91 cfs @	14.15 hrs,	Volume=	2.916 af		
Secondary	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3 Peak Elev= 147.71' @ 14.15 hrs Surf.Area= 55,289 sf Storage= 139,295 cf

Plug-Flow detention time= 1,062.3 min calculated for 2.914 af (62% of inflow) Center-of-Mass det. time= 956.9 min (1,789.1 - 832.2)

Volume	Invert	Avail.Stor	rage Storage	e Description			
#1	145.00'	321,75	57 cf Custom	n Stage Data (Prismatic) Listed below (Recalc)			
Elevatio	on Su	urf.Area	Inc.Store	Cum.Store			
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)			
145.0	00	47,757	0	0			
146.0	00	50,484	49,121	49,121			
147.0	00	53,276	51,880	101,001			
148.0	00	56,130	54,703	155,704			
149.0	00	59,048	57,589	213,293			
150.0	00	62,030	60,539	273,832			
150.5	50	63,545	31,394	305,225			
150.7	'5	68,708	16,532	321,757			
Device	Routing	Invert	Outlet Device	es			
#1	Primary	145.00'	18.0" Round	d RCP_Round 18"			
	-		L= 560.0' RC	CP, rounded edge headwall, Ke= 0.100			
			Inlet / Outlet I	Invert= 145.00' / 143.50' S= 0.0027 '/' Cc= 0.900			
			n= 0.011 Cor	ncrete pipe, straight & clean, Flow Area= 1.77 sf			
#2	Device 1	147.50'	42.0" x 48.0"	Horiz. Orifice/Grate C= 0.600			
			Limited to we	eir flow at low heads			
#3	Device 1	145.48'	3.0" Vert. Ori	ifice/Grate C= 0.600			
#4	Secondary	149.75'	40.0' long x '	10.0' breadth Broad-Crested Rectangular Weir			
			Head (feet) C	0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60			
			Coef. (Englisl	sh) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64			
Primary	Primary OutFlow Max=4.91 cfs @ 14.15 hrs HW=147.71' (Free Discharge)						
· · · · · ·				· · · · · · · · · · · · · · · · · · ·			

1=RCP\_Round 18" (Passes 4.91 cfs of 8.03 cfs potential flow)
2=Orifice/Grate (Weir Controls 4.57 cfs @ 1.48 fps)

**3=Orifice/Grate** (Orifice Controls 0.34 cfs @ 6.98 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=145.00' (Free Discharge)

#### Pond 1P: Basin



Post-Dev /	NOAA 24-hr C 100 Yr Rainfall=8.71
Prepared by DEWBERRY	Printed 12/7/2020
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Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3 Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Post DA-2: Post DA	<b>2</b> Runoff Area=1.280 ac 3.91% Impervious Runoff Depth=3.76" Flow Length=155' Tc=9.2 min UI Adjusted CN=59 Runoff=4.06 cfs 0.401 af
Subcatchment Post-DA 1: Post DA	-1 Runoff Area=14.200 ac 55.21% Impervious Runoff Depth=7.38" Flow Length=945' Tc=25.9 min CN=89 Runoff=50.85 cfs 8.738 af
Pond 1P: Basin Primary	Peak Elev=149.39' Storage=236,442 cf Inflow=53.66 cfs 9.139 af =10.23 cfs 7.319 af Secondary=0.00 cfs 0.000 af Outflow=10.23 cfs 7.319 af
Total Runoff Area	a = 15.480 ac Runoff Volume = 9.139 af Average Runoff Depth = 7.08" 49.03% Pervious = 7.590 ac 50.97% Impervious = 7.890 ac

#### Summary for Subcatchment Post DA-2: Post DA-2

Runoff = 4.06 cfs @ 12.19 hrs, Volume= 0.401 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 100 Yr Rainfall=8.71"

_	Area (	ac) C	N Adj	Descrip	tion				
	0.	750	55	Woods,	Woods, Good, HSG B				
	0.4	420	58	Woods/	grass comb	o., Good, HSG B			
	0.0	050	98	Unconn	ected roofs	, HSG B			
_	0.0	060	96	Gravels	surface, HS	G B			
	1.2	280	60 59	Weighte	ed Average	, UI Adjusted			
	1.:	230		96.09%	Pervious A	rea			
	0.0	050		3.91% l	3.91% Impervious Area				
	0.0	050		100.00%	6 Unconneo	oted			
	Тс	Length	Slope	Velocity	Capacity	Description			
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)				
	8.2	100	0.0300	0.20		Sheet Flow,			
						Grass: Short n= 0.150 P2= 3.30"			
	1.0	55	0.0350	0.94		Shallow Concentrated Flow,			
_						Woodland Kv= 5.0 fps			
	9.2	155	Total						

### Subcatchment Post DA-2: Post DA-2



#### Summary for Subcatchment Post-DA 1: Post DA-1

Runoff = 50.85 cfs @ 12.39 hrs, Volume= 8.738 af, Depth= 7.38"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 100 Yr Rainfall=8.71"

_	Area	(ac) C	N Desc	cription				
	0.	440 5	5 Woo	ds, Good,	HSG B			
	1.760 98 Unconnected roofs, HSG B							
	6.	080 9	8 Pave	ed parking	, HSG B			
_	5.	920 7	<u>′9 &lt;50%</u>	% Grass co	over, Poor,	HSG B		
	14.	200 8	9 Weig	ghted Aver	age			
	6.	360	44.7	9% Pervio	us Area			
	7.	840	55.2	1% Imperv	vious Area			
	1.	760	22.4	5% Uncon	nected			
	Тс	Length	Slope	Velocity	Capacity	Description		
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
	6.2	70	0.0300	0.19		Sheet Flow,		
						Grass: Short n= 0.150 P2= 3.30"		
	10.6	30	0.0100	0.05		Sheet Flow,		
						Woods: Light underbrush n= 0.400 P2= 3.30"		
	4.7	100	0.0200	0.35		Shallow Concentrated Flow,		
	. –					Forest w/Heavy Litter Kv= 2.5 fps		
	1.7	85	0.0150	0.86		Shallow Concentrated Flow,		
						Short Grass Pasture Kv= 7.0 fps		
	0.8	100	0.0100	2.03		Shallow Concentrated Flow,		
		500	0 0050	4.07	0.70	Paved Kv= 20.3 fps		
	1.9	560	0.0050	4.97	8.78	Pipe Channel, RCP_Round 18"		
						18.0" Round Area= 1.8 st Perim= $4.7$ r= $0.38$		
_		- <i>t</i> =				n= 0.011 Concrete pipe, straight & clean		
	25.9	945	Iotal					



#### Subcatchment Post-DA 1: Post DA-1

## Summary for Pond 1P: Basin

Inflow Area	=	15.480 ac, 5	0.97% Impervious	Inflow Depth =	7.08" for	100 Yr event
Inflow	=	53.66 cfs @	12.38 hrs, Volume	e= 9.139 a	af	
Outflow	=	10.23 cfs @	13.99 hrs, Volume	e= 7.319 a	af, Atten= 8	31%, Lag= 96.3 min
Primary	=	10.23 cfs @	13.99 hrs, Volume	e= 7.319 a	af	
Secondary	=	0.00 cfs @	0.00 hrs, Volum	e= 0.000 a	af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3 Peak Elev= 149.39' @ 13.99 hrs Surf.Area= 60,206 sf Storage= 236,442 cf

Plug-Flow detention time= 563.2 min calculated for 7.314 af (80% of inflow) Center-of-Mass det. time= 486.2 min (1,300.8 - 814.6)

Volume	Invert	Avail.Sto	rage Storage	Description			
#1	145.00'	321,75	57 cf Custom	Stage Data (Prismatic) Listed below (Recalc)			
Elevation	Su	rf.Area	Inc.Store	Cum.Store			
(feet)		(sq-ft)	(cubic-feet)	(cubic-feet)			
145.00		47,757	0	0			
146.00		50,484	49,121	49,121			
147.00		53,276	51,880	101,001			
148.00		56,130	54,703	155,704			
149.00		59,048	57,589	213,293			
150.00		62,030	60,539	273,832			
150.50		63,545	31,394	305,225			
150.75		68,708	16,532	321,757			
Device R	outing	Invert	Outlet Devices	S			
#1 P	rimary	145.00'	18.0" Round	RCP_Round 18"			
			L= 560.0' RC	CP, rounded edge headwall, Ke= 0.100			
			Inlet / Outlet Ir	nvert= 145.00' / 143.50' S= 0.0027 '/' Cc= 0.900			
			n= 0.011 Con	ncrete pipe, straight & clean, Flow Area= 1.77 sf			
#2 D	evice 1	147.50'	42.0" x 48.0" l	Horiz. Orifice/Grate C= 0.600			
			Limited to wei	ir flow at low heads			
#3 D	evice 1	145.48'	3.0" Vert. Orif	fice/Grate C= 0.600			
#4 S	econdary	149.75'	40.0' long x 1	10.0' breadth Broad-Crested Rectangular Weir			
			Head (feet) 0.	).20 0.40 0.60 0.80 1.00 1.20 1.40 1.60			
			Coef. (English	n) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64			
Primary OutFlow Max=10.23 cfs @ 13.99 hrs HW=149.39' (Free Discharge) 1=RCP_Round 18" (Barrel Controls 10.23 cfs @ 5.79 fps) 2=Orifice/Grate (Passes < 92.63 cfs potential flow) 3=Orifice/Grate (Passes < 0.46 cfs potential flow)							
Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=145.00' (Free Discharge)							

**4-4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

#### Pond 1P: Basin



# APPENDIX C

WATER QUALITY CALCULATIONS (N.J.A.C. 7:8)



## Area Listing (all nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
5.920	79	<50% Grass cover, Poor, HSG B (Post-DA 1)
0.060	96	Gravel surface, HSG B (Post DA-2)
6.080	98	Paved parking, HSG B (Post-DA 1)
1.810	98	Unconnected roofs, HSG B (Post DA-2, Post-DA 1)
1.190	55	Woods, Good, HSG B (Post DA-2, Post-DA 1)
0.420	58	Woods/grass comb., Good, HSG B (Post DA-2)
15.480	86	TOTAL AREA

## Soil Listing (all nodes)

Area	Soil	Subcatchment
(acres)	Group	Numbers
0.000	HSG A	
15.480	HSG B	Post DA-2, Post-DA 1
0.000	HSG C	
0.000	HSG D	
0.000	Other	
15.480		TOTAL AREA

Post-Dev	
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# Ground Covers (all nodes)

 HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
 0.000	5.920	0.000	0.000	0.000	5.920	<50% Grass cover, Poor	Post-DA 1
0.000	0.060	0.000	0.000	0.000	0.060	Gravel surface	Post DA-2
0.000	6.080	0.000	0.000	0.000	6.080	Paved parking	Post-DA 1
0.000	1.810	0.000	0.000	0.000	1.810	Unconnected roofs	Post DA-2,
							Post-DA 1
0.000	1.190	0.000	0.000	0.000	1.190	Woods, Good	Post DA-2,
							Post-DA 1
0.000	0.420	0.000	0.000	0.000	0.420	Woods/grass comb., Good	Post DA-2
0.000	15.480	0.000	0.000	0.000	15.480	TOTAL AREA	

Post-Dev	NJ E
Prepared by DEWBERRY	
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Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3 Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Post DA-2: Post DA-2	Runoff Area=1.280 ac 3.91% Impervious Runoff Depth=0.00" Flow Length=155' Tc=9.2 min UI Adjusted CN=59 Runoff=0.00 cfs 0.000 af
Subcatchment Post-DA 1: Post DA-1	Runoff Area=14.200 ac 55.21% Impervious Runoff Depth=0.45" Flow Length=945' Tc=25.9 min CN=89 Runoff=6.05 cfs 0.532 af
Pond 1P: Basin Primary	Peak Elev=145.48' Storage=23,154 cf Inflow=6.05 cfs 0.532 af =0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Total Runoff Area	= 15.480 ac Runoff Volume = 0.532 af Average Runoff Depth = 0.41" 49.03% Pervious = 7.590 ac 50.97% Impervious = 7.890 ac

#### Summary for Subcatchment Post DA-2: Post DA-2

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NJ DEP 2-hr WQ Rainfall=1.25"

	Area	(ac) (	CN	Adj	Descript	ion	
	0.	750	55		Woods,	Good, HSC	€B
	0.4	420	58		Woods/g	grass comb	o., Good, HSG B
	0.	050	98		Unconne	ected roofs	, HSG B
_	0.	060	96		Gravel s	surface, HS	G B
	1.:	280	60	59	Weighte	d Average,	UI Adjusted
	1.:	230			96.09%	Pervious A	rea
	0.	050			3.91% Ir	npervious /	Area
	0.	050			100.00%	6 Unconnec	oted
	Та	Longth		None	Valacity	Consoitu	Description
	(min)	(foot)	3	sope /ft/ft)			Description
_	0.0	100	0	0200	0.20	(013)	Shoot Flow
	0.2	100	0.0	0300	0.20		Sileel Flow, Cross: Short, $p = 0.150$ , $D2 = 2.20$ "
	10	55		0250	0.04		Shallow Concentrated Flow
	1.0	55	0.0	0350	0.94		Woodland Ky 5.0 fno
_			-				
	9.2	155	Тс	otal			

#### Subcatchment Post DA-2: Post DA-2



#### Summary for Subcatchment Post-DA 1: Post DA-1

Runoff = 6.05 cfs @ 1.43 hrs, Volume= 0.532 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NJ DEP 2-hr WQ Rainfall=1.25"

Area	(ac) C	N Desc	cription		
0.	440 5	5 Woo	ds, Good,	HSG B	
1.	760 9	8 Unco	onnected r	oofs, HSG	В
6.	080 9	8 Pave	ed parking	, HSG B	
5.	920 7	<u>′9 &lt;50%</u>	% Grass co	over, Poor,	HSG B
14.	200 8	89 Weig	ghted Aver	age	
6.	360	44.7	9% Pervio	us Area	
7.	840	55.2	1% Imperv	ious Area/	
1.	760	22.4	5% Uncon	nected	
_					<b>–</b> 1.4
IC	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.2	70	0.0300	0.19		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.30"
10.6	30	0.0100	0.05		Sheet Flow,
	400		0.05		Woods: Light underbrush n= 0.400 P2= 3.30"
4.7	100	0.0200	0.35		Shallow Concentrated Flow,
4 7	05	0.0450	0.00		Forest W/Heavy Litter KV= 2.5 tps
1.7	85	0.0150	0.80		Shart Cross Desture 164 70 free
0.0	100	0.0100	2 02		Shallow Concentrated Flow
0.0	100	0.0100	2.03		Povod Ky = 20.3 fps
10	560	0 0050	1 07	8 78	Pine Channel RCP Round 18"
1.5	500	0.0000	4.37	0.70	18.0" Round Area 1.8 sf Perim $4.7$ ' r $0.38$ '
					n=0.011 Concrete pipe straight & clean
25.9	945	Total			
25.9	945	Total			n= 0.011 Concrete pipe, straight & clean

#### Hydrograph Runoff 6.05 cfs NJ DEP 2-hr 6 WQ Rainfall=1.25" 5-Runoff Area=14.200 ac Runoff Volume=0.532 af 4 Flow (cfs) Runoff Depth=0.45" Flow Length=945' 3-Tc=25.9 min 2-**CN=89** 1 0 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 Time (hours)

#### Subcatchment Post-DA 1: Post DA-1

## Summary for Pond 1P: Basin

Inflow Area	=	15.480 ac, 50	.97% Impervious, Inflo	w Depth = 0.41"	for WQ event
Inflow :	=	6.05 cfs @	1.43 hrs, Volume=	0.532 af	
Outflow :	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atte	n= 100%, Lag= 0.0 min
Primary =	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Secondary :	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3 Peak Elev= 145.48' @ 4.90 hrs Surf.Area= 49,061 sf Storage= 23,154 cf

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

Volume	Invert	Avail.Sto	rage Storage	e Description	
#1	145.00'	321,75	57 cf Custom	n Stage Data (Prismatic) Listed below (Recalc)	
Elevatio	n Su	urf.Area	Inc.Store	Cum.Store	
(fee	t)	(sq-ft)	(cubic-feet)	(cubic-feet)	
145.0	0	47,757	0	0	
146.0	0	50,484	49,121	49,121	
147.0	0	53,276	51,880	101,001	
148.0	0	56,130	54,703	155,704	
149.0	0	59,048	57,589	213,293	
150.0	0	62,030	60,539	273,832	
150.5	0	63,545	31,394	305,225	
150.7	5	68,708	16,532	321,757	
Device	Routing	Invert	Outlet Device	es	
#1	Primary	145.00'	18.0" Round	d RCP_Round 18"	
			L= 560.0' R0	CP, rounded edge headwall, Ke= 0.100	
			Inlet / Outlet I	Invert= 145.00' / 143.50' S= 0.0027 '/' Cc= 0.900	
			n= 0.011 Cor	oncrete pipe, straight & clean, Flow Area= 1.77 sf	
#2	Device 1	147.50'	42.0" x 48.0"	'Horiz. Orifice/Grate C= 0.600	
			Limited to we	eir flow at low heads	
#3	Device 1	145.48'	3.0" Vert. Ori	ifice/Grate C= 0.600	
#4	Secondary	149.75'	40.0' long x '	10.0' breadth Broad-Crested Rectangular Weir	
			Head (feet) C	0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60	
			Coef. (Englisl	sh) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64	
Primary 1=RC	OutFlow M P_Round 1 Orifice/Grat	lax=0.00 cfs ( 8" (Controls)	2 0.00 hrs HW 0.00 cfs)	V=145.00' (Free Discharge)	

**-3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=145.00' (Free Discharge)

#### Pond 1P: Basin



# **APPENDIX D** GROUNDWATER RECHARGE

		ea averages)	arameters Calculations (ar	iency Pa	<b>Recharge Effici</b>		ill not be	ries. Rows with A=0 wi	on't leave blank rows (with A=0) in between your segment ent	downward. Doi	and proceed
	(cubic feet)	273,598	ual Recharge Deficit=	ent Ann	ost-Developm	٩	of the table	oil. Start from the top	st enter the area, then select TR-55 Land Cover, then select \$	segment, first	For each lanc
341,51	Total Impervious Area (sq.ft)	100%	∍charge to Preserve =	Annual Re	of Pre-Developed	%		ditions Tables	Pre-Development and Post-Development Con	to fill the I	Procedure
278,25	5.4	ion ↓	ge Requirements Calculat	Rechar	Annual	551,855	10.7				
I otal Annual Recharge (cu.ft)	l otal Annual Recharge (in)			14.2	Total =	I otal Annual Recharge (cu-ft)	I otal Annual Recharge (in)			14.2	Total =
				0	15	1				0	15
				0	14					0	14
				0	13					0	13
				0	12					0	12
				0	11					0	11
				0	10					0	10
				0	9					0	6
				0	8					0	8
				0	7					0	7
				0	6					0	6
				0	5					0	5
				0	4					0	4
259,37	12.1	Aura	Open space	5.92	3	331,662	12.1	Aura	Open space	7.57	3
	0.0	Aura	Impervious areas	7.84	2		0.0	Aura	Impervious areas	1.5	2
18,88	11.8	Aura	Woods	0.44	1	220,193	11.8	Aura	Woods	5.13	1
Annual Recharge (cu.ft)	Annual Recharge (in)	Soil	TR-55 Land Cover	Area (acres)	Land Segment	Annual Recharge (cu.ft)	Annual Recharge (in)	Soil	TR-55 Land Cover	Area (acres)	Land Segment
		d Conditions	Post-Develope					itions	Pre-Developed Cond		
		11/23/20	Analysis Date:				1.36	44.0	GLOUCESTER CO., MONROE TWP		
		Basin 1	Description:				Climatic Factor	Average Annual P (in)	Select Township 🔱		
	try	Peach Coun	Project Name:		-32)	based on GSR	alysis (	harge An	Annual Groundwater Rec		

displayed or used in calculations. For impervious areas are only required if an Soil type for impervious areas are only required if an

nindwator Ro	nharmo An	alveie /	DD 40 P0004	0_22			Project Name	Peach Colin	trv.	
	Average Annual P	Climatic		N-32)					"'	
* *****	(in)	Factor								
5., MONROE TWP	44.0	1.36					Analysis Date:	11/23/20		
Pre-Developed Cond	itions						Post-Developed	d Conditions		
i5 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)		Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
Woods	Aura	11.8	220,193		-	0.44	Woods	Aura	11.8	18,886
ervious areas	Aura	0.0			2	7.84	Impervious areas	Aura	0.0	
pen space	Aura	12.1	331,662		3	5.92	Open space	Aura	12.1	259,371
					4	0				
					5	0				
					6	0				
					7	0				
					8	0				
					6	0				
					10	0				
					11	0				
					12	0				
					13	0				
					14	0				
					15	0				
		Total Annual Recharge (in)	Total Annual Recharge (cu-ft)		Total =	14.2			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
		10.7	551,855		Annual	Rechar	ge Requirements Calculati	on ↓	5.4	278,257
and Post-Development Con	ditions Tables			% of Pre	-Developed	Annual Re	scharge to Preserve =	100%	Total Impervious Area (sq.ft)	341,510
lect TR-55 Land Cover, then select \$	Soil. Start from the top	of the table		Post-L	)evelopm	ent Ann	ual Recharge Deficit=	273,598	(cubic feet)	
h A=0) in between your segment ent	tries. Rows with A=0 wi	ll not be		Rech	large Effic	iency Pa	arameters Calculations (are	ea averages)		
eas outside of standard lots select "I	Impervious Areas" as th	he Land Cover.		RWC=	3.56	(in)	DRWC=	3.56	(in)	
infiltration facility will be built within	these areas.			ERWC =	1.14	(in)	EDRWC=	1.14	(in)	

ity and then solve for ABMP or	infiltration facili	nnected to your	npervious area directly cor	and Aimp to im	r target value	et Vdef to you	<ul> <li>recharge requirement, se</li> <li>Aimp" button.</li> </ul>	nly part of the Default Vdef	<sup>9</sup> to recharge c uration clik the	or a LID-IMF fault configu	To solve for a smaller BMP odBMP. To go back to the def
ual Recharge" sheet to "Vdef"	" from the "Ann	ous area "Aimp lable to the BMF	nd total proposed impervi e impervious area is avail	olume "Vdef" ar inoff from entire	suming the ru	equirement as	adsheet assigns the value ndle the entire recharge re	fault the sprea gle BMP to ha	olumes: By de lution for a sing	r <mark>echarge v</mark> is allows sol	How to solve for different r and "Aimp" on this page. Thi
nsideration of lateral flow and other los	d Cover allowing co	ot zone for this Lanc	the soil type and a shallow roo					5	9.6	dr	Recharge Requirement over Imp. Area
I be minimal but not zero as determine	us areas" RWC wil	ou select "impervio	Segment Location of BMP if y	%	21.8%		%Rainfall Recharged	5	44.0	Pavg	Average Annual P
3MP to empty in less than 3 days. For	small enough for E	e dBMP selected is	sensetive to dBMP, make sure	%	28.2%		%Runoff Recharged	no units	1.36	C-factor	Climatic Factor
gnored in these calculations. Results a	upied by BMP are i	ig and the area occu	of BMP infiltration prior to fillin	%	61.6%		%Runoff Infiltrated	5	4.59	DRWC	RWC Modified to consider dEXC
e rech volume= deficit volume. The po	are updated to make	BMP dimensions a	Pdesign is accurate only after	%	77.6%		%Rainfall became Runoff	in	4.59	RWC	Root Zone Water Capacity
			OTHER NOTES	Represents % Infiltration Recharged	45.8%		Avg BMP Recharge Efficiency	sq.ft	341,510	Aimp	Post-D Impervious Area (or target Impervious Area)
		ОК	BMP Location>	cu.ft	273,598		Annual BMP Recharge Volume	cu.ft	273,598	Vdef	Post-D Deficit Recharge (or desired recharge volume)
		<u>Р</u>	dEXC Check>		<b>Parameters</b>	Calculated .	System Performance		e Worksheet	l Recharg	Parameters from Annua
		0K	dBMP Check>	cu.ft	12,013	VBMP	BMP Volume				
		ОК	Volume Balance->	unitless	0.14	Aratio	ABMP/Aimp				
	AGES	HECK MESS.	CALCULATION CH		3	Parameters	<b>BMP Calculated Size</b>				
								unitless	ω	SegBMP	Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined
	21.0 in		Runoff Captured Avg. over imp. Area					in	0.0	dEXC	Depth of lower surface of BMP, must be>=dBMPu
	9.6 in		Recharge Provided Avg. over Imp. Area	j.	1.21	RERWC	Empty Portion of RWC under Infilt. BMP	in	-3.0	dBMPu	Upper level of the BMP surface (negative if above ground)
<u> </u>	0.54 in	Pdesign	Inches of Rainfall to capture	2.	1.47	EDRWC	ERWC Modified to consider dEXC	in	3.0	dBMP	BMP Effective Depth, this is the design variable
	0.43 in	Qdesign	Inches of Runoff to capture	2.	1.47	ERWC	Empty Portion of RWC under Post-D Natural Recharge	sq.ft	48051.1	ABMP	BMP Area
	<u>Value Uni</u>	<u>Symbol</u>	Parameter	Unit	Value	Symbol	Parameter	Unit	Value	<u>Symbol</u>	Parameter
		ameters	<b>Recharge Design Par</b>	ieters	lated Paran	pacity Calcu	<b>Root Zone Water cap</b>			urameters	<b>Recharge BMP Input Pa</b>
			sins	Infiltration Bas		11/23/20			Basin 1		Peach Country
			ID Type	BMP or L	Date	Analysis		<u>S</u>	Descripti		Project Name
APPENDIX E SOIL EROSION AND SEDIMENT CONTROL DESIGN CALCULATIONS CONDUIT OUTLET PROTECTION EMERGENCY SPILLWAY STABILITY

Dewber	ry Engineers Inc.		јов Р	each Country Tracto	or				
101	5 Briggs Road		PROJECT NO.	50132475					
	Suite 210		SHEET NO. 1 OF 4						
Mount	Laurel, NJ 08054		CALCD BY	BDJ DATE	11/23/20				
PH: 856-802-0	843 FX: 856-802-0846		CHECKED BY	DATE					
			SCALE						
Conduit Outlet Protec	tion								
Design in accordance wi	th the Standards for Soil F	rosion and Sec	liment Control i	n New Jersev					
Design in accordance wi				IT New Jersey					
				g					
1 <u>Headwall #A-1</u>									
USE RIP RAP APRON									
Discharge Flow $\Omega_{} =$	8 78 of c	•••••••••••••••••••••••••••••••••••••••	•••••••••••••••••••••••••••••••••••••••	······					
Maximum Inside Culvert	Depth, $D_o = 30$ in	iches or <b>2.50</b>	feet	gg					
Maximum Inside Culvert	Width, $W_o = 30$ in	ches or 2.50	feet						
Tailwater Depth TW/ (As	$x_{sume} TW = 0.2 Do = 0.2 X$	(2.50  ft) = 0	50 feet	1					
		<b>v</b> <u>z</u> <b>v</b>		······					
Unit Discharge, $q = Q/W$	<sub>0</sub> – J.JI CIS								
Since $T_W < \frac{1}{2}D_0$ :	Length of Apron, $L_a =$	<u>1.8</u> q + 7D <sub>2</sub>							
		ן 1/2 ס	· • · · · · · • • • • • • • • • • • • •	······					
		<b>D</b> 0							
	Width of Apron, W =	3W <sub>o</sub> + L <sub>a</sub>							
			······································	1					
	Madian Stana Diamatar	d – 0.016		······					
	Median Stone Diameter,	$a_{50} = 0.016$	ν ι <sub>w</sub> x (Q/D <sub>o</sub> )						
	Results: L <sub>2</sub> =	= <b>21.27</b> ft.	W = 28.77 ft.	d <sub>50</sub> = 0.16 ft.					
	······································			, , , , , , , , , , , , , , , , , , ,					
	Use a 21.50 ft. x 29.00 f	t. rip-rap apro	n with $d_{50} = 6''$	at a thickness of 1	2"				
	w/underlying filter fabr	ic							
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 Peach Country Tractor
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 BDJ
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 Project #:
 50132475
 Checked By:
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### Emergency Spillway Stability

### Basin #1

Surface of Spillway (Ground Cover): Type of Soils:	Lawn Grass Mixture Sandy Loam	e
Permissible Velocity per Table 12-1 of NJ SESC:	2.50 fps	
100 yr. Storm Peak Inflow Rate, Q <sub>100</sub> :	53.66 cfs	
Length of Spillway:	40 ft.	
Weir Coefficient:	3.2	
Flow Height over Spillway from Weir Equation =	0.56 ft.	$H = (Q_{100}/CL)^{2/3}$
Assuming Wide Rectangular Channel for Flow, Velocity =	<b>2.39</b> fps	$V = (Q_{100}/HL)$

Since 2.39 fps is <= 2.50 fps, stability requirements have been satisified.

APPENDIX F SOIL EROSION ROUTING CALCULATIONS



### Area Listing (all nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
5.920	79	<50% Grass cover, Poor, HSG B (Post-DA 1)
0.060	96	Gravel surface, HSG B (Post DA-2)
6.080	98	Paved parking, HSG B (Post-DA 1)
1.810	98	Unconnected roofs, HSG B (Post DA-2, Post-DA 1)
1.190	55	Woods, Good, HSG B (Post DA-2, Post-DA 1)
0.420	58	Woods/grass comb., Good, HSG B (Post DA-2)
15.480	86	TOTAL AREA

### Soil Listing (all nodes)

Area	Soil	Subcatchment
(acres)	Group	Numbers
0.000	HSG A	
15.480	HSG B	Post DA-2, Post-DA 1
0.000	HSG C	
0.000	HSG D	
0.000	Other	
15.480		TOTAL AREA

Post-Dev	
Prepared by DEWBERRY	
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## Ground Covers (all nodes)

 HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
 0.000	5.920	0.000	0.000	0.000	5.920	<50% Grass cover, Poor	Post-DA 1
0.000	0.060	0.000	0.000	0.000	0.060	Gravel surface	Post DA-2
0.000	6.080	0.000	0.000	0.000	6.080	Paved parking	Post-DA 1
0.000	1.810	0.000	0.000	0.000	1.810	Unconnected roofs	Post DA-2,
							Post-DA 1
0.000	1.190	0.000	0.000	0.000	1.190	Woods, Good	Post DA-2,
							Post-DA 1
0.000	0.420	0.000	0.000	0.000	0.420	Woods/grass comb., Good	Post DA-2
0.000	15.480	0.000	0.000	0.000	15.480	TOTAL AREA	

Post-Dev	NOAA 24-hr C 2 Yr Rainfall=3.31"
Prepared by DEWBERRY	Printed 12/7/2020
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Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3 Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Post DA-2: Post DA-2	Runoff Area=1.280 ac 3.91% Impervious Runoff Depth=0.42" Now Length=155' Tc=9.2 min UI Adjusted CN=59 Runoff=0.26 cfs 0.044 af
Subcatchment Post-DA 1: Post DA-1	Runoff Area=14.200 ac 55.21% Impervious Runoff Depth=2.18" Flow Length=945' Tc=25.9 min CN=89 Runoff=15.60 cfs 2.582 af
Pond 1P: Basin Primary	Peak Elev=147.42' Storage=123,807 cf Inflow=15.84 cfs 2.627 af =0.32 cfs 1.444 af Secondary=0.00 cfs 0.000 af Outflow=0.32 cfs 1.444 af
Total Runoff Area =	= 15.480 ac Runoff Volume = 2.627 af Average Runoff Depth = 2.04" 49.03% Pervious = 7.590 ac 50.97% Impervious = 7.890 ac

### Summary for Subcatchment Post DA-2: Post DA-2

Runoff = 0.26 cfs @ 12.28 hrs, Volume= 0.044 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 2 Yr Rainfall=3.31"

_	Area (	(ac) (	CN .	Adj	Descript	tion	
	0.	750	55		Woods,	Good, HSC	€B
	0.4	420	58		Woods/g	grass comb	o., Good, HSG B
	0.0	050	98		Unconne	ected roofs	, HSG B
_	0.0	060	96		Gravel s	surface, HS	G B
	1.:	280	60	59	Weighte	ed Average,	UI Adjusted
	1.:	230			96.09%	Pervious A	rea
	0.0	050			3.91% Ir	mpervious /	Area
	0.0	050			100.00%	6 Unconnec	oted
	Tc	Length	Slo	ppe	Velocity	Capacity	Description
_	(min)	(feet)	(ft	t/ft)	(ft/sec)	(cfs)	
	8.2	100	0.03	300	0.20		Sheet Flow,
							Grass: Short n= 0.150 P2= 3.30"
	1.0	55	0.03	350	0.94		Shallow Concentrated Flow,
_							Woodland Kv= 5.0 fps
	9.2	155	Tota	al			

### Subcatchment Post DA-2: Post DA-2



### Summary for Subcatchment Post-DA 1: Post DA-1

Runoff = 15.60 cfs @ 12.41 hrs, Volume= 2.582 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 2 Yr Rainfall=3.31"

(ac) (	N Dese	cription		
.440	55 Woo	ds, Good,	HSG B	
.760	98 Unco	onnected r	oofs, HSG	В
6.080	98 Pave	ed parking	, HSG B	
5.920	79 <509	% Grass co	over, Poor,	HSG B
.200	89 Weig	ghted Aver	age	
6.360	44.7	9% Pervio	us Area	
.840	55.2	1% Imperv	ious Area/	
.760	22.4	5% Uncon	nected	
			•	-
Length	Slope	Velocity	Capacity	Description
(feet)	(ft/ft)	(ft/sec)	(cfs)	
70	0.0300	0.19		Sheet Flow,
				Grass: Short n= 0.150 P2= 3.30"
30	0.0100	0.05		Sheet Flow,
400		0.05		Woods: Light underbrush n= 0.400 P2= 3.30"
100	0.0200	0.35		Shallow Concentrated Flow,
05	0.0450	0.00		Forest W/Heavy Litter KV= 2.5 fps
85	0.0150	0.86		Shart Cross Desture Ky 7.0 fps
100	0.0100	2 02		Shallow Concentrated Flow
100	0.0100	2.03		Daved Ky = 20.3 fps
560	0 0050	4 97	8 78	Pine Channel RCP Round 18"
000	0.0000	4.07	0.70	18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'
				n = 0.011 Concrete pipe, straight & clean
945	Total			
	(ac) 0 .440 .760 .080 .200 .200 .360 .840 .760 Length (feet) 70 30 100 85 100 560 945	(ac)         CN         Desc           0.440         55         Woo           .760         98         Unco           0.080         98         Pave           0.920         79         <509	(ac)         CN         Description           0.440         55         Woods, Good,           760         98         Unconnected r           0.080         98         Paved parking           0.920         79         <50% Grass cd	(ac)         CN         Description           0.440         55         Woods, Good, HSG B           .760         98         Unconnected roofs, HSG B           0.80         98         Paved parking, HSG B           0.920         79         <50% Grass cover, Poor,

0-



0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 Time (hours)

### Subcatchment Post-DA 1: Post DA-1

NOAA 24-hr C 2 Yr Rainfall=3.31"

Printed 12/7/2020

Page 8

### Summary for Pond 1P: Basin

Inflow Ar Inflow Outflow Primary Seconda Routing I Starting I Peak Ele	rea = 15.4 = 15.8 = 0.3 = 0.3 ary = 0.0 by Dyn-Stor-In Elev= 145.48 ev= 147.42' @	I80 ac, 50.9 4 cfs @ 12 2 cfs @ 24 2 cfs @ 24 0 cfs @ 0 d method, T Surf.Area= 24.41 hrs \$	7% Impervious .41 hrs, Volum .41 hrs, Volum .41 hrs, Volum .00 hrs, Volum ïme Span= 0.0 49,066 sf Sto Surf.Area= 54,4	e= 2.62 e= 1.44 e= 1.44 e= 0.00 0-75.00 hrs, dt= rage= 23,238 ct 84 sf Storage=	= 2.04" for 2 Yr event 7 af 4 af, Atten= 98%, Lag= 720.0 min 4 af 10 af = 0.05 hrs / 3 f = 123,807 cf (100,569 cf above start)
Plug-Flo	w detention tin	ne= 2,474.9	min calculated	for 0.910 af (35	% of inflow)
Center-o	f-Mass det. tin	ne= 1,666.7	min ( 2,515.1 -	848.5)	
Volume	Invert	Avail.Stora	age Storage I	Description	
#1	145.00'	321,75	7 cf Custom \$	Stage Data (Pris	smatic) Listed below (Recalc)
<b>F</b> laviatia	n Ourf	<b>A</b>	las Otana	Ourse Otherse	
Elevatio	n Suri.	Area	Inc.Store	Cum.Store	
1/5 0		757			
146.0	0 50	) 484	49.121	49 121	
147.0	0 53	3,276	51,880	101,001	
148.0	0 56	6,130	54,703	155,704	
149.0	0 59	9,048	57,589	213,293	
150.0	0 62	2,030	60,539	273,832	
150.5	0 63	3,545	31,394	305,225	
150.7	5 68	3,708	16,532	321,757	
Device	Routing	Invert	Outlet Devices	;	
#1	Primary	145.00'	18.0" Round I	RCP_Round 18	)"
			L= 560.0' RC	P, rounded edge	e headwall, Ke= 0.100
			Inlet / Outlet In	vert= 145.00' / 1	143.50' S= 0.0027 '/' Cc= 0.900
			n= 0.011 Cond	crete pipe, strai	ght & clean, Flow Area= 1.77 sf
#2	Device 1	147.50'	42.0" x 48.0" F	loriz. Orifice/Gr	C = 0.600
<b>#</b> 2	Davias 1	115 10	Limited to weir	flow at low hea	
#3 #1	Device 1 Secondary	145.48	3.0 Vert. Orifi	Ce/Grate $C = ($	).000 ad-Crostod Poctangular Woir
#4	Secondary	149.75	Head (feet) 0	20 0 40 0 60 0	1.80 + 1.00 + 1.20 + 1.40 + 1.60
			Coef. (English)	) 2.49 2.56 2.7	70 2.69 2.68 2.69 2.67 2.64
	<b></b>				<b>_</b>
Primary	OutFlow Max	=0.32 cfs @	24.41 hrs HW	/=147.42' (Free	e Discharge)
	r_kouna 18" Orifico/Grata	(Passes 0.	$3 \angle CIS OI (.60 C)$	as potential flow	()
	Orifice/Grate	(Orifice Con	.00 013j trols () 32 cfs @	0.649 fps)	
	ennos orato		1.010 0.02 013 e	- 0.40 ip0/	

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=145.48' (Free Discharge)

### Pond 1P: Basin



Post-Dev	NOAA 24-hr C	10 Yr Rair	nfall=5.11"
Prepared by DEWBERRY		Printed	12/7/2020
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Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3 Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Post DA-2: Post DA-	•2 Runoff Area=1.280 ac 3.91% Impervious Runoff Depth=1.30" Flow Length=155' Tc=9.2 min UI Adjusted CN=59 Runoff=1.26 cfs 0.138 af
Subcatchment Post-DA 1: Post DA-	•1 Runoff Area=14.200 ac 55.21% Impervious Runoff Depth=3.88" Flow Length=945' Tc=25.9 min CN=89 Runoff=27.39 cfs 4.588 af
Pond 1P: Basin Prima	Peak Elev=147.81' Storage=144,900 cf Inflow=28.33 cfs 4.727 af ry=8.18 cfs 3.450 af Secondary=0.00 cfs 0.000 af Outflow=8.18 cfs 3.450 af
Total Runoff Area	= 15.480 ac Runoff Volume = 4.727 af Average Runoff Depth = 3.66" 49.03% Pervious = 7.590 ac 50.97% Impervious = 7.890 ac

### Summary for Subcatchment Post DA-2: Post DA-2

Runoff = 1.26 cfs @ 12.21 hrs, Volume= 0.138 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 10 Yr Rainfall=5.11"

	Area (	(ac) C	N Adj	Descrip	tion	
	0.1	750	55	Woods,	Good, HSC	G B
	0.4	420	58	Woods/	grass comb	o., Good, HSG B
	0.0	050 9	98	Unconn	ected roofs	, HSG B
_	0.0	060	96	Gravel s	surface, HS	G B
	1.2	280 (	50 59	Weighte	ed Average	, UI Adjusted
	1.2	230		96.09%	Pervious A	rea
	0.0	050		3.91% li	mpervious <i>l</i>	Area
	0.0	050		100.00%	6 Unconneo	cted
	-		0		<b>o</b>	
	IC	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	8.2	100	0.0300	0.20		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.30"
	1.0	55	0.0350	0.94		Shallow Concentrated Flow,
_						Woodland Kv= 5.0 fps
	~ ~		<b>T</b>			

9.2 155 Total

### Subcatchment Post DA-2: Post DA-2



### Summary for Subcatchment Post-DA 1: Post DA-1

Runoff = 27.39 cfs @ 12.40 hrs, Volume= 4.588 af, Depth= 3.88"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs NOAA 24-hr C 10 Yr Rainfall=5.11"

_	Area	(ac) C	N Desc	cription		
	0.	440 5	5 Woo	ds, Good,	HSG B	
	1.	760 9	8 Unco	onnected r	oofs, HSG	В
	6.	080 9	8 Pave	ed parking	, HSG B	
_	5.	920 7	<u>′9 &lt;50%</u>	% Grass co	over, Poor,	HSG B
	14.	200 8	9 Weig	ghted Aver	age	
	6.	360	44.7	9% Pervio	us Area	
	7.	840	55.2	1% Imperv	vious Area	
	1.	760	22.4	5% Uncon	nected	
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	6.2	70	0.0300	0.19		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.30"
	10.6	30	0.0100	0.05		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.30"
	4.7	100	0.0200	0.35		Shallow Concentrated Flow,
						Forest w/Heavy Litter Kv= 2.5 fps
	1.7	85	0.0150	0.86		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.8	100	0.0100	2.03		Shallow Concentrated Flow,
	4.0	500	0.0050	4.07	0.70	Paved Kv= 20.3 fps
	1.9	560	0.0050	4.97	8.78	Pipe Channel, RCP_Round 18"
						18.0° Kound Area= 1.8 st Perim= 4.7° r= 0.38°
_						n= 0.011 Concrete pipe, straight & clean
	25.9	945	Iotal			



### Subcatchment Post-DA 1: Post DA-1

Printed 12/7/2020

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### Summary for Pond 1P: Basin

Inflow Ar	ea = 15.4	80 ac, 50.9	7% Impervious,	Inflow Depth =	= 3.66" foi	r 10 Yr event
Inflow	= 28.33	3 cfs @ 12.	.39 hrs, Volume	e= 4.72	7 af	
Outflow	= 8.18	3 cfs @ 13.	.65 hrs, Volume	= 3.45	0 af, Atten=	71%, Lag= 75.2 min
Primary	= 8.18	3 cfs @ 13.	.65 hrs, Volume	e= 3.45	0 af	
Seconda	ry = 0.00	) cfs @ 0.	.00 hrs, Volume	e= 0.00	0 af	
Routing I Starting I	by Dyn-Stor-Inc Elev= 145.48'	d method, T Surf.Area=	ime Span= 0.00 49,066 sf Stor	)-75.00 hrs, dt= age= 23,238 cf	0.05 hrs / 3	
Peak Ele	ev= 147.81' @ <i>1</i>	13.65 hrs S	Surf.Area= 55,57	78 sf Storage=	= 144,900 cf	(121,662 cf above start)
Plug-Flov Center-o	w detention tim f-Mass det. tim	ie= 1,066.5 ie= 806.0 m	min calculated f in ( 1,638.1 - 83	or 2.916 af (62 2.2 )	% of inflow)	
Volume	Invert	Avail.Stora	age Storage D	escription		
#1	145.00'	321,757	7 cf Custom S	tage Data (Pris	matic) Listed	below (Recalc)
_						
Elevatio	n Surf./	Area	Inc.Store	Cum.Store		
	() (S	<u>ara</u> ((		(tubic-leet)		
145.0	0 47	,151 101	U 40 1 2 1	U 40 121		
140.0	0 50	,404 276	49,121 51 880	49,121		
148.0	0 56	130	54 703	155 704		
149.0	0 59	.048	57.589	213.293		
150.0	0 62	,030	60,539	273,832		
150.5	0 63	,545	31,394	305,225		
150.7	5 68	,708	16,532	321,757		
Device	Routing	Invert	Outlet Devices			
#1	Primary	145.00'	18.0" Round R	CP Round 18	"	
			L= 560.0' RCF	, rounded edge	e headwall, k	Ke= 0.100
			Inlet / Outlet Inv	vert= 145.00' / 1	43.50' S= 0	.0027 '/' Cc= 0.900
			n= 0.011 Conc	rete pipe, straig	ght & clean,	Flow Area= 1.77 sf
#2	Device 1	147.50'	42.0" x 48.0" H	oriz. Orifice/Gra	ate C= 0.60	00
			Limited to weir	flow at low hea	ds	
#3	Device 1	145.48	3.0" Vert. Orific	C = 0	0.600	
#4	Secondary	149.75	40.0° long x 10			
			Coef. (English)	2.49 2.56 2.7	0 2.69 2.68	2.69 2.67 2.64
Primary	OutFlow Max= P Round 18"	=8.18 cfs @ (Barrel Cor	13.65 hrs HW:	=147.81' (Free 2 4 63 fps)	e Discharge)	
<b>1</b> -2=0	Orifice/Grate (	Passes < 8	.32 cfs potential	flow)		
<u>∟3=</u> (	Orifice/Grate	Passes < 0	.35 cfs potential	flow)		
Seconda	ry OutFlow M	lax=0.00 cfs	s @ 0.00 hrs H\	V=145.48' (Fr	ee Discharge	e)

4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

### Pond 1P: Basin



APPENDIX G STORMWATER MANAGEMENT COLLECTION SYSTEM

Runoff Coe Runoff Coe	:fficient = :fficient =	Type A Soil: 0.10 \ 0.15 (	s Woods (goo Open Space	)d) (good)	Type B Soils 0.15 \ 0.25 (	s Woods (goc Open Space	d) (good)	Type C Soils 0.45 V 0.51 C	; Voods (goc )pen Space	od) € (good)	
Runoff Coe	fficient =	Type A, B o 0.99	r C Soils Impervious (	(Buildings,	pavement, s	idewalks, e	tc.)				
	TYPE A	SOILS	TYPE B	SOILS	TYPE C	SOILS					
Structure	$A_{woods}$	A <sub>open</sub>	$A_{woods}$	A <sub>open</sub>	$A_{woods}$	A <sub>open</sub>	A <sub>imp</sub>	A <sub>total</sub>	$C_{w}$	$C_w \times A_{tot}$	$T_c$ to Inlet
A-3	0.00	0.00	0.00	0.26	0.00	0.00	0.43	0.69	0.71	0.49	13.3
A-4	0.00	0.00	0.00	0.28	0.00	0.00	0.45	0.73	0.71	0.52	12.7
A-5	0.00	0.00	0.00	0.53	0.00	0.00	0.90	1.43	0.72	1.02	13
B-3	0.00	0.00	0.00	0.40	0.00	0.00	1.09	1.49	0.79	1.18	6.1
B-4	0.00	0.00	0.00	0.42	0.00	0.00	1.06	1.48	0.78	1.15	6.1
B-5	0.00	0.00	0.00	0.55	0.00	0.00	1.36	1.91	0.78	1.48	6.8
B-7	0.00	0.00	0.00	0.01	0.00	0.00	0.13	0.14	0.94	0.13	6
B-8	0.00	0.00	0.17	0.44	0.00	0.00	0.14	0.75	0.37	0.27	25.9
B-9	0.00	0.00	0.75	0.42	0.00	0.00	0.11	1.28	0.26	0.33	9.2
C-2	0.00	0.00	0.00	0.28	0.00	0.00	0.42	0.70	0.69	0.49	13.4
C-3	0.00	0.00	0.00	0.27	0.00	0.00	1.29	1.56	0.86	1.34	11.5
	0.00	0.00	0.92	3.60	0.00	0.00	6.95	11.47	0.69	7.92	
See attach	ad TR-22 Tr	• Calculation	ne Sheete fo	r Times of	Concentratio	ä					

See attached TR-33 TC Calculations Sheets for Times of Concentration

Rational C<sub>w</sub> Calculations for System: 100



**Hydraflow Plan View** 

# **Storm Sewer Tabulation**

_	
Page 1	

-					<u> </u>		
Pro	4	ω	2	<u> </u>		Line	Stat
ject File	ω	Ν	-	End		To	ion
PIPE	144.0	190.0	126.0	136.0	(ft)		Len
CALCS	0.90	0.73	0.69	0.00	(ac)	Incr	Drng
-A.stm	0.90	1.63	2.32	2.32	(ac)	Total	Area
	0.72	0.71	0.71	0.00	(C)	000	Rnoff
	0.65	0.52	0.49	0.00		Incr	Are
	0.65	1.17	1.66	1.66		Total	a x C
	13.0	12.7	13.3	0.0	(min)	Inlet	
	13.0	13.8	14.8	15.6	(min)	Syst	0
	5.4	5.2	5.1	5.0	(in/hr)	3	Rain
	3.49	6.12	8.47	8.28	(cfs)		Total
	4.57	7.43	15.99	15.99	(cfs)	5	Cap
	3.41	4.70	4.07	5.15	(ft/s)		Vel
	15	18	24	24	(in)	Size	P
	0.50	0.50	0.50	0.50	(%)	Slope	ipe
Numbe	148.73	147.76	146.31	145.68	(ft)	Up	Inver
r of lines:	148.01	146.81	145.68	145.00	(ft)	Dn	t Elev
	149.58	148.80	147.39	146.70	(ft)	Up	НС
	149.19	147.8	147.2	146.0	(ft)	Dn	L Elev
R	9 154	154	3 154	1 151	(f	c	Grn
n Date:	.00	.00	.40 1	.50 1	t)	σ	d / Rim
12-07-20	54.00	54.40	51.50	46.50	(ft)	Dn	Elev
320	INLA4-INLA5	INLA3-INLA4	MHA2-INLA3	HW-A1-MHA2			Line ID

NOTES: Intensity = 50.77 / (Inlet time + 10.50) ^ 0.71; Return period = 25 Yrs.



# **Storm Sewer Tabulation**

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NOT	Pro	8	7	6	Ŋ	4	ω	N	<b>→</b>		Line	Sta
ES: Inte	oject Filo	4	6	σı	-	ω	Ν	-	End	Line	. То	tion
ensity = 5	9: PIPE(	84.0	234.0	188.0	62.0	194.0	188.0	190.0	70.0	(ft)		Len
50.77 / (I	CALCS-I	1.28	0.75	0.14	0.00	1.91	1.48	1.49	0.00	(ac)	Incr	Drng
nlet time	B.stm	1.28	0.75	0.89	0.89	3.19	4.67	6.16	7.05	(ac)	Total	Area
+ 10.50)		0.26	0.37	0.94	0.00	0.78	0.78	0.79	0.00	(C)	COEII	Rnoff
^ 0.71;		0.33	0.28	0.13	0.00	1.49	1.15	1.18	0.00		Incr	Are
Return p		0.33	0.28	0.41	0.41	1.82	2.98	4.15	4.56		Total	a x C
eriod =		9.2	25.9	60.0	0.0	6.8	6.1	6.1	0.0	(min)	Inlet	т
25 Yrs.		9.2	25.9	60.0	63.8	10.0	11.0	11.9	65.1	(min)	Syst	0
		6.1	3.9	2.5	2.4	5.9	5.7	5.6	2.3	(in/hr)	3	Rain
		2.03	1.09	1.01	0.97	10.79	17.08	23.14	10.71	(cfs)	TIOW	Total
		4.57	4.57	4.57	4.57	15.99	29.00	29.00	29.00	(cfs)	Ĩ	Cap
		2.50	2.46	1.52	0.79	4.84	3.98	6.57	5.17	(ft/s)		Vel
		15	15	15	15	24	30	30	30	(in)	Size	P
		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(%)	Slope	pe
	Numbe	149.88	148.10	146.93	145.99	148.71	147.24	146.30	145.35	(ft)	dn	Inver
	of lines: 8	149.46	146.93	145.99	145.68	147.74	146.30	145.35	145.00	(ft)	Dn	t Elev
	-	150.54	148.52	147.43	147.27	149.88	149.06	147.98	146.45	(ft)	Up	HG
		150.45	147.53	147.27	147.25	149.34	148.80	147.04	146.09	(ft)	P	L Elev
	Run [	160.25	150.85	157.00	154.00	154.70	154.80	154.80	152.25	(ft)	Ч	Grnd /
	ate: 12-07	154.70	157.00	154.00	152.25	154.80	154.80	152.25	146.50	(ft)	Dn	Rim Elev
	-2020	INB5-INB9	INB8-INB7	INB7-MHB6	MHB6-MHB2	INLB4-INLB5	INLB3-INLB4	MHB2-INLB3	HW-B1-MHB2			Line ID

Hydraflow Storm Sewers 2005		
12-07-2020	No. Lines: 2	Project File: PIPECALCS-C.stm
-		
		Outfall
		IN C2
		N
		N C3

**Hydraflow Plan View** 

## **Storm Sewer Tabulation**

Pro	Ν			Line	Sta
ject File	1	End		To	tion
9: PIPE	104.0	74.0	(ft)		Len
CALCS	1.56	0.70	(ac)	Incr	Drng
-C.stm	1.56	2.26	(ac)	Tota	y Area
	0.86	0.69	(C)		Rno
	1.34	0.48		Inci	" ff
	4 1.ω	1.8		To	Area x (
	4	<sup>20</sup>	(n	tal Ir	
	1.5	3.4 1	nin) (	nlet S	ъ
	1.5	3.4	min) (	ŝyst	
	5.6	5.3	(in/hr)	3	Rain
Project File:         PIPECALCS-C.stm           Run Date:         12-07-2020	7.57	9.70	(cfs)		Total
	12.35	12.33	(cfs)	2	Cap
	3.07	4.85	(ft/s)		Vel
	24	24	(in)	Size	
	0.30	0.30	(%)	e Slob	Pipe
Z	145	145	(1	ое U	
Imber of	.53	.22	t)	q	nvert E
lines: 2	145.22	145.00	(ft)	Dn	lev
	146.91	146.59	(ft)	ЧU	Б
	146	146	(1	D	3L Elev
	.80	.10 1	ť	ר -	
Run Dat	148.70	149.50	(ft)	Ч	3rnd / R
e: 12-07-	149.50	146.50	(ft)	Dn	im Elev
2020	INLC2-IN	HW-C1-I			Line
	VLC3	INC2			Đ

NOTES: Intensity = 50.77 / (Inlet time + 10.50) ^ 0.71; Return period = 25 Yrs.

## APPENDIX H SOIL TEST PIT DATA

GROUND SURFACE ELEVATION (ft.): 147.0 (Approx.) PROJECT DESCRIPTION: PEACH COUNTRY TRACTOR PROJECT LOCATION: BLOCK 14301; LOTS 8 & 9 PROJECT CLIENT: WOOD MANAGEMENT, INC.



		s	AMPLE DAT	A	SAMPLE DESCRIPTION				
DEPTH BELOW SURFACE (FT)	WATER LEVEL *	SAMPLE NUMBER	INDEX PROPERTIES	USCS SYMBOL	LITHOLOGIC DESCRIPTION	ELEVATION/ DEPTH (FT)			
_				FILL	Fill - Mulch/Topsoil (Wet)	146.2			
1					Grey Fine SAND and Silt (Moist, Loose)	0.8			
2 - 3-					Orange/Brown Fine SAND and Silt (Moist, Loose)	2.0			
4 5 6		BS-50"	k = 17.4 in/hr	SM	Orange/Brown Fine SAND, Some Silt (Moist, Loose)	4.0			
7				Orange/Brown Fine SAND, Little Silt (Moist, Loose)	<u>139.9</u> 7.1				
<del>- 10 -</del> - 11 -					End of Log	137.0			
- 12—									
- 13- -									
14- - 15-									
ID       ID         COMPLETION DEPTH (ft.): 10'       * Groundwater depths refer to stabilized readings observed within the test pit during the period of this investigation.         DEPTH TO GROUNDWATER (ft.): N.E.       * Groundwater depths refer to stabilized readings observed within the test pit during the period of this investigation.         DEPTH TO ESHWT (ft.): N.E.       * On Encountered         DATE TEST PIT STARTED: SEPTEMBER 7, 2018       * On Encountered         DATETEST PIT COMPLETED: SEPTEMBER 7, 2018       * EXCAVATOR: WOOD MANAGEMENT, INC.						1			
PR	FIELD REP.: E. HILL PROJECT NUMBER: 50105867 Page 1 of 1 Page 1 of 1 Page 1 of 1 Page 1 of 1								

GROUND SURFACE ELEVATION (ft.): 151.0 (Approx.) PROJECT DESCRIPTION: PEACH COUNTRY TRACTOR PROJECT LOCATION: BLOCK 14301; LOTS 8 & 9 PROJECT CLIENT: WOOD MANAGEMENT, INC.



		s		A	SAMPLE DESCRIPTION		
DEPTH BELOW SURFACE (FT)	WATER LEVEL *	SAMPLE NUMBER	INDEX PROPERTIES	USCS SYMBOL	LITHOLOGIC DESCRIPTION	ELEVATION/ DEPTH (FT)	
_				FILL	Fill - Mulch/Topsoil (Wet)	150.2	
1- - 2-					Grey Fine SAND, Little Silt (Moist, Loose)	0.8	
-						148.3 2.7	
4		BS-48"	k = 13.5 in/hr				
5-				SM			
6-					Orange/Brown Fine SAND, Some Silt (Moist, Loose)		
- 7—							
8-							
9-							
- 10-						140.8	
- 11—					End of Log	10.2	
-							
-							
13-							
14							
15-							
COMPLETION DEPTH (ft.): 10.2 COMMENTS: * Groundwater depths refer to stabilized readings observed							
DE	DEPTH TO GROUNDWATER (ft.): N.E. within the test pit during the period of this investigation. DEPTH TO ESHWT (ft.): N.E.						
DATE TEST PIT STARTED: SEPTEMBER 7, 2018							
DATETEST PIT COMPLETED: SEPTEMBER 7, 2018							
EXCAVATOR: WOOD MANAGEMENT, INC.							
FIE	LD REF	<b>י.:</b> E. HILL					
PR	OJECT	NUMBER: 5	50105867			Page 1 of 1	

GROUND SURFACE ELEVATION (ft.): 149.0 (Approx.) PROJECT DESCRIPTION: PEACH COUNTRY TRACTOR PROJECT LOCATION: BLOCK 14301; LOTS 8 & 9 PROJECT CLIENT: WOOD MANAGEMENT, INC.



	*	S	AMPLE DAT	A	SAMPLE DESCRIPTION			
DEPTH BELOW SURFACE (FT)	WATER LEVEL	Sample Number	INDEX PROPERTIES	USCS SYMBOL	LITHOLOGIC DESCRIPTION	ELEVATION/ DEPTH (FT)		
- 1— -				FILL	Fill - Mulch/Topsoil (Wet)	147.3		
2- - 3-		BS-24"	k = 18.8 in/hr		Grey Fine SAND, Some Silt (Moist, Loose)	1.7		
- 4- -		BS-50"	k = 13.2 in/hr			145.2 3.8		
5- - 6-				SM	Orange/Brown Fine SAND, Little Silt (Moist, Loose)			
7- - 8-								
						140.0		
- 10-					End of Log	0.0		
11								
12- - 13-								
15- co								
OOM: LE FIGUEZE TH (it.): 0       * Groundwater depths refer to stabilized readings observed         DEPTH TO GROUNDWATER (ft.): N.E.       within the test pit during the period of this investigation.         N.E. = Not Encountered       N.E. = Not Encountered								
DA	DATE TEST PIT STARTED: SEPTEMBER 7, 2018							
DATETEST PIT COMPLETED: SEPTEMBER 7, 2018								
EX	CAVAT	DR: WOOD	MANAGEMENT,	INC.				
FIE	LD REF	P.: E. HILL						
PR	PROJECT NUMBER: 50105867 Page 1 of 1							

GROUND SURFACE ELEVATION (ft.): 148.0 (Approx.) PROJECT DESCRIPTION: PEACH COUNTRY TRACTOR PROJECT LOCATION: BLOCK 14301; LOTS 8 & 9 PROJECT CLIENT: WOOD MANAGEMENT, INC.



		S	AMPLE DAT	A	SAMPLE DESCRIPTION	
DEPTH BELOW SURFACE (FT)	WATER LEVEL *	SAMPLE NUMBER	INDEX PROPERTIES	USCS SYMBOL	LITHOLOGIC DESCRIPTION	ELEVATION/ DEPTH (FT)
- 1- - 2-				FILL	Fill - Mulch/Topsoil (Wet)	145.5
3					Grey Fine SAND, Some Silt, Trace Small Roots (Moist, Loose)	2.5
5		BS-80"	k = 15.4 in/hr	SM	Orange/Brown Fine SAND, Some Silt (Moist, Medium Dense)	5.0
8— 9— -					Orange/Brown Fine SAND, Little Silt (Moist, Loose)	138.0
					End of Log	10.0
COMPLETION DEPTH (ft.): 10       COMMENTS:         DEPTH TO GROUNDWATER (ft.): N.E.       * Groundwater depths refer to stabilized readings observed within the test pit during the period of this investigation.         DEPTH TO ESHWT (ft.): N.E.       N.E.         DATE TEST PIT STARTED: SEPTEMBER 7, 2018       N.E. = Not Encountered         DATETEST PIT COMPLETED: SEPTEMBER 7, 2018       EXCAVATOR: WOOD MANAGEMENT, INC.         FIELD REP.: E. HILL       FIELD REP.: E. HILL						
PR	OJECT	NUMBER: 5	50105867			Page 1 of 1
GROUND SURFACE ELEVATION (ft.): 150.5 (Approx.) PROJECT DESCRIPTION: PEACH COUNTRY TRACTOR PROJECT LOCATION: BLOCK 14301; LOTS 8 & 9 PROJECT CLIENT: WOOD MANAGEMENT, INC.



Dewberry Engineers Inc. 1015 Briggs Road, Suite 210 Mount Laurel, New Jersey 08054 Tel: 856.802.0843 Fax: 856.802.0846

		SAMPLE DATA		A	SAMPLE DESCRIPTION			
DEPTH BELOW SURFACE (FT)	WATER LEVEL *	SAMPLE NUMBER	INDEX PROPERTIES	USCS SYMBOL	LITHOLOGIC DESCRIPTION	ELEVATION/ DEPTH (FT)		
- 1- 2-				FILL	Fill - Mulch/Topsoil (Wet)	147.8		
3-					Grey Fine SAND, Little Silt (Moist, Loose)	2.7		
4 5 6 7		BS-40"	k = 8.8 in/hr	SM	Orange/Brown Fine SAND, Some Silt (Moist, Loose)			
8- - 9- - 10-					End of Log	<u>140.7</u> 9.8		
- 13— - 14—								
15_								
LIS CO DE DE DA DA EX	MPLET PTH TO PTH TO TE TES TETES <sup>1</sup> CAVAT <sup>(</sup>	ION DEPTH GROUNDW ESHWT (ft. T PIT STAR F PIT COMP OR: WOOD	(ft.): 9.8 VATER (ft.): N.E. .): N.E. TED: SEPTEMBI LETED: SEPTEM MANAGEMENT,	ER 7, 2018 //BER 7, 20 INC.	<u>COMMENTS:</u> * Groundwater depths refer to stabilized readings observed within the test pit during the period of this investigation. N.E. = Not Encountered	1		
FIE	FIELD REP.: E. HILL							
PROJECT NUMBER: 50105867 Page 1 of						Page 1 of 1		

Tube Permeameter Test	Data		PROJECT #:	50105867			
1 TEST# TP-1		D	ATE COLLECTED	): 9/18/2018			
2 MATERIAL TESTED: DEPTH: 50"	Fill F	Native Soil X Retrieved sample	ίX e				
3 TYPE OF SAMPLE:	UNDISTURBED		DISTURBED	XX			
4 BULK DENSITY DETER Sample D	4 BULK DENSITY DETERMINATION (disturbed Samples Only) Sample Density Used No Yes Section density						
5 HEIGHT OF WATER LE At the beginning At the end of eac	EVEL ABOVE RIM OF of each test interval, h test interval,	BASIN IN INCH H1 20.35 H2 12.07	HES: STAND PIPE SAMPLE TUBE	r = 0.33cm R = 1.78cm			
6 RATE OF WATER LEV TIME T <sub>1</sub> 0 0 0	EL DROP: (interval ir TIME T <sub>2</sub> 0.186 0.186 0.186	n minutes) TIME T 0.186 0.186 0.186	LENGTH OF S	SAMPLE = 3.0" IME = 0.186 min			
7 CALCULATION OF PERMEABILITY:							
K, (in/hr.) = 60 mi	n. / hr. X r²/R² X L (in)	/ T (min.) X In (I	H <sub>1</sub> /H <sub>2</sub> )				
K= 17.4 in/hr.							

8 DEFECTS IN THE SAMPLE (Check the appropriate items)

None Cracks Worn Channels Dry Soil Root Channels Large gravel Large Roots

Soil / Tube Contacts Smearing Compaction Others (Specify) \_\_\_\_\_

9 I HEARBY CERTIFY THAT THE INFORMATION FURNISHED ON FORM 3-B OF THIS APPLICATION (AND ATTACHMENTS THERETO) IS TRUE AND ACCURATE. I AM AWARE THAT FALSIFICATION OF DATA IS IN VIOLATION OF THE WATER POLLUTION CONTROL ACT N.J.S.A.58:10A-1 (et. Seq) AND IS SUBJECTED TO PENALTIES AS PRESCRIBED IN N.J.A.C. 7:14.8

Tube Permeameter Test Data	PROJECT #: 50105867
1 TEST# TP-2	DATE COLLECTED: 9/18/2018
2 MATERIAL TESTED: Fill DEPTH: 48"	Native Soil XX Retrieved sample
3 TYPE OF SAMPLE: UNDISTURBED	DISTURBED XX
4 BULK DENSITY DETERMINATION (disturbed Sample Density Used No	Samples Only) Yes Section density
5 HEIGHT OF WATER LEVEL ABOVE RIM OF At the beginning of each test interval, At the end of each test interval,	BASIN IN INCHES: H1 20.35 STAND PIPE r = 0.33cm H2 12.07 SAMPLE TUBE R = 1.78cm
$\begin{array}{ccc} 6 \text{ RATE OF WATER LEVEL DROP: (interval in } \\ TIME T_1 & TIME T_2 \\ 0 & 0.240 \\ 0 & 0.240 \\ 0 & 0.240 \end{array}$	minutes) TIME $T_3$ 0.240 0.240 0.240 AVERAGE TIME = 0.240 min
7 CALCULATION OF PERMEABILITY:	
K, (in/hr.) = 60 min. / hr. X r²/R² X L (in) / <b>K= 13.5 in/hr.</b>	′ T (min.) X In (H <sub>1</sub> /H <sub>2</sub> )
8 DEFECTS IN THE SAMPLE (Check the appro <u>None</u> Cracks Worn Channels Dry Soil Ro	priate items) oot Channels Large gravel Large Roots
Soil / Tube Contacts Smearing Compaction	Others (Specify)

Tube Permeameter Test Data	PROJECT #: 50105867					
1 TEST# TP-3	DATE COLLECTED: 9/18/2018					
2 MATERIAL TESTED: Fill DEPTH: 24"	Native Soil XX Retrieved sample					
3 TYPE OF SAMPLE: UNDISTURBED	DISTURBED XX					
4 BULK DENSITY DETERMINATION (disturbed Samples Only) Sample Density Used No Yes Section density						
5 HEIGHT OF WATER LEVEL ABOVE RIM OF At the beginning of each test interval, At the end of each test interval,	BASIN IN INCHES: H1 20.35 STAND PIPE r = 0.33cm H2 12.07 SAMPLE TUBE R = 1.78cm					
$\begin{array}{c c} 6  RATE OF WATER LEVEL DROP: (interval in the second s$	minutes) TIME $T_3$ 0.172 LENGTH OF SAMPLE = 3.0" 0.172 AVERAGE TIME = 0.172 min					
7 CALCULATION OF PERMEABILITY:						
K, (in/hr.) = 60 min. / hr. X r²/R² X L (in) / <b>K= 18.8 in/hr.</b>	′ T (min.) X In (H <sub>1</sub> /H <sub>2</sub> )					
8 DEFECTS IN THE SAMPLE (Check the appropriate of the second seco	priate items) ot Channels Large gravel Large Roots Others (Specify)					

9 I HEARBY CERTIFY THAT THE INFORMATION FURNISHED ON FORM 3-B OF THIS APPLICATION (AND ATTACHMENTS THERETO) IS TRUE AND ACCURATE. I AM AWARE THAT FALSIFICATION OF DATA IS IN VIOLATION OF THE WATER POLLUTION CONTROL ACT N.J.S.A.58:10A-1 (et. Seq)

AND IS SUBJECTED TO PENALTIES AS PRESCRIBED IN N.J.A.C. 7:14.8

Tube Permeameter Test Data	PROJECT #: 50105867					
1 TEST# TP-3	DATE COLLECTED: 9/18/2018					
2 MATERIAL TESTED: Fill DEPTH: 50"	Native Soil XX Retrieved sample					
3 TYPE OF SAMPLE: UNDISTURBED	DISTURBED XX					
4 BULK DENSITY DETERMINATION (disturbed S Sample Density Used No	Samples Only) Yes Section density					
5 HEIGHT OF WATER LEVEL ABOVE RIM OF B At the beginning of each test interval, H At the end of each test interval, H	ASIN IN INCHES: 1 20.35 STAND PIPE r = 0.33cm 2 12.07 SAMPLE TUBE R = 1.78cm					
$\begin{array}{ccc} 6  RATE OF WATER LEVEL DROP: (interval in model of the second	ninutes) TIME $T_3$ 0.244 0.244 0.244 0.244 AVERAGE TIME = 0.244 min					
7 CALCULATION OF PERMEABILITY: K, (in/hr.) = 60 min. / hr. X r <sup>2</sup> /R <sup>2</sup> X L (in) / T (min.) X ln (H <sub>1</sub> /H <sub>2</sub> ) <b>K= 13.2 in/hr.</b>						
8 DEFECTS IN THE SAMPLE (Check the approp <u>None</u> Cracks Worn Channels Dry Soil Roo Soil / Tube Contacts Smearing Compaction O	riate items) t Channels Large gravel Large Roots thers (Specify)					

Tube Permeameter Test Data	PROJECT #: 50105867					
1 TEST# TP-4	DATE COLLECTED: 9/18/2018					
2 MATERIAL TESTED: Fill DEPTH: 80"	Native Soil XX Retrieved sample					
3 TYPE OF SAMPLE: UNDISTURBED	DISTURBED XX					
4 BULK DENSITY DETERMINATION (disturbed Samples Only) Sample Density Used No Yes Section density						
5 HEIGHT OF WATER LEVEL ABOVE RIM OF E At the beginning of each test interval, H At the end of each test interval, H	3ASIN IN INCHES: 11 20.35 STAND PIPE r = 0.33cm 12 12.07 SAMPLE TUBE R = 1.78cm					
6 RATE OF WATER LEVEL DROP: (interval in r TIME T 1 TIME T 2 0 0.210 0 0.210 0 0.210	ninutes) TIME T <sub>3</sub> 0.210 LENGTH OF SAMPLE = 3.0" 0.210 AVERAGE TIME = 0.210 min					
7 CALCULATION OF PERMEABILITY:						
K, (in/hr.) = 60 min. / hr. X $r^2/R^2 X L$ (in) /	T (min.) X In (H $_1$ /H $_2$ )					
K= 15.4 in/hr.						
8 DEFECTS IN THE SAMPLE (Check the approp <u>None</u> Cracks Worn Channels Dry Soil Roo Soil / Tube Contacts Smearing Compaction C	oriate items) ot Channels Large gravel Large Roots Others (Specify)					

Tube Permeameter Test Data	PROJECT #: 50105867
1 TEST# TP-5	DATE COLLECTED: 9/18/2018
2 MATERIAL TESTED: Fill DEPTH: 40"	Native Soil XX Retrieved sample
3 TYPE OF SAMPLE: UNDISTURBED	DISTURBED XX
4 BULK DENSITY DETERMINATION (disturbed Sample Density Used No	Samples Only) Yes Section density
5 HEIGHT OF WATER LEVEL ABOVE RIM OF E At the beginning of each test interval, H At the end of each test interval, H	BASIN IN INCHES: 11 20.35 STAND PIPE r = 0.33cm 12 12.07 SAMPLE TUBE R = 1.78cm
$\begin{array}{c c} 6 \text{ RATE OF WATER LEVEL DROP: (interval in r TIME T_1 TIME T_2 \\ 0 0.365 \\ 0 0.365 \\ 0 0.365 \end{array}$	ninutes) TIME T <sub>3</sub> 0.365 0.365 0.365 0.365 AVERAGE TIME = 0.365 min
7 CALCULATION OF PERMEABILITY:	
K, (in/hr.) = 60 min. / hr. X r²/R² X L (in) /	T (min.) X In (H <sub>1</sub> /H <sub>2</sub> )
K= 8.8 in/hr.	
8 DEFECTS IN THE SAMPLE (Check the approp <u>None</u> Cracks Worn Channels Dry Soil Roo Soil / Tube Contacts Smearing Compaction C	oriate items) ot Channels Large gravel Large Roots Others (Specify)



CIVIL, GEOTECHNICAL & STRUCTURAL CONSULTING ENGINEERS

November 5, 2020

Brian Jillson, Civil Designer Dewberry Engineers Inc. 1015 Briggs Road, Suite 210 Mount Laurel, New Jersey 08054

Sent via email to: bjillson@dewberry.com

Re: Geotechnical Investigation - Proposed Stormwater Management Basin Block 14301; Lots 4 & 7-10 – 1463 North Tuckerton Road Williamstown, New Jersey 08094

Dear Brian:

EDH Engineering Services, LLC. (EDH) is pleased to provide this letter report summarizing the results of a geotechnical investigation performed at the above referenced property for the proposed stormwater management basin.

### PROJECT BACKGROUND

The property is currently occupied by a landscape supply company. Based on our discussions with you, it is our understanding that the property owner is proposing to re-develop the property with contractor storage units, resulting in the need for stormwater management improvements. Five (5) test pits and permeability tests were previously performed within the basin location; however, the basin location has been modified and additional test pits were required to comply with New Jersey BMP standards for stormwater management. The location of the proposed stormwater basin, as well as suggested locations for test pits were provided by Dewberry.

### SUBSURFACE SOILS EVALUATION

EDH's geotechnical engineer visited the site on November 5, 2020 and guided/observed three (3) test pits excavated by a representative of Peach Country Tractor. Test pits, designated TP-7 through TP-8, were performed using a New Holland B95C backhoe and extended to depths ranging from 9.5 to 10 feet below the existing ground surface. Test pits were excavated at locations identified by Dewberry and measured in the field from existing features. EDH's geotechnical engineer observed the excavation of test pits, visually classified the subsurface soils, noted the presence/absence of groundwater and/or seasonal high water table depths and prepared soil logs.

Four (4) soil samples were collected from the test pits for permeability testing purposes.



# **CONCLUSIONS**

Based on the results of our geotechnical investigation, the planned development is feasible. The onsite soils primarily consist of silty sands. Groundwater and seasonal high water table elevations were not observed within the test pits performed during this study.

For the three (3) test pits performed for this study (TP-6 through TP-8), permeability rates for the subsurface soils located beneath the proposed basin bottom elevation (EL 148) were observed to range from 12.2 inches/hour to 16.4 inches/hour. EDH reviewed prior test pit (TP-1 through TP-5) and permeability data provided by Dewberry and notes that permeability rates ranged from 13.2 inches per hour to 18.8 inches per hour for the test pits located within the proposed basin (TP-1, TP-3 and TP-4).

Based on our evaluation of the subsurface soils data collected to date, the proposed basin bottom elevation of 148 is not within 2-feet of the seasonal high water table. It is also our opinion that the proposed infiltration basin could be designed utilizing the measured permeability rate of 12.2 inches per hour and appropriate safety factor of 2 as per the NJDEP BMP requirements, resulting in a design permeability rate of 6.1 inches per hour. The infiltration basin should be designed to meet all other applicable NJDEP BMP requirements. Design documents should include a basin construction and maintenance plan to ensure that the construction and maintenance of the basin is performed in accordance with Best Management Practices.

# <u>CLOSING</u>

We thank you for providing us the opportunity to prepare this report and aid you with this project. If you have any questions or require additional information, please do not hesitate to us.

Very truly yours,

EDH ENGINEERING SERVICES, LLC.

Evan D. Hill, P.E., C.M.E. President

Attachments: Test Pit Logs (3 pages) Test Pit Location Sketch (1 page) Permeability Testing Results (4 pages)

C:\Users\Evan Hill\Documents\EDH Engineering Services LLC\Projects\Dewberry\Peach Country\PeachCountry\_Stormwater\_GeotechReport\_1152020.doc

GROUND SURFACE ELEVATION (FT): 149.5

PROJECT DESCRIPTION: PEACH COUNTRY TRACTOR

PROJECT LOCATION: BLOCK 14301; LOTS 4 & 7-10

PROJECT CLIENT:

DEWBERRY



OW FT)	/EL	SAMPLE DATA			SAMPLE DESCRIPTION		
DEPTH BEL SURFACE (	WATER LEV	SAMPLE NUMBER	INDEX PROPERTIES	USCS SYMBOL	LITHOLOGIC DESCRIPTION		
				FILL	Fill - mulch/topsoil (wet)		
1 2 3 4					Grey fine SAND, some silt (moist, loose)		
56		BS=60"	k = 13.1 in/hr	SM	Orange/brown fine SAND, and silt (moist, loose)		
7 8 9					Orange/brown fine SAND, some silt (moist, loose)		
10					End of Log		
11							
12							
13							
14							
15							
COMF	PLETION D	EPTH (ft):	9.5		COMMENTS:		
DEPTH TO GROUNDWATER (ft): N.E.					(1) Groundwater depth refers to stabilized readings observed		
DEPTH TO ESHWT (ft): N.E.			N.E.		within the test pit during the period of this investigation.		
DATE	TEST PIT	STARTED:	11/2/2020				
DATE	TEST PIT	COMPLET	ED: 11/2/2020		N.E. = Not Encountered		
EXCA	VATOR:	Wood Mg	nnt				
FIELD	REP:	E. HILL					
PROJ	ECT NUME	BER:	DEI00120				

GROUND SURFACE ELEVATION (FT): 150

PROJECT DESCRIPTION: PEACH COUNTRY TRACTOR

PROJECT LOCATION: BLOCK 14301; LOTS 4 & 7-10

PROJECT CLIENT:

DEWBERRY



OW FT)	ΈL	SAMPLE DATA			SAMPLE DESCRIPTION		
DEPTH BEL SURFACE (	WATER LEV	SAMPLE NUMBER	INDEX PROPERTIES	USCS SYMBOL	LITHOLOGIC DESCRIPTION		
1					Brown fine to medium SAND, and silt (TOPSOIL)		
					Grey fine SAND, and silt (moist, medium-dense)		
2 3 4 5		BS=48"	k= 13.4 in/hr	SM	Orange/brown fine SAND, and silt (moist, loose)		
6 7 8 9					Grey fine SAND, little silt (moist, loose)		
10					End of Log		
11							
12							
13							
14							
15							
COMP	PLETION D	EPTH (ft):	9.5		COMMENTS:		
DEPTH TO GROUNDWATER (ft): N.E.					(1) Groundwater depth refers to stabilized readings observed		
DEPTH TO ESHWT (ft): N.E.			N.E.		within the test pit during the period of this investigation.		
DATE	TEST PIT	STARTED:	11/2/2020				
DATE	TEST PIT	COMPLET	ED: 11/2/2020		N.E. = Not Encountered		
EXCA	VATOR:	Wood Mgr	nnt				
FIELD	REP:	E. HILL					
PROJ	ECT NUME	BER:	DEI00120				

GROUND SURFACE ELEVATION (FT): 149

PROJECT DESCRIPTION: PEACH COUNTRY TRACTOR

PROJECT LOCATION: BLOCK 14301; LOTS 4 & 7-10

PROJECT CLIENT:

DEWBERRY



OW FT)	/EL	SAMPLE DATA			SAMPLE DESCRIPTION		
DEPTH BEL SURFACE (	WATER LEV	SAMPLE NUMBER	INDEX PROPERTIES	USCS SYMBOL	LITHOLOGIC DESCRIPTION		
					Brown fine to medium SAND, and silt (TOPSOIL)		
1					Light brown fine SAND, some silt (loose, moist)		
2 3 4 5		BS=36"	k = 12.2 in/hr		Orange/brown fine sand, and silt (moist, medium-dense)		
6		BS=72"	k = 16.4 in/hr	SM	Orange/brown fine SAND, little silt (moist, loose)		
7					stratified with grey fine sand, little silt at 7'		
8							
9							
10							
11					End of Log		
12							
13							
14							
15							
COMPLETION DEPTH (ft): 10					COMMENTS:		
DEPT	H TO GRO	UNDWATE	<i>R (ft):</i> N.E.		(1) Groundwater depth refers to stabilized readings observed		
DEPT	H TO ESH	NT (ft):	N.E.		within the test pit during the period of this investigation.		
DATE		SIARIED:			N.E. = Not Encountered		
EXCA	VATOR:		mnt		N.E NOL ENCOUNTEREU		
FIELD	REP:	E. HILL					
PROJ	ECT NUME	BER:	DEI00120				

# TEST PIT LOCATION SKETCH

PROJECT DESCRIPTION: PEACH COUNTRY TRACTOR

PROJECT LOCATION: BLOCK 14301; LOTS 4 & 7-10

PROJECT CLIENT: DEWBERRY







**CIVIL & GEOTECHNICAL CONSULTING ENGINEERS** 

### FORM 3B TUBE PERMEAMETER TEST

Project:	Peach Country Tracto	<u>r - Stormwater Basin</u>	Address:	Tuckahoe Road	<u> </u>	Block: 14301
				Monroe Township		Lot: 4 & 7-10
<u>Sample S</u>	ource: Onsite Bul	k Sample from Test Pit		Date Collected:	<u>11/2/2020</u>	<u><b>By:</b></u> <u>E. Hill</u>
				Date Tested:	<u>11/3/2020</u>	<u>By:</u> E. Hill
1	Test No.	TP-6; 60"_				
2	Material Tested	Fill	Х	Native Soil (depth)		
3	Type of Sample	Undisturbed	Х	Disturbed		
4	Sample Dimensions	Inside radius of sample	tube, R		0.75 incl	nes
		Length of sample, L			3.1 incl	nes
5	Bulk Density determin	ation (disturbed samples	only):			
		Sample Weight, Sw			<b>114</b> gra	ms
		Sample Volume (L x 3.1	4 x R <sup>2</sup> )(16.3	39), Sv	<b>89.74</b> cc	
		Bulk Density (Sw/Sv)			<b>1.27</b> gra	ms/cc
6	Standpipe Used	X Yes		No	<b>0.25</b> rad	ius, inches
7	Height of water above	rim of test basin, inches				
	At beginning of each t	est interval, H1				
	At end of each test int	erval, H2				

#### Rate of water level drop:

	ſ	H1	H2	Time, Start of Test Interval, T1	Time, End of Test Interval, T2	Length of Test
		(inches)	(inches)	(minutes)	(minutes)	Interval, T, minutes
Test	1	23	8.9	0.00	1.50	1.50
Test	2					
Test	3					
Test	4					
Test	5					
Test	6					
Test	7					

#### 8 Calculation of Permeability:

 $K(in/hr) = 60min/hr x r^2/R^2 x L(in)/T(min) x Ln (H1/H2)$ 

K₁ (in/hr)=	13.1	Soil Permeability Class
K <sub>2</sub> (in/hr)=		Soil Permeability Class
K <sub>3</sub> (in/hr)=		Soil Permeability Class
K <sub>4</sub> (in/hr)=		Soil Permeability Class
K <sub>5</sub> (in/hr)=		Soil Permeability Class
K <sub>6</sub> (in/hr)=		Soil Permeability Class
K <sub>7</sub> (in/hr)=		Soil Permeability Class

9 I hereby certify that the information furnished on Form 3B of this application is true and accurate. I am aware that falsification of the data is a violation of the Water Pollution Control Act (NJSA 58:10A-1 et.seq) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

New Jersey Licensed Professional Engineer 24GE4305800



**CIVIL & GEOTECHNICAL CONSULTING ENGINEERS** 

### FORM 3B TUBE PERMEAMETER TEST

Project:	Peach Country Tracto	<u>r - Stormwater Basin</u>	Address:	Tuckahoe Road		<b>Block:</b> 14301
				Monroe Township		Lot: 4 & 7-10
<u>Sample S</u>	Cource: Onsite Bull	k Sample from Test Pit		Date Collected:	<u>11/2/2020</u>	<u>By:</u> E. Hill
				Date Tested:	<u>11/3/2020</u>	<u>Вү:</u> Е. НіШ
1	Test No.	TP-7; 48"				
2	Material Tested	Fill	Х	Native Soil (depth)		
3	Type of Sample	Undisturbed	Х	Disturbed		
4	Sample Dimensions	Inside radius of sample	tube, R	-	<b>0.75</b> inc	hes
		Length of sample, L			<b>3.1</b> inc	hes
5	Bulk Density determin	ation (disturbed samples	only):			
		Sample Weight, Sw			<b>118</b> gra	ams
		Sample Volume (L x 3.1	$4 \times R^{2}$ )(16.3	39), Sv	<b>89.74</b> cc	
		Bulk Density (Sw/Sv)			<b>1.3</b> gra	ams/cc
6	Standpipe Used	X Yes		No	0.25 rad	lius, inches
7	Height of water above	rim of test basin, inches		-		
	At beginning of each te	est interval, H1				
	At end of each test inte	erval, H2				

#### Rate of water level drop:

		H1	H2	Time, Start of Test Interval, T1	Time, End of Test Interval, T2	Length of Test
		(inches)	(inches)	(minutes)	(minutes)	Interval, T, minutes
Test	1	22	11.5	0.00	1.00	1.00
Test	2					
Test	3					
Test	4					
Test	5					
Test	6					
Test	7					

#### 8 Calculation of Permeability:

 $K(in/hr) = 60min/hr x r^2/R^2 x L(in)/T(min) x Ln (H1/H2)$ 

K₁ (in/hr)=	13.4	Soil Permeability Class
K <sub>2</sub> (in/hr)=		Soil Permeability Class
K <sub>3</sub> (in/hr)=		Soil Permeability Class
K <sub>4</sub> (in/hr)=		Soil Permeability Class
K <sub>5</sub> (in/hr)=		Soil Permeability Class
K <sub>6</sub> (in/hr)=		Soil Permeability Class
K <sub>7</sub> (in/hr)=		Soil Permeability Class

9 I hereby certify that the information furnished on Form 3B of this application is true and accurate. I am aware that falsification of the data is a violation of the Water Pollution Control Act (NJSA 58:10A-1 et.seq) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

New Jersey Licensed Professional Engineer 24GE4305800



**CIVIL & GEOTECHNICAL CONSULTING ENGINEERS** 

### FORM 3B TUBE PERMEAMETER TEST

Project:	Peach Country Tracto	<u>r - Stormwater Basin</u>	Address:	Tuckahoe Road		<b>Block:</b> 14301
				Monroe Township		Lot: 4 & 7-10
<u>Sample S</u>	ource: Onsite Bul	k Sample from Test Pit		Date Collected:	<u>11/2/2020</u>	<u>By:</u> E. Hill
				Date Tested:	<u>11/3/2020</u>	<u>By:</u> E. Hill
1	Test No.	TP-8; 36"				
2	Material Tested	Fill	Х	Native Soil (depth)		
3	Type of Sample	Undisturbed	Х	Disturbed		
4	Sample Dimensions	Inside radius of sample	tube, R		<b>0.75</b> inc	ches
		Length of sample, L			3.1 inc	ches
5	Bulk Density determin	ation (disturbed samples	only):			
		Sample Weight, Sw			<b>122</b> gra	ams
		Sample Volume (L x 3.1	4 x R <sup>2</sup> )(16.3	39), Sv	<b>89.74</b> cc	
		Bulk Density (Sw/Sv)			<b>1.4</b> gra	ams/cc
6	Standpipe Used	X Yes		No	0.25 rad	dius, inches
7	Height of water above	rim of test basin, inches				
	At beginning of each t	est interval, H1				
	At end of each test int	erval, H2				

#### Rate of water level drop:

		H1	H2	Time, Start of Test Interval, T1	Time, End of Test Interval, T2	Length of Test
		(inches)	(inches)	(minutes)	(minutes)	Interval, T, minutes
Test	1	22	12.2	0.00	1.00	1.00
Test	2					
Test	3					
Test	4					
Test	5					
Test	6					
Test	7					

#### 8 Calculation of Permeability:

 $K(in/hr) = 60min/hr x r^2/R^2 x L(in)/T(min) x Ln (H1/H2)$ 

K₁ (in/hr)=	12.2	Soil Permeability Class
K <sub>2</sub> (in/hr)=		Soil Permeability Class
K <sub>3</sub> (in/hr)=		Soil Permeability Class
K <sub>4</sub> (in/hr)=		Soil Permeability Class
K <sub>5</sub> (in/hr)=		Soil Permeability Class
K <sub>6</sub> (in/hr)=		Soil Permeability Class
K <sub>7</sub> (in/hr)=		Soil Permeability Class

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Signature of Professional Engineer

New Jersey Licensed Professional Engineer 24GE4305800



**CIVIL & GEOTECHNICAL CONSULTING ENGINEERS** 

### FORM 3B TUBE PERMEAMETER TEST

Project:	Peach Country Tracto	<u>r - Stormwater Basin</u>	Address:	Tuckahoe Road		<b>Block:</b> 14301
				Monroe Township		Lot: 4 & 7-10
<u>Sample S</u>	Cource: Onsite Bull	k Sample from Test Pit		Date Collected:	<u>11/2/2020</u>	<u>By:</u> E. Hill
				Date Tested:	<u>11/3/2020</u>	<u>Вү:</u> Е. НіШ
1	Test No.	TP-8; 72"				
2	Material Tested	Fill	Х	Native Soil (depth)		
3	Type of Sample	Undisturbed	Х	Disturbed		
4	Sample Dimensions	Inside radius of sample	tube, R	-	<b>0.75</b> inc	hes
		Length of sample, L			<b>3.1</b> inc	hes
5	Bulk Density determin	ation (disturbed samples	only):			
		Sample Weight, Sw			<b>115</b> gra	ams
		Sample Volume (L x 3.1	4 x R <sup>2</sup> )(16.3	39), Sv	89.74 cc	
		Bulk Density (Sw/Sv)			<b>1.3</b> gra	ams/cc
6	Standpipe Used	X Yes		No	<b>0.25</b> rac	lius, inches
7	Height of water above	rim of test basin, inches		-		
	At beginning of each te	est interval, H1				
	At end of each test inte	erval, H2				

#### Rate of water level drop:

		H1	H2	Time, Start of Test Interval, T1	Time, End of Test Interval, T2	Length of Test
		(inches)	(inches)	(minutes)	(minutes)	Interval, T, minutes
Test	1	23	10.4	0.00	1.00	1.00
Test	2					
Test	3					
Test	4					
Test	5					
Test	6					
Test	7					

#### 8 Calculation of Permeability:

 $K(in/hr) = 60min/hr x r^2/R^2 x L(in)/T(min) x Ln (H1/H2)$ 

K₁ (in/hr)=	16.4	Soil Permeability Class
K <sub>2</sub> (in/hr)=		Soil Permeability Class
K <sub>3</sub> (in/hr)=		Soil Permeability Class
K <sub>4</sub> (in/hr)=		Soil Permeability Class
K <sub>5</sub> (in/hr)=		Soil Permeability Class
K <sub>6</sub> (in/hr)=		Soil Permeability Class
K <sub>7</sub> (in/hr)=		Soil Permeability Class

9 I hereby certify that the information furnished on Form 3B of this application is true and accurate. I am aware that falsification of the data is a violation of the Water Pollution Control Act (NJSA 58:10A-1 et.seq) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

New Jersey Licensed Professional Engineer 24GE4305800