STORMWATER MANAGEMENT REPORT

MARLBORO MEDICAL ARTS BUILDINGS

BLOCK 213; LOT 8.01
479 ROUTE 520
TOWNSHIP OR MARLBORO
MONMOUTH COUNTY, NJ

Prepared for:

SFC Enterprises, LLC
46 Newman Springs Road East
Red Bank, NJ 07701

February 5, 2016
March 15, 2016
May 11, 2016
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July 10, 2020

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APPENDICES

1.0 INTRODUCTION

Predevelopment Site Conditions

The subject property is known and designated as Block 213, Lots 8.01, as shown on Marlboro Township Tax Map Sheet No. 89. The property contains 5.06 acres along the eastbound side of Monmouth County Route 520 (AKA Newman Springs Road), between Osprey Court and Dunn Drive, and is bordered to the east by an exempted area of New Jersey Transit. The site is bound by commercial development to the west, south and east, and County Route 520 with residential development beyond to the north.

Prior to development, the site contained a one-story residence with a paved driveway, as well as a two-story building that houses a spa with associated parking, signage, and minimal drainage structures. These drainage structures consisted of four inlets that discharged into a grassed area beyond the building. The lot had undeveloped, partially wooded areas along the west, south, and east property lines.

Existing Site Conditions

Currently the property has been constructed. Building 1 is fully built and occupied and Building 2 is fully built and mostly occupied. All of the drainage facilities have been constructed as well as the parking spaces, curbing and sidewalks. Final pavement has been completed. The wet pond, which was the subject of revision 4 of this report, and which is summarized below, has been constructed.

Summary of Prior Revision to this Report

This is a summary for the fourth revision of the Stormwater Management Report for this site. The application was originally approved in 2008 and the site was designed using an infiltration basin which infiltrated 100% of the captured stormwater runoff. This was based on a thorough geotechnical analysis performed by Carlin Simpson and Associates (dated May 5, 2006). In April of 2016, the applicant received amended approval to construct two (2) buildings instead of the original one (1) building. The revised site plan accompanying this amended approval utilized the same geotechnical report and maintained the same approach of infiltrating 100% of the captured stormwater runoff. Post-construction, field conditions revealed that the soils did not

adequately infiltrate the required runoff volume and the basin did not drain within 72 hours. As such, alternative options were thoroughly investigated. Groundwater recharge elsewhere on site was deemed not possible based on further geotechnical analysis of the entire site. This is indicated in the report from Carlin Simpson and Associates (dated 5/1/18), which was previously submitted to the Board. The applicant therefore requested a waiver from groundwater recharge per the Township Ordinance (with the required mitigation). The applicant and applicant's professionals met with the Township Engineer to discuss solutions and a decision was made to utilize a retention basin along with a single outlet structure for both stormwater quantity and quality compliance. The basin has since been constructed and is operational.

Progression of Stormwater Management Design

This is the fifth revision of the stormwater management report for this site. With the site being constructed, the applicant is now proposing medical building C to replace the existing spa which existed in the pre-developed conditions. As part of the approval for the second story of Building 2 (now known as "Building B"), the applicant greenbanked 22 parking spaces which they are now looking to construct to satisfy the new parking demand. The construction of these 22 parking spaces were previously included in the design of the wet pond. With the new Building C roof area being larger than the existing spa facility, the outlet structure to the wet pond is proposed to be modified to maintain compliance with the required post development runoff reductions. Also, water quality compliance is maintained after the slight increase in detained impervious tributary to the wet pond. Finally, the applicant has demonstrated compliance with groundwater recharge through a monetary contribution, per Ordinance requirements. This is expanded upon below.

2.0 PROPOSED DEVELOPMENT

The applicant previously developed two medical art buildings at the center of the property. The northern medical building ("Building A") is two-stories and has a total floor area of 24,000 square feet and is currently constructed and occupied. The southern medical building ("Building B") is two-story and have a total floor area of 22,912 square feet is also currently constructed and occupied. Both buildings share the associated parking surrounding the structures. The parking

area is served by a new driveway opening onto Route 520, near the northeastern corner of the property. The applicant is proposing to develop Medical Building C which will replace the existing spa facility on-site and which will also be served by the same parking area and driveway. Other appurtenant features include landscaping and lighting measures, as well as a constructed wet pond to attenuate post-development runoff. The proposed development is approximately 61.7% impervious surfaces, with the remaining areas landscaped with trees, shrubs, ornamental plant material and grasses.

3.0 PRE-DEVELOPMENT CONDITIONS

Pre-existing onsite drainage consists of four drainage areas described below:

- ***Area to Route 520 (EX-1)***

  This area consists of the front portions of the property that drain to a catch basin on Route 520 (POA #1).

- ***Western Property Area to South Property Line (EX-2)***

  This area consists of the majority of the property as well as the parking area for the existing spa and aforementioned drainage structures. This area drains to POA#2 at the rear of the site. From POA #2, flow continues through the wooded and grassed regions of Lot 10 to an existing swale which runs along the adjacent train tracks.

- ***Eastern Property Area to South Property Line (EX-3)***

  This area runs along the western property line and flows to an existing inlet on adjacent Lot 10 (POA #3).

4.0 POST-DEVELOPMENT CONDITIONS

In the post development condition, predevelopment offsite drainage patterns will be mimicked to the greatest extent practicable. Onsite runoff from the interior of the site will be routed through the constructed wet pond. The five post development drainage areas are further described below:

- ***Undetained Area to Route 520 (P-1)***

This area is almost identical to EX-1 described above. It is slightly smaller due to the proposed development activity and is tributary to the existing catch basin within Route 520 (POA #1).

- ***Area to South Property Line (P-2 & P-4))***

  This area is almost identical to EX-2 above. This area contains the interior portion of the property that is to be developed with the medical buildings and associated parking. The entirety of runoff generated within this area will be conveyed by either sheet flow or conduit conveyance to the proposed wet pond at the south side of the property. It also contains undetained areas along the eastern and southern property lines. This area drains to POA#2 at the rear of the site. From POA #2, flow continues through the wooded and grassed regions of Lot 10 to an existing swale which runs along the adjacent train tracks.

- ***Undetained Area to South Property Line (P-3)***

  This area is the undetained remaining portion of the property that runs along the western property line and flows to an existing inlet on adjacent Lot 10 (POA #4). It will remain similar in size to the area described in EX-4 above.

Please refer to Appendix K for the Proposed Conditions Drainage Area Map which provides further information regarding areas and flow paths.

5.0 METHODOLOGY

The onsite stormwater collection system was designed using the "Rational Formula" (Q=CiA), where:

Q = Peak Discharge (CFS)

C = Runoff Coefficient

i = Rainfall intensity in inches per hour based upon a Time of Concentration (Tc) of 10 minutes (minimum)

A = Area of watershed in acres

A design storm frequency of 25-years was used to design the stormwater collection system. The Trenton rainfall intensity curve was used to determine the value of "i" in the Rational Method. The hydraulic analysis used for the design of the stormwater collection system was the Manning's Formula, $Q = (1.486 / n) * AR^{2/3} * S^{1/2}$, where:

Q = Flow within the pipe at capacity (CFS)

A = Cross sectional area of pipe

R = Hydraulic radius of the system (R = A / Wp)

Where Wp is the wetted perimeter of the pipe

S = Slope of the pipe in FT/FT

n = Manning's roughness coefficient

Stormwater conveyance capacity was calculated utilizing the StormCAD analysis software.

The retention facilities onsite were designed using the soil conservation services "Urban Hydrology for Small Watersheds (TR55)." Due to the proposed development of Building C, a slight modification of the wet pond's outlet structure is required due to the increase in impervious coverage on the property. In order to size the system, runoff hydrographs representing existing and proposed conditions were developed. Proposed runoff hydrographs were routed through the proposed basin to determine if the wet pond could handle the onsite runoff with an outlet structure routed to the rear lot line being the only source of discharge.

The proposed wet pond has been designed in accordance with standard engineering principle, best management practices, and municipal regulations to control runoff from the developed site. The basin was analyzed for storm frequencies of 2-, 10-, and 100-years. The water quality storm was also routed through the basin to demonstrate compliance with total suspended solid (TSS) removal requirements.

Peak runoff rate calculations and hydrographs were created using the SCS Method for the 2-, 10-, and 100-year storm events as calculated by the HydroCAD analysis software.

The entire development (including that which was recently constructed) will generate more than ¼ acre of net new impervious surface and generate more than one-acre of land disturbance.

Therefore, the project will be considered "major development" for stormwater and regulated by Section 220-150 of the Marlboro Land Development regulations. These regulations outline the requirements for stormwater quantity reductions, water quality treatment, and groundwater recharge which will be discussed in further detail below.

6.0 SOILS

Soils information has been taken from the U.S. Department of Agriculture, Natural Resources Conservation Service Soil Survey Geographic (SSURGO) database for Monmouth County, New Jersey. A summary of the soils located within the tributary drainage area to the overall site are as follows:

Name	***Description***	***Hydrologic Soil Group***
ConA	Collington loam, 0 to 2 percent slopes	B
FrkB	Freehold sandy loam, 2 to 5 percent slopes	B

Please refer to Appendix B for the applicable soil mapping of the development area. Based on test pits performed on June 15, 2017, soils within the basin were deemed inadequate for infiltration as originally proposed. As such, a wet pond was designed to replace the infiltration basin (this is described in the introduction).

7.0 STORMWATER MANAGEMENT SUMMARY

As discussed above, the project is regulated by the Marlboro Land Development Regulations for the purposes of stormwater management. Per these regulations, the project meets the definition for *Major Development,* and must therefore comply with Section 220-150.F(1)(c)[3]:

- *Design stormwater management measures so that the post construction peak runoff rates for the 2-, 10- and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates.*

The required reduction rates are achieved via the implementation of the proposed wet pond to attenuate the increase in runoff experienced as a result of the proposed impervious surfaces. The basin is equipped with an outlet structure for positive discharge. The wet pond has been designed to contain the entirety of its tributary design flow. This thereby eliminates the

possibility of any adverse off-site impacts. An emergency spillway is provided at an elevation of 148.6, which conveys overflow in the event of an emergency only, as required. Otherwise, no stormwater is discharged from the emergency spillway during any design storm event. The 100-year maximum water surface elevation within the wet pond is 148.50, which is below the crest of the emergency spillway, indicating that the wet pond contains sufficient volume to contain the 100-year storm. Existing versus proposed peak release rates for the entire property are as follows:

PRE-DEVELOPMENT vs. POST DEVELOPMENT

COMPARISON CHART FOR ENTIRE DEVELOPMENT

Design Storm Frequency	Total Predevelopment Runoff (CFS)	Required Reduction (%)	Allowable Total Runoff (CFS)	Total Post Development Runoff (CFS)
2-year	1.7	50	0.9	0.7
10-year	5.3	75	4.0	3.3
100-year	15.2	80	12.2	12.0

As is seen in the table above, post-development peak release rates have been reduced below those required by regulations for the development as a whole. However, since runoff will discharge to various points in post-development conditions, the following table has also been prepared to demonstrate flow reductions at each point of analysis described above:

PRE-DEVELOPMENT vs. POST DEVELOPMENT

COMPARISON CHART FOR INDIVIDUAL ANALYSIS POINTS

Analysis Point	Peak Discharge (CFS)					
	2-Year		10-Year		100-Year	
	Pre	Post	Pre	Post	Pre	Post
POA #1	0.31	0.28	0.71	0.68	1.75	1.64
POA #2	1.49	0.61	4.63	2.79	13.21	10.27
POA #3	0.07	0.06	0.33	0.29	1.16	0.97

Analysis Point	Runoff Volume (ac-ft)					
	2-Year		10-Year		100-Year	
	Pre	Post	Pre	Post	Pre	Post

POA #1	0.034	0.031	0.070	0.065	0.161	0.156
POA #2	0.267	0.857	0.671	1.467	1.772	2.837
POA #3	0.016	0.014	0.053	0.045	0.162	0.134

POA#2 represents the developed portion of the site. Therefore, the required reductions are provided. POA's #1 and #3 represent undeveloped portions of the site. Therefore, the design of the site was prepared to prevent any increase in runoff from these areas. Please refer to Appendices C & D for pre- versus post-development hydrographs and detailed runoff calculations.

8.0 GROUNDWATER RECHARGE

As discussed above, the project is regulated by the Marlboro Land Development Regulations for the purposes of stormwater management. Per these regulations, the project meets the definition for *Major Development,* and must therefore comply with Section 220-150.F(1)(b)[1][b]:

- *Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from preconstruction to post construction for the two-year storm is infiltrated.*

The *italicized* text below represents is taken from the prior revision to this report and was used for demonstrative purposes in support of our waiver request in accordance with §220-158 Mitigation plan for stormwater management. Since the last revision, the applicant has been approved to fulfil their groundwater recharge obligation through monetary contribution, as outlined in the Ordinance.

The table below demonstrates the total two-year design storm runoff volumes in both the pre and post development condition, as well as the total volume of runoff that its infiltrated via the use of an illustrative underground infiltration system during the two-year design storm:

PRE-DEVELOPMENT vs. POST DEVELOPMENT VOLUME COMPARISON CHART (2-YEAR DESIGN EVENT)

Design Storm Frequency	***(A) Predevelopment Runoff Volume (ac-ft)***	***(B) Post Development Runoff Volume (ac-ft)***	***Volume Required To Be Infiltrated (B – A) (ac-ft)***	***Volume Infiltrated Through Basin Bottom (ac-ft)***
2-Year	*0.32*	*0.89*	*0.57*	*0.59*

As demonstrated above, the volume infiltrated through the bottom of the illustrative underground infiltration system well exceeds the volume required by regulations. This was calculated by using an infiltration rate of 5 in./hr which is the same as the recommended infiltration rate given in the geotechnical report from 2006. The volume infiltrated through the bottom of the illustrative infiltration system was calculated as follows:

- *Overall storage of system: 0.049 af*
- *Time to infiltrate entire system storage: 2 hrs*
- *Time of 2-year design storm: 24 hrs*
- *Total infiltrated volume during 2-year storm: (0.049) x (24/2) = 0.59 af*

As explained in this report's introduction, current field conditions are different from the undisturbed soils investigation which was performed in 2006. While analyzing alternatives, the applicant sought to recharge elsewhere on-site. A thorough geotechnical analysis was performed for the entire site and it was found that recharge was not possible anywhere on site. The applicant is now seeking a waiver for the groundwater recharge requirement and the information and calculations related to groundwater recharge are for analytical purposes only.

The illustrative underground infiltration system shown on the site plan is to demonstrate the size required to meet the Ordinance requirements for groundwater recharge. Since the inlet to the system is located at the permanent pool elevation of the wet pond, it is assumed that during the 2-year storm, the illustrative underground infiltration system is receiving a constant flow of stormwater and becomes full.

Included in Appendix E is a construction cost estimate in accordance with §220-158 Mitigation plan for stormwater management. The applicant agrees to make a contribution to the Township

in lieu of constructing the system, equal to the cost of the system which would meet Ordinance requirements if recharge was possible on-site.

9.0 WATER QUALITY

As discussed above, the project is regulated by the Marlboro Land Development Regulations for the purposes of stormwater management. Per these regulations, the project meets the definition for Major Development, and must therefore comply with Section 220-150.G(1):

- Stormwater management measures shall be designed to reduce the postconstruction load of total suspended solids (TSS) in stormwater runoff by 80% of the anticipated load from the developed site, expressed as an annual average. Stormwater management measures shall only be required for water quality control if an additional 1/4 acre of impervious surface is being proposed on a development site.

The proposed development exceeds the threshold of an additional ¼ acre of net new impervious surface and is therefore required to meet these TSS removal rates. As noted in Chapter 9.11 in the New Jersey Stormwater Best Management Practices Manual, wet ponds achieve the required TSS removal rate of 80% with a required ratio of the permanent pool volume to the Water Quality Design Storm volume of 3:1.

Volume of Design Permanent Pool (ac-ft)	Water Quality Design Storm Volume (ac-ft)	Ratio
1.72	0.27	6.37:1

All runoff generated by the proposed impervious surfaces during the water quality storm event is conveyed to the wet pond by the means described above. Please refer to Appendix F for the detailed water quality storm calculations.

Maintaining Permanent Pool Elevation:

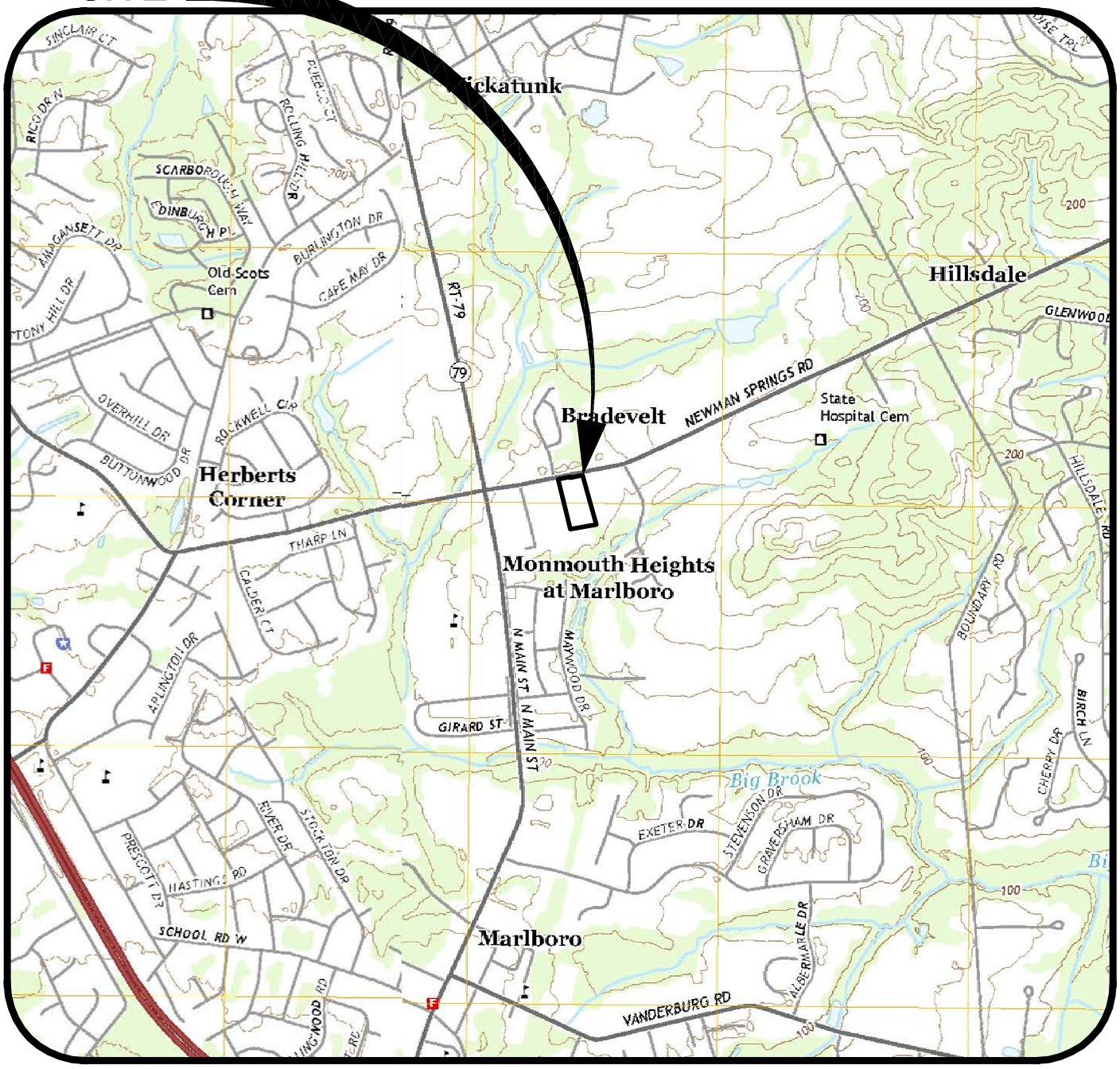
As stated above, to achieve the required TSS removal rate, the ratio of the permanent pool to the Water Quality Design Storm volume must be maintained above 3:1. The system has been designed to maintain the minimum 3:1 ratio at all times. The design was based upon a thorough geotechnical analysis of the soils in the area of the wet pond which has little to no permeability and is also impacted by groundwater, which further helps maintain the permanent pool elevation. The existing basin, as constructed and based on field observations, has little to no infiltration and over the course of the last year, the water level has not significantly changed. When the wet pond is constructed, the bottom of the wet pond will be maintained in the same soil stratum which is currently not infiltrating. We have designed the wet pond with double the required volume to achieve 80% TSS removal and do not anticipate the wet pond will drop below the required volume to achieve 80% TSS removal.

10.0 STATEMENT OF COMPLIANCE

It has been determined that peak runoff rates for the entire development are reduced from existing to proposed conditions, as required. Groundwater recharge requirements are met by the applicant's financial contribution equaling the cost to construct a compliant system, as per Ordinance requirements. The wet pond has a volume well above the required volume to achieve the required 80% TSS removal. Therefore, the project complies and meets the intent of the regulations.

APPENDICES

A USGS LOCATION MAP



PLAN

2,000 0 2,000

Scale 1"=2,000'

USGS MAP

InSite Engineering, LLC
CERTIFICATE OF AUTHORIZATION: 24GA28083200
1913 ATLANTIC AVE., SUITE F4,
WALL, NJ 08736
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Site Location:
Block 213, Lot 8.01; 479 Route 520, Township of Marlboro, Monmouth County, New Jersey

Owner:
79 Route 520 Associates, LLC, 809 Highway 36, 2nd Floor, Union Beach, NJ, 07735

Applicant:
SFC Enterprises, Inc., 809 Highway 36, 2nd Floor, Union Beach, NJ, 07735

InSite Project No.
15-036-06
Drawing No.
15-036-06
Date
02/05/16

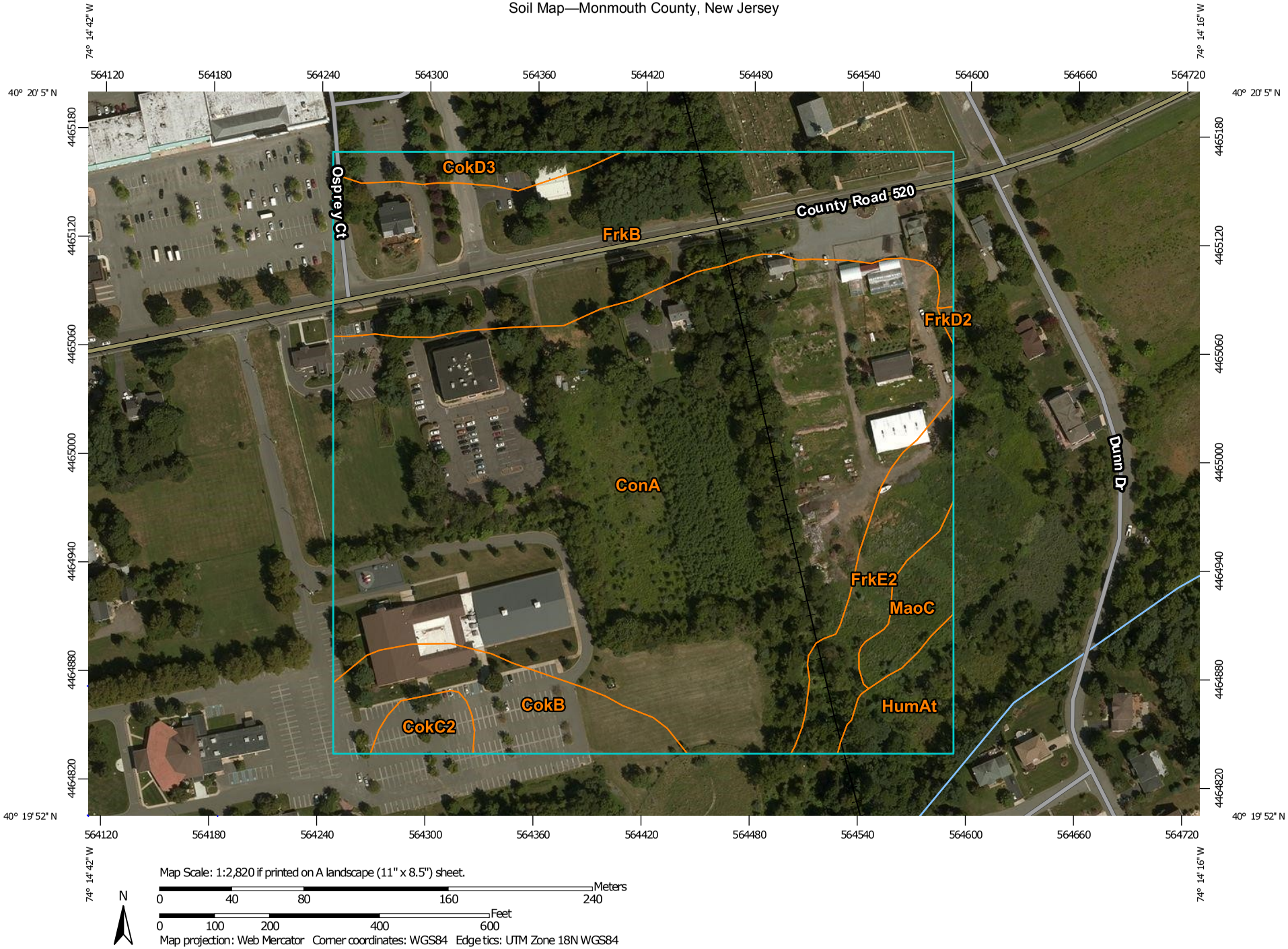
Revisions

CAUTION: IF THIS DOCUMENT DOES NOT CONTAIN THE SIGNATURE AND RAISED SEAL OF THE PROFESSIONAL, IT IS NOT AN ORIGINAL AND MAY HAVE BEEN ALTERED

JASON L. FICHTER, PE, PP, CFM, CME
NJPE 43118 NJPP 5726 PAPE 61968 DEPE 3813 NYPE 802295 CTPE 23291
NCPE 33336 DCPE 900682 COPE 36605

B SOIL SURVEY MAP

Soil Map—Monmouth County, New Jersey



Map Scale: 1:2,820 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Monmouth County, New Jersey
Survey Area Data: Version 9, Sep 17, 2015

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

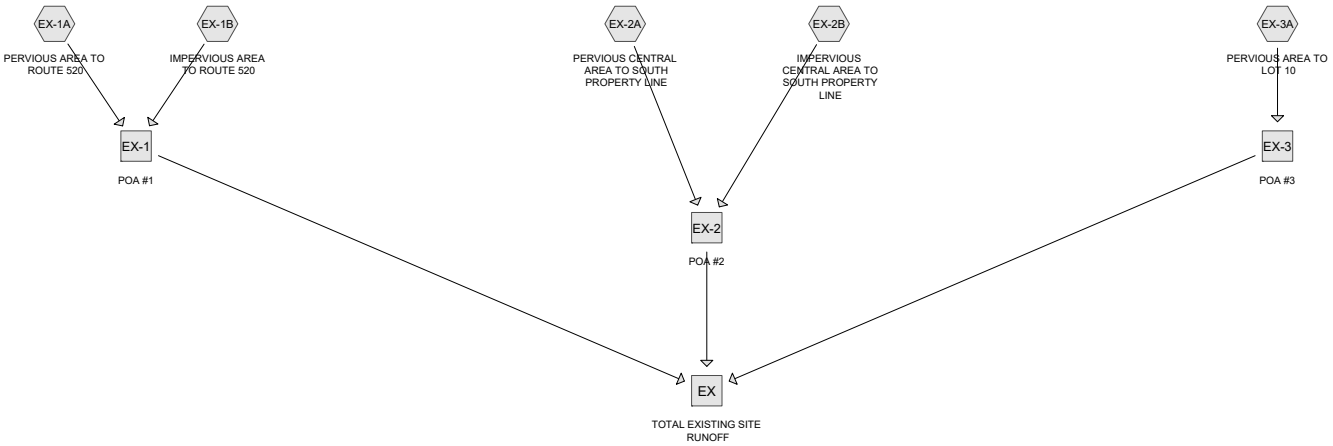
Date(s) aerial images were photographed: Aug 25, 2014—Sep 23, 2014

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

Map Unit Legend

Monmouth County, New Jersey (NJ025)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CokB	Collington sandy loam, 2 to 5 percent slopes	1.7	6.1%
CokC2	Collington sandy loam, 5 to 10 percent slopes, eroded	0.4	1.4%
CokD3	Collington sandy loam, 10 to 15 percent slopes, severely eroded	0.6	2.1%
ConA	Collington loam, 0 to 2 percent slopes	16.8	59.0%
FrkB	Freehold sandy loam, 2 to 5 percent slopes	6.2	21.9%
FrkD2	Freehold sandy loam, 10 to 15 percent slopes, eroded	0.0	0.1%
FrkE2	Freehold sandy loam, 15 to 25 percent slopes, eroded	1.4	4.8%
HumAt	Humaquepts, 0 to 3 percent slopes, frequently flooded	0.7	2.6%
MaoC	Marlton sandy loam, 5 to 10 percent slopes	0.6	2.1%
Totals for Area of Interest		**28.4**	**100.0%**

C PRE-DEVELOPMENT FLOW CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for 200601_20138001_SWM
Prepared by {enter your company name here}, Printed 7/9/2020
HydroCAD® 10.00-24 s/n 03018 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment EX-1A: PERVIOUS AREA TO ROUTE 520

Runoff = 0.08 cfs @ 12.24 hrs, Volume= 0.011 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.097	55	Woods, Good, HSG B
0.206	61	>75% Grass cover, Good, HSG B
0.303	59	Weighted Average
0.303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3333	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
5.2	111	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
12.1	176	Total			

Summary for Subcatchment EX-1B: IMPERVIOUS AREA TO ROUTE 520

Runoff = 0.24 cfs @ 12.16 hrs, Volume= 0.023 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
*	0.087	98	Paved parking & roofs, HSG B
	0.087		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3333	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
5.2	111	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
12.1	176	Total			

Summary for Subcatchment EX-2A: PERVIOUS CENTRAL AREA TO SOUTH PROPERTY LINE

Runoff = 1.01 cfs @ 12.60 hrs, Volume= 0.190 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.763	55	Woods, Good, HSG B
3.896	61	>75% Grass cover, Good, HSG B
4.659	60	Weighted Average
4.659		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	40	0.0250	0.16		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
23.5	110	0.0180	0.08		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
4.1	370	0.0100	1.50		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
0.8	50	0.0450	1.06		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
32.6	570	Total			

Summary for Subcatchment EX-2B: IMPERVIOUS CENTRAL AREA TO SOUTH PROPERTY LINE

Runoff = 0.53 cfs @ 12.42 hrs, Volume= 0.077 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
*	0.291	98	Paved parking & roofs, HSG B
	0.291		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	40	0.0250	0.16		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
23.5	110	0.0180	0.08		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
4.1	370	0.0100	1.50		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
0.8	50	0.0450	1.06		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
32.6	570	Total			

Summary for Subcatchment EX-3A: PERVIOUS AREA TO LOT 10

Runoff = 0.07 cfs @ 12.70 hrs, Volume= 0.016 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.502	55	Woods, Good, HSG B
0.048	61	>75% Grass cover, Good, HSG B
0.550	56	Weighted Average
0.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	150	0.0170	0.08		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
4.7	215	0.0230	0.76		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
35.5	365	Total			

Summary for Reach EX: TOTAL EXISTING SITE RUNOFF

Inflow Area = 5.890 ac, 6.42% Impervious, Inflow Depth = 0.65" for 2-Year event
Inflow = 1.67 cfs @ 12.53 hrs, Volume= 0.317 af
Outflow = 1.67 cfs @ 12.53 hrs, Volume= 0.317 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach EX-1: POA #1

Inflow Area = 0.390 ac, 22.31% Impervious, Inflow Depth = 1.06" for 2-Year event
Inflow = 0.31 cfs @ 12.17 hrs, Volume= 0.034 af
Outflow = 0.31 cfs @ 12.17 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach EX-2: POA #2

Inflow Area = 4.950 ac, 5.88% Impervious, Inflow Depth = 0.65" for 2-Year event
Inflow = 1.49 cfs @ 12.56 hrs, Volume= 0.267 af
Outflow = 1.49 cfs @ 12.56 hrs, Volume= 0.267 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach EX-3: POA #3

Inflow Area = 0.550 ac, 0.00% Impervious, Inflow Depth = 0.35" for 2-Year event
Inflow = 0.07 cfs @ 12.70 hrs, Volume= 0.016 af
Outflow = 0.07 cfs @ 12.70 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Subcatchment EX-1A: PERVIOUS AREA TO ROUTE 520

Runoff = 0.35 cfs @ 12.19 hrs, Volume= 0.034 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.097	55	Woods, Good, HSG B
0.206	61	>75% Grass cover, Good, HSG B
0.303	59	Weighted Average
0.303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3333	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
5.2	111	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
12.1	176	Total			

Summary for Subcatchment EX-1B: IMPERVIOUS AREA TO ROUTE 520

Runoff = 0.37 cfs @ 12.16 hrs, Volume= 0.036 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

	Area (ac)	CN	Description
*	0.087	98	Paved parking & roofs, HSG B
	0.087		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3333	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
5.2	111	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
12.1	176	Total			

Summary for Subcatchment EX-2A: PERVIOUS CENTRAL AREA TO SOUTH PROPERTY LINE

Runoff = 3.84 cfs @ 12.50 hrs, Volume= 0.551 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.763	55	Woods, Good, HSG B
3.896	61	>75% Grass cover, Good, HSG B
4.659	60	Weighted Average
4.659		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	40	0.0250	0.16		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
23.5	110	0.0180	0.08		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
4.1	370	0.0100	1.50		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
0.8	50	0.0450	1.06		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
32.6	570	Total			

Summary for Subcatchment EX-2B: IMPERVIOUS CENTRAL AREA TO SOUTH PROPERTY LINE

Runoff = 0.82 cfs @ 12.42 hrs, Volume= 0.120 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

	Area (ac)	CN	Description
*	0.291	98	Paved parking & roofs, HSG B
	0.291		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	40	0.0250	0.16		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
23.5	110	0.0180	0.08		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
4.1	370	0.0100	1.50		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
0.8	50	0.0450	1.06		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
32.6	570	Total			

Summary for Subcatchment EX-3A: PERVIOUS AREA TO LOT 10

Runoff = 0.33 cfs @ 12.58 hrs, Volume= 0.053 af, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.502	55	Woods, Good, HSG B
0.048	61	>75% Grass cover, Good, HSG B
0.550	56	Weighted Average
0.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	150	0.0170	0.08		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
4.7	215	0.0230	0.76		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
35.5	365	Total			

Summary for Reach EX: TOTAL EXISTING SITE RUNOFF

Inflow Area = 5.890 ac, 6.42% Impervious, Inflow Depth = 1.62" for 10-Year event
Inflow = 5.26 cfs @ 12.49 hrs, Volume= 0.794 af
Outflow = 5.26 cfs @ 12.49 hrs, Volume= 0.794 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach EX-1: POA #1

Inflow Area = 0.390 ac, 22.31% Impervious, Inflow Depth = 2.16" for 10-Year event
Inflow = 0.71 cfs @ 12.17 hrs, Volume= 0.070 af
Outflow = 0.71 cfs @ 12.17 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach EX-2: POA #2

Inflow Area = 4.950 ac, 5.88% Impervious, Inflow Depth = 1.63" for 10-Year event
Inflow = 4.63 cfs @ 12.50 hrs, Volume= 0.671 af
Outflow = 4.63 cfs @ 12.50 hrs, Volume= 0.671 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach EX-3: POA #3

Inflow Area = 0.550 ac, 0.00% Impervious, Inflow Depth = 1.15" for 10-Year event
Inflow = 0.33 cfs @ 12.58 hrs, Volume= 0.053 af
Outflow = 0.33 cfs @ 12.58 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Subcatchment EX-1A: PERVIOUS AREA TO ROUTE 520

Runoff = 1.12 cfs @ 12.17 hrs, Volume= 0.098 af, Depth= 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

Area (ac)	CN	Description
0.097	55	Woods, Good, HSG B
0.206	61	>75% Grass cover, Good, HSG B
0.303	59	Weighted Average
0.303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3333	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
5.2	111	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
12.1	176	Total			

Summary for Subcatchment EX-1B: IMPERVIOUS AREA TO ROUTE 520

Runoff = 0.63 cfs @ 12.16 hrs, Volume= 0.063 af, Depth= 8.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

	Area (ac)	CN	Description
*	0.087	98	Paved parking & roofs, HSG B
	0.087		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3333	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
5.2	111	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
12.1	176	Total			

Summary for Subcatchment EX-2A: PERVIOUS CENTRAL AREA TO SOUTH PROPERTY LINE

Runoff = 11.82 cfs @ 12.46 hrs, Volume= 1.562 af, Depth= 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

Area (ac)	CN	Description
0.763	55	Woods, Good, HSG B
3.896	61	>75% Grass cover, Good, HSG B
4.659	60	Weighted Average
4.659		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	40	0.0250	0.16		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
23.5	110	0.0180	0.08		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
4.1	370	0.0100	1.50		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
0.8	50	0.0450	1.06		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
32.6	570	Total			

Summary for Subcatchment EX-2B: IMPERVIOUS CENTRAL AREA TO SOUTH PROPERTY LINE

Runoff = 1.41 cfs @ 12.42 hrs, Volume= 0.210 af, Depth= 8.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

	Area (ac)	CN	Description
*	0.291	98	Paved parking & roofs, HSG B
	0.291		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	40	0.0250	0.16		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
23.5	110	0.0180	0.08		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
4.1	370	0.0100	1.50		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
0.8	50	0.0450	1.06		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
32.6	570	Total			

Summary for Subcatchment EX-3A: PERVIOUS AREA TO LOT 10

Runoff = 1.16 cfs @ 12.51 hrs, Volume= 0.162 af, Depth= 3.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

Area (ac)	CN	Description
0.502	55	Woods, Good, HSG B
0.048	61	>75% Grass cover, Good, HSG B
0.550	56	Weighted Average
0.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	150	0.0170	0.08		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
4.7	215	0.0230	0.76		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
35.5	365	Total			

Summary for Reach EX: TOTAL EXISTING SITE RUNOFF

Inflow Area = 5.890 ac, 6.42% Impervious, Inflow Depth = 4.27" for 100-Year event
Inflow = 15.16 cfs @ 12.46 hrs, Volume= 2.095 af
Outflow = 15.16 cfs @ 12.46 hrs, Volume= 2.095 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach EX-1: POA #1

Inflow Area = 0.390 ac, 22.31% Impervious, Inflow Depth = 4.96" for 100-Year event
Inflow = 1.75 cfs @ 12.17 hrs, Volume= 0.161 af
Outflow = 1.75 cfs @ 12.17 hrs, Volume= 0.161 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach EX-2: POA #2

Inflow Area = 4.950 ac, 5.88% Impervious, Inflow Depth = 4.30" for 100-Year event
Inflow = 13.21 cfs @ 12.46 hrs, Volume= 1.772 af
Outflow = 13.21 cfs @ 12.46 hrs, Volume= 1.772 af, Atten= 0%, Lag= 0.0 min

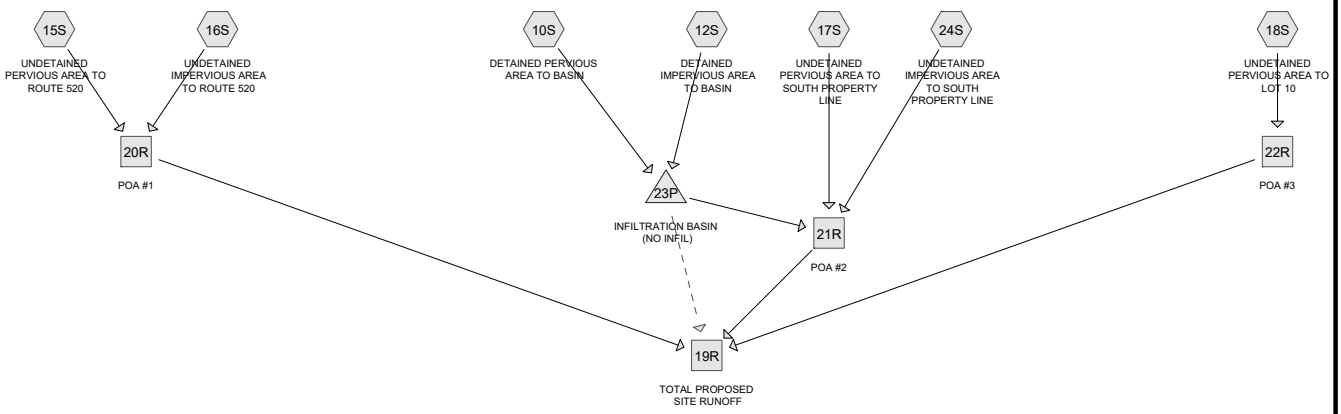
Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach EX-3: POA #3

Inflow Area = 0.550 ac, 0.00% Impervious, Inflow Depth = 3.54" for 100-Year event
Inflow = 1.16 cfs @ 12.51 hrs, Volume= 0.162 af
Outflow = 1.16 cfs @ 12.51 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

D POST-DEVELOPMENT FLOW CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for 200601_20138001_SWM

Prepared by {enter your company name here}, Printed 7/9/2020

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Summary for Subcatchment 10S: DETAINED PERVIOUS AREA TO BASIN

Runoff = 0.47 cfs @ 12.18 hrs, Volume= 0.056 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.267	61	>75% Grass cover, Good, HSG B
1.267		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 12S: DETAINED IMPERVIOUS AREA TO BASIN

Runoff = 8.90 cfs @ 12.13 hrs, Volume= 0.810 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
*	3.068	98	Paved parking & roofs, HSG B
	3.068		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 15S: UNDETAINED PERVIOUS AREA TO ROUTE 520

Runoff = 0.08 cfs @ 12.28 hrs, Volume= 0.012 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.097	55	Woods, Good, HSG B
0.228	61	>75% Grass cover, Good, HSG B
0.325	59	Weighted Average
0.325		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3330	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
6.5	137	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
13.4	202	Total			

Summary for Subcatchment 16S: UNDETAINED IMPERVIOUS AREA TO ROUTE 520

Runoff = 0.18 cfs @ 12.17 hrs, Volume= 0.018 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
*	0.070	98	Paved parking & roofs, HSG B
	0.070		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3330	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
6.5	137	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
13.4	202	Total			

Summary for Subcatchment 17S: UNDETAINED PERVIOUS AREA TO SOUTH PROPERTY LINE

Runoff = 0.14 cfs @ 12.25 hrs, Volume= 0.023 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.472	55	Woods, Good, HSG B
0.246	61	>75% Grass cover, Good, HSG B
0.718	57	Weighted Average
0.718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 18S: UNDETAINED PERVIOUS AREA TO LOT 10

Runoff = 0.06 cfs @ 12.68 hrs, Volume= 0.014 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.171	61	>75% Grass cover, Good, HSG B
0.270	55	Woods, Good, HSG B
0.441	57	Weighted Average
0.441		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.8	150	0.0200	0.09		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
6.3	300	0.0250	0.79		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
35.1	450	Total			

Summary for Subcatchment 24S: UNDETAINED IMPERVIOUS AREA TO SOUTH PROPERTY LINE

Runoff = 0.00 cfs @ 12.13 hrs, Volume= 0.000 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.001	98	Paved parking, HSG B
0.001		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Reach 19R: TOTAL PROPOSED SITE RUNOFF

Inflow Area = 5.890 ac, 53.29% Impervious, Inflow Depth > 1.84" for 2-Year event
Inflow = 0.66 cfs @ 13.98 hrs, Volume= 0.902 af
Outflow = 0.66 cfs @ 13.98 hrs, Volume= 0.902 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach 20R: POA #1

Inflow Area = 0.395 ac, 17.72% Impervious, Inflow Depth = 0.93" for 2-Year event
Inflow = 0.26 cfs @ 12.20 hrs, Volume= 0.031 af
Outflow = 0.26 cfs @ 12.20 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach 21R: POA #2

Inflow Area = 5.054 ac, 60.72% Impervious, Inflow Depth > 2.04" for 2-Year event
Inflow = 0.61 cfs @ 14.14 hrs, Volume= 0.857 af
Outflow = 0.61 cfs @ 14.14 hrs, Volume= 0.857 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach 22R: POA #3

Inflow Area = 0.441 ac, 0.00% Impervious, Inflow Depth = 0.38" for 2-Year event
Inflow = 0.06 cfs @ 12.68 hrs, Volume= 0.014 af
Outflow = 0.06 cfs @ 12.68 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Pond 23P: INFILTRATION BASIN (NO INFIL)

Inflow Area = 4.335 ac, 70.77% Impervious, Inflow Depth = 2.40" for 2-Year event
Inflow = 9.32 cfs @ 12.14 hrs, Volume= 0.865 af
Outflow = 0.57 cfs @ 14.25 hrs, Volume= 0.834 af, Atten= 94%, Lag= 126.7 min
Primary = 0.57 cfs @ 14.25 hrs, Volume= 0.834 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Starting Elev= 146.27' Surf.Area= 0.507 ac Storage= 1.850 af
Peak Elev= 147.36' @ 14.25 hrs Surf.Area= 0.553 ac Storage= 2.426 af (0.576 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,069.5 min (1,838.2 - 768.7)

Volume	Invert	Avail.Storage	Storage Description
#1	141.70'	3.738 af	**CONTOUR AREAS (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
141.70	0.284	0.000	0.000	0.284
142.00	0.295	0.087	0.087	0.295
143.00	0.332	0.313	0.400	0.334
144.00	0.435	0.382	0.783	0.437
145.00	0.465	0.450	1.232	0.469
146.00	0.499	0.482	1.714	0.505
147.00	0.530	0.514	2.229	0.538
148.00	0.595	0.562	2.791	0.605
149.50	0.669	0.947	3.738	0.681

Device	Routing	Invert	Outlet Devices
#1	Primary	145.15'	**15.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 145.15' / 145.00' S= 0.0041 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	146.27'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	147.20'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Primary	148.50'	**1.0" x 2.0" Horiz. Orifice/Grate** X 10 rows C= 0.600 in 48.0" x 48.0" Grate (1% open area) Limited to weir flow at low heads
#5	Secondary	148.60'	**20.0' long x 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.57 cfs @ 14.25 hrs HW=147.36' (Free Discharge)
- **1=Culvert** (Passes 0.57 cfs of 6.76 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.23 cfs @ 4.74 fps)
  - **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.33 cfs @ 1.38 fps)
- **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=146.27' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 10S: DETAINED PERVIOUS AREA TO BASIN

Runoff = 1.77 cfs @ 12.15 hrs, Volume= 0.157 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
1.267	61	>75% Grass cover, Good, HSG B
1.267		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 12S: DETAINED IMPERVIOUS AREA TO BASIN

Runoff = 13.70 cfs @ 12.13 hrs, Volume= 1.269 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

	Area (ac)	CN	Description
*	3.068	98	Paved parking & roofs, HSG B
	3.068		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 15S: UNDETAINED PERVIOUS AREA TO ROUTE 520

Runoff = 0.36 cfs @ 12.20 hrs, Volume= 0.037 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.097	55	Woods, Good, HSG B
0.228	61	>75% Grass cover, Good, HSG B
0.325	59	Weighted Average
0.325		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3330	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
6.5	137	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
13.4	202	Total			

Summary for Subcatchment 16S: UNDETAINED IMPERVIOUS AREA TO ROUTE 520

Runoff = 0.28 cfs @ 12.17 hrs, Volume= 0.029 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

	Area (ac)	CN	Description
*	0.070	98	Paved parking & roofs, HSG B
	0.070		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3330	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
6.5	137	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
13.4	202	Total			

Summary for Subcatchment 17S: UNDETAINED PERVIOUS AREA TO SOUTH PROPERTY LINE

Runoff = 0.76 cfs @ 12.16 hrs, Volume= 0.073 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.472	55	Woods, Good, HSG B
0.246	61	>75% Grass cover, Good, HSG B
0.718	57	Weighted Average
0.718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 18S: UNDETAINED PERVIOUS AREA TO LOT 10

Runoff = 0.29 cfs @ 12.56 hrs, Volume= 0.045 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.171	61	>75% Grass cover, Good, HSG B
0.270	55	Woods, Good, HSG B
0.441	57	Weighted Average
0.441		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.8	150	0.0200	0.09		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
6.3	300	0.0250	0.79		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
35.1	450	Total			

Summary for Subcatchment 24S: UNDETAINED IMPERVIOUS AREA TO SOUTH PROPERTY LINE

Runoff = 0.00 cfs @ 12.13 hrs, Volume= 0.000 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.001	98	Paved parking, HSG B
0.001		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Reach 19R: TOTAL PROPOSED SITE RUNOFF

Inflow Area = 5.890 ac, 53.29% Impervious, Inflow Depth > 3.21" for 10-Year event
Inflow = 3.36 cfs @ 12.52 hrs, Volume= 1.577 af
Outflow = 3.36 cfs @ 12.52 hrs, Volume= 1.577 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach 20R: POA #1

Inflow Area = 0.395 ac, 17.72% Impervious, Inflow Depth = 1.99" for 10-Year event
Inflow = 0.64 cfs @ 12.19 hrs, Volume= 0.065 af
Outflow = 0.64 cfs @ 12.19 hrs, Volume= 0.065 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach 21R: POA #2

Inflow Area = 5.054 ac, 60.72% Impervious, Inflow Depth > 3.48" for 10-Year event
Inflow = 2.79 cfs @ 12.57 hrs, Volume= 1.467 af
Outflow = 2.79 cfs @ 12.57 hrs, Volume= 1.467 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach 22R: POA #3

Inflow Area = 0.441 ac, 0.00% Impervious, Inflow Depth = 1.21" for 10-Year event
Inflow = 0.29 cfs @ 12.56 hrs, Volume= 0.045 af
Outflow = 0.29 cfs @ 12.56 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Pond 23P: INFILTRATION BASIN (NO INFIL)

Inflow Area = 4.335 ac, 70.77% Impervious, Inflow Depth = 3.95" for 10-Year event
Inflow = 15.45 cfs @ 12.14 hrs, Volume= 1.426 af
Outflow = 2.55 cfs @ 12.67 hrs, Volume= 1.394 af, Atten= 83%, Lag= 32.3 min
Primary = 2.55 cfs @ 12.67 hrs, Volume= 1.394 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Starting Elev= 146.27' Surf.Area= 0.507 ac Storage= 1.850 af
Peak Elev= 147.78' @ 12.67 hrs Surf.Area= 0.580 ac Storage= 2.661 af (0.811 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 728.1 min (1,492.7 - 764.6)

Volume	Invert	Avail.Storage	Storage Description
#1	141.70'	3.738 af	**CONTOUR AREAS (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
141.70	0.284	0.000	0.000	0.284
142.00	0.295	0.087	0.087	0.295
143.00	0.332	0.313	0.400	0.334
144.00	0.435	0.382	0.783	0.437
145.00	0.465	0.450	1.232	0.469
146.00	0.499	0.482	1.714	0.505
147.00	0.530	0.514	2.229	0.538
148.00	0.595	0.562	2.791	0.605
149.50	0.669	0.947	3.738	0.681

Device	Routing	Invert	Outlet Devices
#1	Primary	145.15'	**15.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 145.15' / 145.00' S= 0.0041 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	146.27'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	147.20'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Primary	148.50'	**1.0" x 2.0" Horiz. Orifice/Grate** X 10 rows C= 0.600 in 48.0" x 48.0" Grate (1% open area) Limited to weir flow at low heads
#5	Secondary	148.60'	**20.0' long x 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=2.55 cfs @ 12.67 hrs HW=147.78' (Free Discharge)
- **1=Culvert** (Passes 2.55 cfs of 7.92 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.28 cfs @ 5.66 fps)
  - **3=Sharp-Crested Rectangular Weir** (Weir Controls 2.27 cfs @ 2.84 fps)
- **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=146.27' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 10S: DETAINED PERVIOUS AREA TO BASIN

Runoff = 5.34 cfs @ 12.14 hrs, Volume= 0.438 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

Area (ac)	CN	Description
1.267	61	>75% Grass cover, Good, HSG B
1.267		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 12S: DETAINED IMPERVIOUS AREA TO BASIN

Runoff = 23.54 cfs @ 12.13 hrs, Volume= 2.214 af, Depth= 8.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

	Area (ac)	CN	Description
*	3.068	98	Paved parking & roofs, HSG B
	3.068		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 15S: UNDETAINED PERVIOUS AREA TO ROUTE 520

Runoff = 1.16 cfs @ 12.19 hrs, Volume= 0.106 af, Depth= 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

Area (ac)	CN	Description
0.097	55	Woods, Good, HSG B
0.228	61	>75% Grass cover, Good, HSG B
0.325	59	Weighted Average
0.325		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3330	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
6.5	137	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
13.4	202	Total			

Summary for Subcatchment 16S: UNDETAINED IMPERVIOUS AREA TO ROUTE 520

Runoff = 0.49 cfs @ 12.17 hrs, Volume= 0.051 af, Depth= 8.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

	Area (ac)	CN	Description
*	0.070	98	Paved parking & roofs, HSG B
	0.070		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	27	0.0100	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.40"
2.4	28	0.3330	0.19		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.40"
6.5	137	0.0050	0.35		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow, DE** Paved Kv= 20.3 fps
13.4	202	Total			

Summary for Subcatchment 17S: UNDETAINED PERVIOUS AREA TO SOUTH PROPERTY LINE

Runoff = 2.64 cfs @ 12.14 hrs, Volume= 0.219 af, Depth= 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

Area (ac)	CN	Description
0.472	55	Woods, Good, HSG B
0.246	61	>75% Grass cover, Good, HSG B
0.718	57	Weighted Average
0.718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 18S: UNDETAINED PERVIOUS AREA TO LOT 10

Runoff = 0.97 cfs @ 12.52 hrs, Volume= 0.134 af, Depth= 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

Area (ac)	CN	Description
0.171	61	>75% Grass cover, Good, HSG B
0.270	55	Woods, Good, HSG B
0.441	57	Weighted Average
0.441		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.8	150	0.0200	0.09		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
6.3	300	0.0250	0.79		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
35.1	450	Total			

Summary for Subcatchment 24S: UNDETAINED IMPERVIOUS AREA TO SOUTH PROPERTY LINE

Runoff = 0.01 cfs @ 12.13 hrs, Volume= 0.001 af, Depth= 8.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

Area (ac)	CN	Description
0.001	98	Paved parking, HSG B
0.001		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Reach 19R: TOTAL PROPOSED SITE RUNOFF

Inflow Area = 5.890 ac, 53.29% Impervious, Inflow Depth > 6.37" for 100-Year event
Inflow = 12.14 cfs @ 12.41 hrs, Volume= 3.128 af
Outflow = 12.14 cfs @ 12.41 hrs, Volume= 3.128 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach 20R: POA #1

Inflow Area = 0.395 ac, 17.72% Impervious, Inflow Depth = 4.74" for 100-Year event
Inflow = 1.64 cfs @ 12.19 hrs, Volume= 0.156 af
Outflow = 1.64 cfs @ 12.19 hrs, Volume= 0.156 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach 21R: POA #2

Inflow Area = 5.054 ac, 60.72% Impervious, Inflow Depth > 6.74" for 100-Year event
Inflow = 10.27 cfs @ 12.43 hrs, Volume= 2.837 af
Outflow = 10.27 cfs @ 12.43 hrs, Volume= 2.837 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Reach 22R: POA #3

Inflow Area = 0.441 ac, 0.00% Impervious, Inflow Depth = 3.66" for 100-Year event
Inflow = 0.97 cfs @ 12.52 hrs, Volume= 0.134 af
Outflow = 0.97 cfs @ 12.52 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs

Summary for Pond 23P: INFILTRATION BASIN (NO INFIL)

Inflow Area = 4.335 ac, 70.77% Impervious, Inflow Depth = 7.34" for 100-Year event
Inflow = 28.86 cfs @ 12.14 hrs, Volume= 2.652 af
Outflow = 9.15 cfs @ 12.50 hrs, Volume= 2.618 af, Atten= 68%, Lag= 21.7 min
Primary = 9.15 cfs @ 12.50 hrs, Volume= 2.618 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Starting Elev= 146.27' Surf.Area= 0.507 ac Storage= 1.850 af
Peak Elev= 148.57' @ 12.50 hrs Surf.Area= 0.623 ac Storage= 3.140 af (1.290 af above start)

Plug-Flow detention time= 1,580.6 min calculated for 0.767 af (29% of inflow)
Center-of-Mass det. time= 454.0 min (1,213.9 - 759.9)

Volume	Invert	Avail.Storage	Storage Description
#1	141.70'	3.738 af	**CONTOUR AREAS (Conic)**Listed below (Recalc)

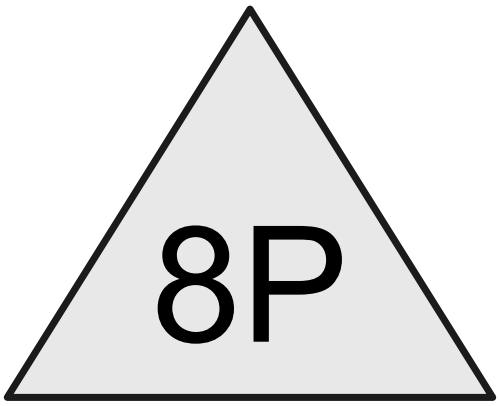
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
141.70	0.284	0.000	0.000	0.284
142.00	0.295	0.087	0.087	0.295
143.00	0.332	0.313	0.400	0.334
144.00	0.435	0.382	0.783	0.437
145.00	0.465	0.450	1.232	0.469
146.00	0.499	0.482	1.714	0.505
147.00	0.530	0.514	2.229	0.538
148.00	0.595	0.562	2.791	0.605
149.50	0.669	0.947	3.738	0.681

Device	Routing	Invert	Outlet Devices
#1	Primary	145.15'	**15.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 145.15' / 145.00' S= 0.0041 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	146.27'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	147.20'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Primary	148.50'	**1.0" x 2.0" Horiz. Orifice/Grate** X 10 rows C= 0.600 in 48.0" x 48.0" Grate (1% open area) Limited to weir flow at low heads
#5	Secondary	148.60'	**20.0' long x 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=9.15 cfs @ 12.50 hrs HW=148.57' (Free Discharge)
- **1=Culvert** (Passes 8.97 cfs of 9.77 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.35 cfs @ 7.11 fps)
  - **3=Sharp-Crested Rectangular Weir** (Weir Controls 8.62 cfs @ 5.12 fps)
- **4=Orifice/Grate** (Orifice Controls 0.18 cfs @ 1.31 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=146.27' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

E GROUNDWATER RECHARGE VOLUME CALCULATIONS



(new Pond)

Subcat Reach Pond Link

Routing Diagram for 170808_1503606_SWM_r3
Prepared by {enter your company name here}, Printed 5/31/2019
HydroCAD® 10.00-19 s/n 03018 © 2016 HydroCAD Software Solutions LLC

Time span=0.00-90.00 hrs, dt=0.01 hrs, 9001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond 8P: (new Pond) Peak Elev=145.68' Storage=0.049 af Inflow=0.00 cfs 0.000 af
Outflow=0.27 cfs 0.049 af

Summary for Pond 8P: (new Pond)

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.27 cfs @	0.00 hrs, Volume=	0.049 af, Atten= 0%, Lag= 0.0 min
Discarded	=	0.27 cfs @	0.00 hrs, Volume=	0.049 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Starting Elev= 145.68' Surf.Area= 0.053 ac Storage= 0.049 af
Peak Elev= 145.68' @ 0.00 hrs Surf.Area= 0.053 ac Storage= 0.049 af

Plug-Flow detention time= (not calculated: no plugs found)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.80'	0.029 af	**55.47'W x 41.33'L x 1.88'H Field A** 0.099 af Overall - 0.025 af Embedded = 0.074 af x 40.0% Voids
#2A	144.13'	0.019 af	**ADS N-12 12** x 52 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf 26 Rows of 2 Chambers
		0.049 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.80'	**5.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.27 cfs @ 0.00 hrs HW=145.68' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.27 cfs)

ENGINEER'S ESTIMATE: SITE INFRASTRUCTURE

PROJECT NAME Marlboro Medical Arts Buildings DATE 5/30/19

PROJECT LOCATION 479 Route 520, Marloboro, NJ REVISED

INSITE PROJECT NO. 15-036-06 CLIENT NAME SFC Enterprises

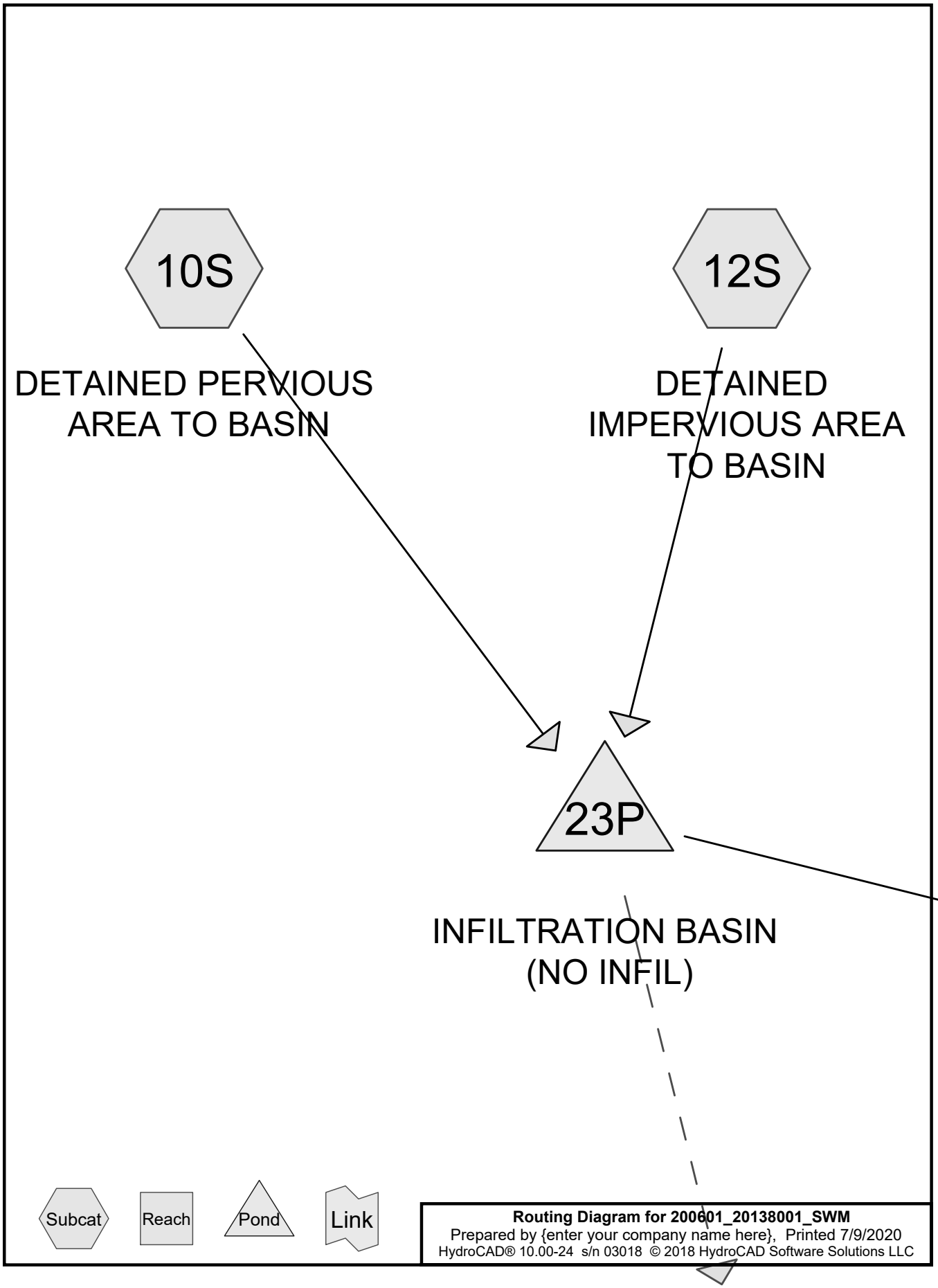
Item Description	Quantity		Unit Price	Total Amount
3/4" Clean Stone	126	CY	$26	$3,276.00
12" HDPE	32	LF	$18	$576.00
12" RCP FES	1	Each	$210	$210.00
12" Perforated HDPE	1040	LF	$18	$18,720.00
Geotextile Fabric	2800	SF	$0.55	$1,540.00
18" Inspection Port	2	Each	$500	$1,000.00
			SUBTOTAL	**$25,322.00**
	CONTIGENCY		10%	$2,532.20
			GRAND TOTAL	$27,854.20

Engineer's opinion of probable Construction Cost is made on the basis of Engineer's experience and qualifications and represent Engineer's best judgment as an experienced and qualified professional engineer generally familiar with the construction industry. However, since Engineer has not control over the costs of labor, materials, equipment, or other services furnished by others, or over the Contractor's methods of determining prices, or over competitive bidding and market conditions, Engineer cannot and does not guarantee that proposals, bids, or actual Construction Cost will not vary.

X:\Jobs\036 - SFC Enterprises\15-036-06 - Marlboro Medical Arts Building\Reports & Design\SWM\[190530 - Recharge Cost Estimate.xls]ESTIMATE

InSite Engineering, LLC
1955 Route 34, Suite 1A • Wall, NJ 07719
732-531-7100 (ph) • 732-531-7344 (fx) • InSite@InSiteEng.net • www.InSiteEng.net
Licensed in NJ, PA, DE, NY, CT, MD, NC, DC, & CO

F WATER QUALITY RUNOFF CALCULATIONS


10S
12S
DETAINED PERVIOUS AREA TO BASIN
DETAINED IMPERVIOUS AREA TO BASIN
23P
INFILTRATION BASIN (NO INFIL)
Subcat
Reach
Pond
Link
Routing Diagram for 200601_20138001_SWM
Prepared by {enter your company name here}, Printed 7/9/2020
HydroCAD® 10.00-24 s/n 03018 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 10S: DETAINED PERVIOUS AREA TO BASIN

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr NJDEP 2-Hr WQ Rainfall=1.25"

Area (ac)	CN	Description
1.267	61	>75% Grass cover, Good, HSG B
1.267		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Subcatchment 12S: DETAINED IMPERVIOUS AREA TO BASIN

Runoff = 7.98 cfs @ 1.15 hrs, Volume= 0.265 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr NJDEP 2-Hr WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	3.068	98	Paved parking & roofs, HSG B
	3.068		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, MIN Tc**

Summary for Pond 23P: INFILTRATION BASIN (NO INFIL)

Inflow Area = 4.335 ac, 70.77% Impervious, Inflow Depth = 0.73" for NJDEP 2-Hr WQ event
Inflow = 7.98 cfs @ 1.15 hrs, Volume= 0.265 af
Outflow = 0.14 cfs @ 2.15 hrs, Volume= 0.249 af, Atten= 98%, Lag= 60.2 min
Primary = 0.14 cfs @ 2.15 hrs, Volume= 0.249 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.01 hrs
Starting Elev= 146.27' Surf.Area= 0.507 ac Storage= 1.850 af
Peak Elev= 146.76' @ 2.15 hrs Surf.Area= 0.522 ac Storage= 2.103 af (0.252 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,073.1 min (1,147.1 - 74.0)

Volume	Invert	Avail.Storage	Storage Description
#1	141.70'	3.738 af	**CONTOUR AREAS (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
141.70	0.284	0.000	0.000	0.284
142.00	0.295	0.087	0.087	0.295
143.00	0.332	0.313	0.400	0.334
144.00	0.435	0.382	0.783	0.437
145.00	0.465	0.450	1.232	0.469
146.00	0.499	0.482	1.714	0.505
147.00	0.530	0.514	2.229	0.538
148.00	0.595	0.562	2.791	0.605
149.50	0.669	0.947	3.738	0.681

Device	Routing	Invert	Outlet Devices
#1	Primary	145.15'	**15.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 145.15' / 145.00' S= 0.0041 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	146.27'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	147.20'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Primary	148.50'	**1.0" x 2.0" Horiz. Orifice/Grate** X 10 rows C= 0.600 in 48.0" x 48.0" Grate (1% open area) Limited to weir flow at low heads
#5	Secondary	148.60'	**20.0' long x 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.14 cfs @ 2.15 hrs HW=146.76' (Free Discharge)
- **1=Culvert** (Passes 0.14 cfs of 4.84 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.14 cfs @ 2.91 fps)
  - **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
- **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=146.27' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

G CONDUIT CAPACITY CALCULATIONS

Conduit Capacity Calculations

Start Node	Stop Node	Label	Upstream Inlet Area (acres)	Upstream Inlet C	System CA (acres)	System Intensity (In/h)	Upstream Inlet Tc (hours)	Flow (cfs)	Length (ft)	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Manning's n	Material	Cover (Start) (ft)	Cover (Stop) (ft)	Elevation Ground (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (Out) (ft)
INLET A1	INLET A2	Pipe - (1)	0.420	0.640	0.269	6.500	0.170	1.76	55	15	146.62	146.35	0.005	4.95	3.69	0.012	Corrugated HDPE (Smooth Interior)	4.84	2.40	152.71	147.15	150.00	146.99
INLET A2	INLET A3	Pipe - (2)	0.320	0.730	0.502	6.456	0.170	3.27	154	15	146.25	145.48	0.005	4.95	4.31	0.012	Corrugated HDPE (Smooth Interior)	2.50	7.83	150.00	146.99	154.56	146.21
INLET A3	INLET A7	Pipe - (3)	0.060	0.980	0.561	6.351	0.170	3.59	144	15	145.38	144.66	0.005	4.95	4.40	0.012	Corrugated HDPE (Smooth Interior)	7.93	7.12	154.56	146.17	153.03	145.55
INLET A6	INLET A7	Pipe - (4)	0.260	0.930	0.242	6.500	0.170	1.58	72	15	146.05	145.33	0.010	7.00	4.61	0.012	Corrugated HDPE (Smooth Interior)	3.70	6.45	151.00	146.55	153.03	145.74
INLET A4	INLET A5	Pipe - (5)	0.180	0.900	0.162	6.500	0.170	1.06	81	15	148.29	147.48	0.010	7.00	4.12	0.012	Corrugated HDPE (Smooth Interior)	4.37	4.94	153.91	148.70	153.67	147.96
INLET A5	INLET A7	Pipe - (6)	0.070	0.880	0.224	6.442	0.170	1.45	98	15	147.48	146.50	0.010	7.00	4.50	0.012	Corrugated HDPE (Smooth Interior)	4.94	5.28	153.67	147.96	153.03	146.89
INLET A7	INLET A9	Pipe - (7)	0.230	0.860	1.224	6.254	0.170	7.72	138	18	144.31	143.62	0.005	8.05	5.18	0.012	Corrugated HDPE (Smooth Interior)	7.22	7.66	153.03	145.55	152.78	145.05
INLET A8	INLET A9	Pipe - (8)	0.220	0.950	0.209	6.500	0.170	1.37	72	15	144.60	144.24	0.005	4.95	3.45	0.012	Corrugated HDPE (Smooth Interior)	4.51	7.29	150.36	145.06	152.78	145.05
INLET A9	INLET A10	Pipe - (9)	0.290	0.820	1.671	6.176	0.170	10.40	53	18	143.52	143.26	0.005	8.05	5.89	0.012	Corrugated HDPE (Smooth Interior)	7.76	6.74	152.78	145.05	151.50	144.50
INLET B1	INLET B2	Pipe - (10)	0.580	0.920	0.534	6.500	0.170	3.50	235	15	145.90	144.72	0.005	4.96	4.38	0.012	Corrugated HDPE (Smooth Interior)	5.85	6.84	153.00	146.67	152.81	145.50
INLET B2	INLET A10	Pipe - (11)	0.540	0.940	1.041	6.342	0.170	6.66	240	18	144.46	143.26	0.005	8.05	5.09	0.012	Corrugated HDPE (Smooth Interior)	6.85	6.74	152.81	145.50	151.50	144.28
INLET A10	HW 1	Pipe - (12)	0.270	0.700	2.901	6.149	0.170	17.98	5	24	142.75	142.70	0.010	24.44	8.50	0.012	Corrugated HDPE (Smooth Interior)	6.75	1.21	151.50	144.28	145.91	144.13

H CONDUIT OUTLET PROTECTION CALCULATIONS

PROJECT- SFC Enterprises
NUMBER- 15-036-06
BY- DDC
DATE- 5/30/2019
rev

SCOUR HOLE CALCULATIONS

15 " RCP -Description of Structure

Do = 1.25
Wo = 1.25 (CIRCULAR SAME AS Do)
TW = 0.25 (0.2 Do ASSUMED)
Q(25) = 4.93 CFS MAX. FLOW BASED ON HW
Y = DEPTH OF SCOUR HOLE BELOW INVERT
q= 3.94 CFS/FT (Q/Wo)

CASE 1 - RIPRAP SIZE FOR Y = 1/2 Do

$$D(50) = \frac{0.0125}{TW} (q/Do)^{4/3} = 3.74 \text{ INCHES}$$

USE 6.0 INCHES

CASE 2 - RIPRAP SIZE FOR Y = Do

$$D(50) = \frac{0.0082}{TW} (q/Do)^{4/3} = 2.45 \text{ INCHES}$$

USE 6.0 INCHES

USE CASE 1 RIPRAP SIZE = 6.0 INCHES
Y = 0.625 FEET

APRON THICKNESS

T = 2 x D (50) = 12.00 Inches
With filter fabric
USE 1.00 FEET

WIDTH OF HOLE BOTTOM

W(H) = 2 x Wo = 2.50 FEET

LENGTH OF HOLE BOTTOM

L(H) = 3 x Do = 3.75 FEET

OVERALL WIDTH

W = W(H) + 2 (3 * Y) = 6.3 FEET

OVERALL LENGTH

L = L(H) + 2 (3 * Y) = 7.5 FEET

RIP RAP QUANTITY

= WLT(1/27) = 2 CUBIC YARDS

I LOW IMPACT DEVELOPMENT CHECKLIST

New Jersey Stormwater Best Management Practices Manual

February 2004

APPENDIX A

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

According to the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, the groundwater recharge, stormwater quality, and stormwater quantity standards established by the Rules for major land development projects must be met by incorporating nine specific nonstructural stormwater management strategies into the project's design to the maximum extent practicable.

To accomplish this, the Rules require an applicant seeking land development approval from a regulatory board or agency to identify those nonstructural strategies that have been incorporated into the project's design. In addition, if an applicant contends that it is not feasible to incorporate any of the specific strategies into the project's design, particularly for engineering, environmental, or safety reasons, the Rules further require that the applicant provide a basis for that contention.

This checklist has been prepared to assist applicants, site designers, and regulatory boards and agencies in ensuring that the nonstructural stormwater management requirements of the Rules are met. It provides an applicant with a means to identify both the nonstructural strategies incorporated into the development's design and the specific low impact development BMPs (LID-BMPs) that have been used to do so. It can also help an applicant explain the engineering, environmental, and/or safety reasons that a specific nonstructural strategy could not be incorporated into the development's design.

The checklist can also assist municipalities and other land development review agencies in the development of specific requirements for both nonstructural strategies and LID-BMPs in zoning and/or land use ordinances and regulations. As such, where requirements consistent with the Rules have been adopted, they may supersede this checklist.

Finally, the checklist can be used during a pre-design meeting between an applicant and pertinent review personnel to discuss local nonstructural strategies and LID-BMPs requirements in order to optimize the development's nonstructural stormwater management design.

Since this checklist is intended to promote the use of nonstructural stormwater management strategies and provide guidance in their incorporation in land development projects, municipalities are permitted to revise it as necessary to meet the goals and objectives of their specific stormwater management program and plan within the limits of N.J.A.C. 7:8.

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: TOWNSHIP OF MARLBORO

County: MONMOUTH Date: 2/5/16

Review board or agency: TOWNSHIP OF MARLBORO ZONING BOARD OF ADJUSTMENT

Proposed land development name: MARLBORO MEDICAL ARTS BUILDING

Lot(s): 8.01 Block(s): 213

Project or application number: NOT ASSIGNED AT TIME OF CHECKLIST PREPARATION

Applicant's name: SFC ENTERPRISES, INC.

Applicant's address: 809 ROUTE 36, UNION BEACH, NJ 07735

(732)282-2200

Telephone: _____ Fax: _____

Email address: _____

Designer's name: JASON L. FICHTER, PE, PP, CFM, CME (INSITE ENGINEERING, LLC)

Designer's address: 1913 ATLANTIC AVENUE, SUITE F4

WALL, NJ 08736

Telephone: (732)531-7100 Fax: (732)531-7344

Email address: INSITE@INSITEENG.NET

Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

THE DEVELOPMENT MAINTAINS THE EXISTING GRADING AND DRAINAGE PATTERNS. THE DIFFERENCE IN THE PRE AND POST CONSTRUCTION TIME OF CONCENTRATION HAS BEEN KEPT TO A MINIMUM FOR AREAS THAT DRAIN OFFSITE. FLOWS ARE REDUCED THROUGHOUT THE SITE.

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

MARLBORO LAND USE DEVELOPMENT REGULATIONS, CHAPTER 84 SECTION 220-150

Do regulations include nonstructural requirements? Yes: X No: _____

If yes, briefly describe: REDUCE IMPERVIOUS SURFACES, MAINTAIN EXISTING NATURAL FEATURES, MINIMIZE LAND CLEARING AND SOIL COMPACTION

List LID-BMPs prohibited by local regulations: NONE

Pre-design meeting held? Yes: _____ Date: _____ No: X

Meeting held with: _____

Pre-design site walk held? Yes: _____ Date: _____ No: X

Site walk held with: _____

Other agencies with stormwater review jurisdiction:

Name: FREEHOLD SOIL CONSERVATION DISTRICT

Required approval: SOIL CERTIFICATION

Name: MONMOUTH COUNTY PLANNING BOARD

Required approval: SITE PLAN APPROVAL

Name: _____

Required approval: _____

Part 3: Nonstructural Strategies and LID-BMPs in Design

3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: X No: _____

If yes, was this inventory a factor in the site's layout and design? Yes: X No: _____

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes: X No: _____ If yes, specify % of site: 4.1%

Native ground cover? Yes: X No: _____ If yes, specify % of site: 4.1%

Vegetated buffers? Yes: X No: _____ If yes, specify % of site: 8.5%

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: X No: _____ If yes, specify % of site: WHERE POSSIBLE

Native ground cover? Yes: X No: _____ If yes, specify % of site: WHERE POSSIBLE

Vegetated buffers? Yes: X No: _____ If yes, specify % of site: WHERE POSSIBLE

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: _____ No: X

Reduce runoff pollutant loads through runoff treatment: Yes: _____ No: X

Maintain groundwater recharge by preserving natural areas: Yes: _____ No: X

3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed? Yes: X No: _____

If yes, were these inventories factors in the site's layout and design? Yes: X No: _____

B. Does the development's design utilize any of the following nonstructural LID-BMPs?

Restrict permanent site disturbance by land owners? Yes: _____ No: X

If yes, how: _____

_____

Restrict temporary site disturbance during construction? Yes: X No: _____

If yes, how: LIMITS OF CLEARING TO BE DELINEATED PRIOR TO CONSTRUCTION

Consider soils and slopes in selecting disturbance limits? Yes: X No: _____

If yes, how: DESIGNS WERE COMPLETED UTILIZING SOIL INFORMATION INCLUDING SOIL TYPES, PERMEABILITY RATES AND SEASONAL WATER TABLE

C. Specify percentage of site to be cleared: 95.9% Regraded: 95.9%

D. Specify percentage of cleared areas done so for buildings: 10.4%

For driveways and parking: 44.3% For roadways: N/A

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above?

REDUCE BUILDING SIZE TO LESSEN PARKING REQUIREMENTS

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: _____ HSG B: 100% HSG C: _____ HSG D: _____

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: _____ HSG B: 100% HSG C: _____ HSG D: _____

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

NONE, ALL WITHIN SAME SOIL GROUP

I. Does the site include Karst topography? Yes: _____ No: X

If yes, discuss measures taken to limit Karst impacts:

3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 7.5% Proposed: 60.5%

B. Specify maximum site impervious coverage allowed by regulations: 50%

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access – low intensity	N/A	N/A
Residential access – medium intensity	N/A	N/A
Residential access – high intensity with parking	N/A	N/A
Residential access – high intensity without parking	N/A	N/A
Neighborhood	N/A	N/A
Minor collector – low intensity without parking	N/A	N/A
Minor collector – with one parking lane	N/A	N/A
Minor collector – with two parking lanes	N/A	N/A
Minor collector – without parking	N/A	N/A
Major collector	N/A	N/A

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: 10' X 20' Regulations: 10' X 20'

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: 211 Regulations: 211

F. Specify percentage of total site impervious cover created by buildings:

By driveways and parking: 44.3% By roadways: N/A

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

REDUCE BUILDING SIZE TO DECREASE NUMBER OF PARKING STALLS REQUIRED

H. Specify percentage of total impervious area that will be unconnected:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

I. Specify percentage of total impervious area that will be porous:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

J. Specify percentage of total building roof area that will be vegetated: 0%

K. Specify percentage of total parking area located beneath buildings: 0%

L. Specify percentage of total parking located within multi-level parking deck: 0%

3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 100% Vegetated swale: N/A Natural channel: N/A

Stormwater management facility: N/A Other: N/A

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

REDUCE THE SIZE OF THE PROPOSED DEVELOPMENT

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: SLOPES ARE AT A MINIMUM AS DESIGNED

Increase overland flow roughness: USE POROUS PAVEMENT SYSTEMS OR ADD NATIVE GRASS AND ELIMINATE TURF GRASS

3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: 2

Specify the spacing between the trash receptacles: 400 FEET

Compare trash receptacles proposed with those required by regulations:

Proposed: 2 Regulations: 2

B. Pet Waste Stations

Specify the number of pet waste stations provided: N/A

Specify the spacing between the pet waste stations: N/A

Compare pet waste stations proposed with those required by regulations:

Proposed: N/A Regulations: N/A

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 0

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: N/A Regulations: TWP JURISIDICTION

Litter collection: Proposed: AS NEEDED Regulations: NONE

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: MEDICAL WASTES Location: WITHIN BUILDING

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: INDOOR STORAGE AREA Location: WITHIN BUILDING

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: DISPOSAL BY LICENSED CONTRACTOR Location: WITHIN BUILDING

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	X	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	X	
3.	Maximize the protection of natural drainage features and vegetation.	X	
4.	Minimize the decrease in the pre-construction time of concentration.	X	
5.	Minimize land disturbance including clearing and grading.	X	
6.	Minimize soil compaction.	X	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	X	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.		X
9.	Provide preventative source controls.	X	

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

DUE TO NATURE AND SIZE OF THE PROPOSED DEVELOPMENT THE MAJORITY OF THE SITE IS BEING DISTURBED, PROVIDING AN OPEN CHANNEL CONVEYANCE SYSTEM IS NOT ACHIEVABLE. ALTHOUGH ENTIRE PROPERTY IS TO BE DISTURBED, NATIVE VEGETATION WILL BE PLANTED IN PERVIOUS AREAS AS PER THE LANDSCAPE PLAN TO PROVIDE AREAS WITH WATER QUALITY BENEFITS.

J PRE-DEVELOPMENT DRAINAGE AREA MAP

REFERENCE MERIDIAN N.J.S.P.C.S. NAD 1983

POA #3

POA #2

POA #1

215 LF 'WOODLANDS' @2.3% (4.7 MIN.)

150 LF 'WOODS-LIGHT UNDERBRUSH' @1.7% (30.8 MIN.)

40 LF 'SHORT GRASS' @2.5% (4.2 MIN.)

110 LF 'WOODS-LIGHT UNDERBRUSH' @1.8% (23.5 MIN.)

EX-3
AREA = 0.550 AC
PERVIOUS AREA = 0.550 AC (CN = 56)
Tc = 35.5 MIN.

50 LF 'WOODLAND' @4.5% (0.8 MIN.)

365 LF 'GRASSED WATERWAY' @1.0% (4.1 MIN.)

EX-2
AREA = 4.95 AC
PERVIOUS AREA = 4.659 AC (CN = 61)
IMPERVIOUS AREA = 0.291 AC (CN = 98)
Tc = 32.6 MIN.

27 LF 'SHORT GRASS' @1.0% (4.4 MIN.)

28 LF 'WOODS-LIGHT UNDERBRUSH' @33.3% (2.4 MIN.)

10 LF 'PAVED' @1.0% (0.1 MIN.)

111 LF 'WOODLAND' @0.5% (5.2 MIN.)

EX-1
AREA = 0.390 AC
PERVIOUS AREA = 0.303 AC (CN = 59)
IMPERVIOUS AREA = 0.087 AC (CN = 98)
Tc = 12.1 MIN.

MONMOUTH COUNTY ROUTE 520 (A.K.A. NEWMAN SPRINGS ROAD) (R.O.W. VARIES)

OSPREY

PLAN

30 0 30 60

Scale: 1"=30'

LEGEND

EXISTING		PROPOSED
	BOUNDARY LINE	
98	CONTOUR LINE	98
X46.80	SPOT ELEVATION	X46.80
	BUILDING	
	WALL	
G G	GAS	GAS
W W	WATER	WTR
	INLET	
	STORM	D
	SANITARY MAIN	S
SAN	SANITARY LATERAL	SAN
OH	OVERHEAD WIRE	O/H
E E	ELECTRIC	E
T T	TELEPHONE	TEL
	UTILITY POLE	
	HYDRANT	
	SIGN POST	
x x	FENCE	x
	LIGHT FIXTURE	
TP-1	TEST PIT LOCATION	TP-1
	GRADE FLOW ARROW	
	SWALE CENTER LINE	

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PROJECT INFORMATION

PROJECT NAME:

MARLBORO MEDICAL ARTS BUILDING C

PROJECT LOCATION:
TM #89; BLOCK 213, LOT 8.01
479 ROUTE 520
TOWNSHIP OF MARLBORO,
MONMOUTH COUNTY, NJ

OWNER:
479 ROUTE 520 ASSOCIATES, LLC
46 NEWMAN SPRINGS ROAD EAST
RED BANK, NJ 07701

APPLICANT:
479 ROUTE 520 ASSOCIATES, LLC
46 NEWMAN SPRINGS ROAD EAST
RED BANK, NJ 07701

APPLICANT'S PROFESSIONALS

ATTORNEY:
CLEARY GIACOBBE ALFIERI JOCOBS, LLC
LAKEVIEW PROFESSIONAL BUILDING
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MATAWAN, NJ 07747

ARCHITECT:
MICHAEL SAVARESE ASSOCIATES ARCHITECTS
34 SYCAMORE AVENUE, BLDG1 UNIT 1E
LITTLE SILVER, NJ 07739

SURVEYOR:
INSITE SURVEYING, LLC
1955 HIGHWAY 34, SUITE 1A
WALL, NJ 07719

INSITE ENGINEERING, LLC SINCE 2003

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(at least 3 days prior to excavation)

ELECTRIC	RED
GAS / OIL	YELLOW
COMMUNICATION / TV	ORANGE
WATER	BLUE
SEWER	GREEN
TEMP SURVEY MARKINGS	MAGENTA
PROPOSED EXCAVATION	WHITE

InSite Engineering, LLC
CERTIFICATE OF AUTHORIZATION: 24GA28083200
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732-531-7100 (Ph) 732-531-7344 (Fax)
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NJPE 43110 NJPP 5726 PAPE 61968
DEPE 3813 NYPE 802295 CTPE 23391
NCPE 33336 DCPE 900682 COPE 36605

REVISIONS

Rev.#	Date	Comment
0	07/10/20	INITIAL RELEASE

SCALE: 1"=30'	DESIGNED BY: DDC
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CAD ID: 20-1380-01r0	

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PLAN INFORMATION

DRAWING TITLE:
AMENDED PRELIMINARY & FINAL MAJOR SITE PLAN

SHEET TITLE:
PRE-DEVELOPMENT DRAINAGE AREA MAP

SHEET NO:
1 OF 3

K POST-DEVELOPMENT DRAINAGE AREA MAP

REFERENCE MERIDIAN N.J.S.P.C.S. NAD 1983

P-3
AREA = 0.441 AC
PERVIOUS AREA = 0.441 AC (CN = 57)
Tc = 35.1 MIN.

300 LF 'WOODED AREA' @2.5% (6.3 MIN.)

150 LF 'WOODS-LIGHT UNDERBRUSH' @2.0% (28.8 MIN.)

POA #3

POA #2

P-2
AREA = 0.719 AC
PERVIOUS AREA = 0.718 AC (CN = 57)
IMPERVIOUS AREA = 0.001 AC (CN = 98)
Tc = 10 MIN.

P-4
AREA = 4.432 AC
PERVIOUS AREA = 1.267 AC (CN = 61)
IMPERVIOUS AREA = 3.068 AC (CN = 98)
Tc = 10 MIN.

27 LF 'SHORT GRASS' @1.0% (4.4 MIN.)
28 LF 'WOODS-LIGHT UNDERBRUSH' @33.3% (2.4 MIN.)

P-1
AREA = 0.395 AC
PERVIOUS AREA = 0.325 AC (CN = 59)
IMPERVIOUS AREA = 0.070 AC (CN = 98)
Tc = 13.4 MIN.

137 LF 'WOODLAND' @0.5% (6.5 MIN.)

10 LF 'PAVED' @1.0% (0.1 MIN.)

POA #1

OSPREY

MONMOUTH COUNTY ROUTE 520 (A.K.A. NEWMAN SPRINGS ROAD) (R.O.W. VARIES)

LOT 10 BLOCK 213

LOT 8.01
BLOCK 213
220,696 SF
5.066 Ac.

BLOCK 213
LOT 49

RETENTION BASIN

2 STORY MASONRY BUILDING
FF=155.0
PARRAPET=189.4
BLDG. HT=34.4'
BUILDING 2

2 STORY MASONRY BUILDING
BUILDING #1

PLAN

30 0 30 60

Scale: 1"=30'

LEGEND

EXISTING		PROPOSED
	BOUNDARY LINE	
	CONTOUR LINE	
X46.80	SPOT ELEVATION	X46.80
	BUILDING	
	WALL	
G G	GAS	GAS
W W	WATER	WTR
	INLET	
	STORM	D
	SANITARY MAIN	S
SAN SAN	SANITARY LATERAL	SAN
OH OH	OVERHEAD WIRE	O/H
E E	ELECTRIC	E
T T	TELEPHONE	TEL
	UTILITY POLE	
OC	HYDRANT	
	SIGN POST	
	FENCE	
	LIGHT FIXTURE	
TP-1	TEST PIT LOCATION	TP-1
	GRADE FLOW ARROW	
	SWALE CENTER LINE	

NOTE:
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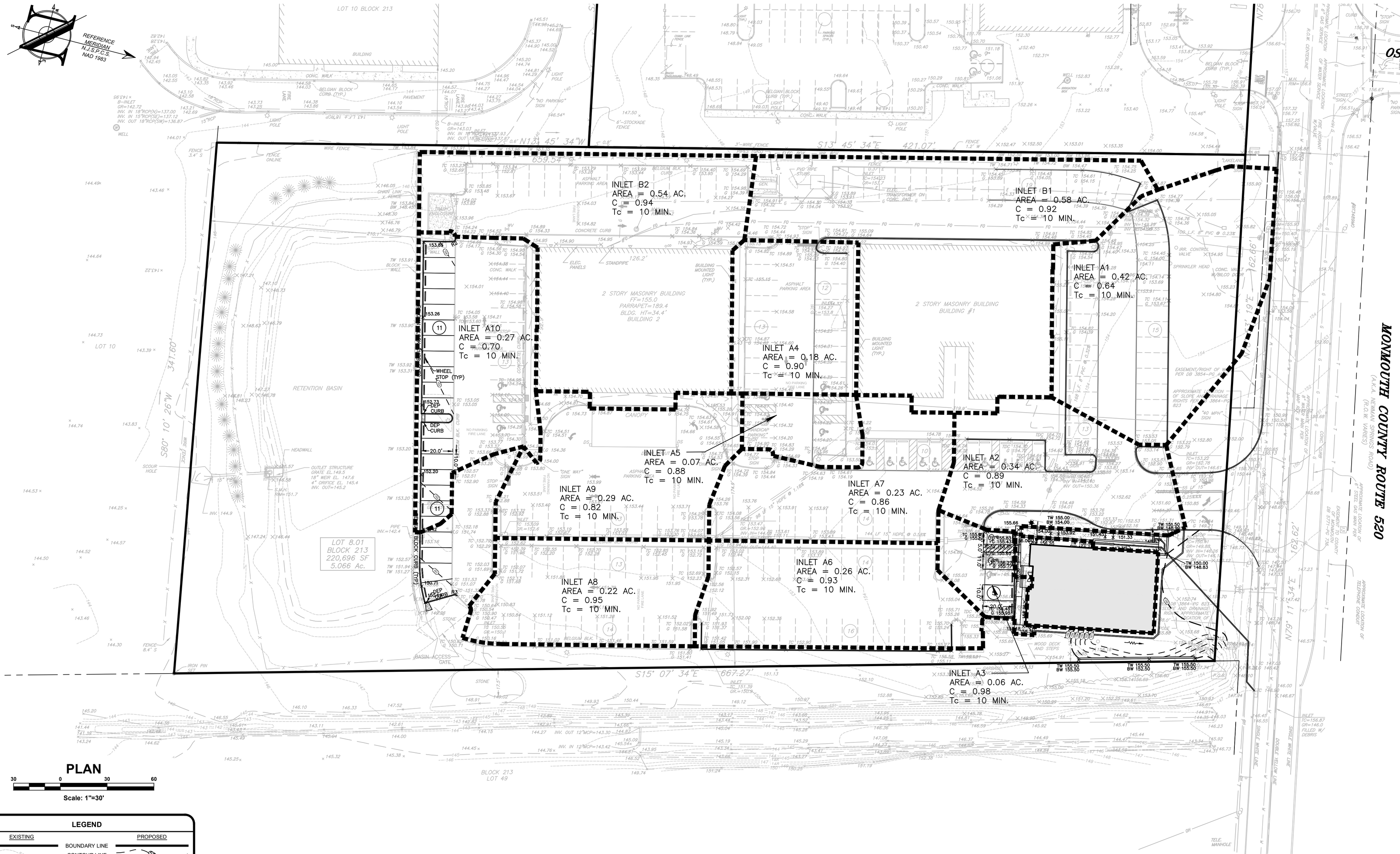
SHEET NO:
2 OF 3

L INLET AREA MAP



PLAN

30 0 30 60

Scale: 1"=30'

LEGEND

EXISTING		PROPOSED
158	CONTOUR LINE	158
X46.80	SPOT ELEVATION	X46.80
	BUILDING	
	WALL	
G G	GAS	GAS
W W	WATER	WTR
	INLET	
	STORM	D
	SANITARY MAIN	S
SAN SAN	SANITARY LATERAL	SAN
OH OH	OVERHEAD WIRE	O/H
E E	ELECTRIC	E
T T	TELEPHONE	TEL
	UTILITY POLE	
	HYDRANT	
	SIGN POST	
X X	FENCE	X
	LIGHT FIXTURE	
TP-1	TEST PIT LOCATION	TP-1
	GRADE FLOW ARROW	
	SWALE CENTER LINE	

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