STORMWATER MANAGEMENT REPORT

Prepared For:

CSH 123, LLC
75 Washington Ave, Suite 2H
Portland, Maine

Prepared By:

Acorn Engineering, Inc.
PO Box 3372
Portland, Maine 04104

February 2017
Rev. February 7, 2017
Rev. April 2017

INTRODUCTION

Acorn Engineering, Inc. has been retained by CSH 123, LLC (CSH) to provide civil engineering services for parking improvements for the two existing parking lots at 107 and 121 Washington Ave in Portland (CBL 12-P-018, 12-P-007). The existing two commercial buildings are to remain structurally unchanged, with minor, non-structural changes to be implemented such as added ADA access to the front entrance. The proposed parking lot improvements include removing the existing, central section of overgrowth to connect the two lots and form a more cohesive parking layout, improved circulation, new stormwater quality and quantity measures, and more efficient use of impervious surfaces. The existing pavement and compacted gravel surfaces are to be resurfaced with limited areas of full-depth pavement reconstruction; the existing section of impervious gravel surface is to be paved at the same grade to better maintain the area for parking.

A stormwater analysis will be prepared to demonstrate that the project will meet the following requirements of the City of Portland (the City):

- City of Portland Land Use Ordinance Chapter 14, Article V. Site Plan Section 14-523. Required Approvals and Applicability (E) Level II Site Plan Review.
- City of Portland Technical Manual – Section 5 – Portland Stormwater Management Standards and Maine DEP Chapter 500 Stormwater Management Amended January 11, 2015.

The proposed project BMPs were designed to the standards and specifications set by the MDEP Stormwater BMP Manual and the University of New Hampshire Stormwater Center (UNHSC).

EXISTING CONDITIONS

The proposed redevelopment project is located at 121 and 107 Washington Ave in Portland, Maine (the Property) bordered to the north by Walnut Street and to the east by Sheridan Street. There are two commercial buildings within the Property which will remain unchanged.

The property is in the B2 Community Business Zone. Abutting Uses include:

- North R-6 Zone – Single and Multi-Family Residential
- West R-6 Zone – Single and Multi-Family Residential
- South B-2b Zone – Community Business
- East R-6 Zone – Single and Multi-Family Residential

The two existing buildings are both single-story commercial spaces at with approximately 17,360 and 5,070 square feet of floor area. The north building at 121 Washington Ave has paved parking to the front and side and gravel parking to the rear for upwards of 27 spaces and the south building at 107 Washington Ave is surrounded by 67 paved, striped parking spaces. The two lots are separated by a strip of undeveloped, brushy growth preventing connectivity between the two.

There is relatively steep terrain that backs the Property at upwards of 50% grades sloping into the existing parking lots. The gravel and paved sections of both lots then gradually slope towards

Washington Ave into the two existing catch basins towards the two lot entrances. There are two existing concrete retaining walls along the south-easternmost corner of the Property as well. The stormwater then outlets into the existing combined sewer system within Washington Ave. However, the City anticipates reconstructing this system to create a separate stormwater service extending to one of the existing site catch basins.

The project team is not aware of the presence of any existing significant natural features located on the site. Given the urban setting and existing impervious surfaces, a field inventory of significant natural features was not undertaken. The project is also not located within a watershed classified as an Urban Impaired Stream.

PROPOSED DEVELOPMENT

The proposed project does not include the addition of any new structures other than that providing ADA access to the front entrance. The two parking lots are to rearranged and partially resurfaced to be reconnected with a drive aisle between the two. The lots will remain accessible via two entrances from Washington Ave, with one entrance shifted slightly to accommodate the rearranged drive aisles. The existing brushy overgrowth buffer is to be replaced by a landscaped, curbed island.

The additional stormwater runoff generated from these layout improvements is proposed to be detained by an Underdrained Infiltration Trench and detained and treated by a series of Modular Pervious Concrete Panels with an underdrained subbase.

The existing section of gravel is to be resurfaced as to maintain the same drainage pattern. The stormwater will continue to drain from the site into Washington Ave with the proposed system providing improvements to the hydraulic capacity, and overall line, grade, and outfall. Therefore, the improvements are classified as a maintenance activity as outlined by the maintenance definition under Chapter 500 quoted below:

> *"Maintenance" means an activity undertaken to maintain operating condition, original line and grade, hydraulic capacity, and original purpose of the project. Paving an impervious gravel surface at original line, grade and hydraulic capacity is considered maintenance.*

Consequently, the project's stormwater system is sized to treat only the new impervious surfaces generated from the reconstructed pavement within the site. A breakdown on the surfaces to be improved are as follows:

Table 1 – Surface Treatment Summary	
Surface	Area (SF)
Existing Compacted Gravel	8,739
Existing Pavement	8,804
New Pavement	4,043
Parking Lot Landscaping	1,657
Net Impervious Surface Increase	**2,386**

Refer to Attachment D for a surface sketch outlining the locations of the above areas.

The development will include installation of new underground water, sewer, and electrical/telephone/cable services; it is not anticipated that the new services will impact the proposed site stormwater improvements. No stormwater work is anticipated to occur within Washington Ave right of way and will be only impacted for utility service connections and driveway reconstruction. Because the southernmost driveway is to be closed, a headstone will be added to the existing catch basin and the rim lowered 3" below existing pavement grade per City Standards. The project incorporates incorporating Maine DEP approved stormwater Best Management Practices to meet the General and Flooding Standards.

GENERAL STANDARDS - WATER QUALITY

The resurfaced portions of the parking lot are to be graded as to direct stormwater runoff into either the proposed Infiltration Trench or Pervious Concrete. The rear portions of the site, including runoff from abutting properties, are tributary to the Infiltration Trench which then convene stormwater into a series of two proposed catch basin structure. The runoff from the side of the building is to be collected by the Pervious Concrete and outlet to the second proposed catch basin.

The pervious concrete surface was sized to meet or exceed the requirements set forth in the MDEP Volume III BMPs Technical Design Manual, Chapter 7.7: 'Manmade Pervious Surfaces'. Filter BMP systems have shown to be effective at filtering out and removing a wide range of pollutants from stormwater runoff.

Impervious Treatment Area

The pervious concrete panels were sized per the standards designated for Run-on Modular Pervious Pavement (Chapter 7.7.1). Per requirement, the impervious area tributary to the BMP is no less than 20% of the BMP surface and the stormwater travels no greater than fifty (50) feet. Because the BMP surface is sized to 20% of the tributary impervious surface, the filter course depth is defined as 18 inches per design requirement.

The stormwater shall then be detained within the reservoir course layer for a minimum of 24 hours and a maximum of 48 hours before flowing vertically through the filter and underdrain stone layer. The treated stormwater shall then be collected within the perforated underdrain pipe and outlet into a proposed catch basin (CB-2).

When stormwater flows exceed the storage and treatment volume capacity of the system, the excess runoff will be collected by CB-2, down gradient of the modular concrete. Another catch basin has been proposed before the system (CB-1) as well to collect stormwater runoff prior to the pervious concrete as to bypass the BMP and not overload the subsurface storage capacity.

The treatment of the impervious surface by the BMPs are as follows:

Table 2 - Impervious Treatment Area Table					
	Existing Impervious Area (SF)	Proposed Total Impervious Area (SF)	Net change in Impervious Area (SF)	Proposed Impervious Area with Treatment (SF)	% Overall New Imp. Area Treated
Pervious Concrete Panels	59,170	61,556	2,386	2,809	118%

As shown above, the project anticipates to meet and exceed the required treatment for new impervious surfaces with the filter BMP.

Filter Area Size

Per the requirements for manmade pervious surfaces, all specifications from Chapter 7: Filtration apply for sizing the BMP surface. As defined in Chapter 7, the surface area of the filter shall be no less than the sum of 5% of the tributary impervious area and 2% of the tributary landscaped area. The filter area is calculated by the following formula:

$$[(\text{Imp. SF} \times 0.05) + (\text{Veg. SF} \times 0.02)] = \text{Filter Area (SF)}$$

Please refer to Table 2 below.

Table 3 –Total Filter Surface Area			
	Required Filter Area (SF)	Actual Filter Area (SF)	Percentage of Required Area (%)
Pervious Concrete Panels	140	480	286%

The outflow from the pervious concrete is then tributary to CB-2 before entering the existing private stormdrain system and the Washington Ave municipal system. As shown, the size of the soil filter area will meet and exceed the surface area requirements. Values from the HydroCAD calculations are attached to this report in Attachment E.

Water Quality Volume

In accordance with the Volume III: BMPs Technical Design Manual, a water quality volume of 1.0 inch times the tributary impervious area plus 0.4 inch times the tributary landscaped developed area is required to be treated by the Pervious Concrete Surface. The water quality volume is calculated by the following formula:

$$\left(\frac{\text{Imp. [SF]} \times 1.0''}{12''/1'}\right) + \left(\frac{\text{Dist. [SF]} \times 0.4''}{12''/1'}\right) = \text{Treatment Volume [CF]}$$

The proposed water quality volume is as follows:

Table 4 - Water Quality Volume Table				
	Tributary Landscaped Area (SF)	Tributary Impervious Area (SF)	Treatment Volume Required (CF)	Treatment Volume Provided (CF)
Subsurface Sand Filter	0	2,809	**234**	**248**

As shown, the size of the combined water quality volume will meet and exceed the treatment volume requirements. Values from the HydroCAD calculations are attached to this report.

FLOODING STANDARD – WATER QUANTITY

To evaluate the project with respect to the Section E. Flooding Standard, the proposed development was modeled using HydroCAD to verify that the post-development conditions do not exceed the pre-development conditions. The model applied a 24-hour SCS Type III storm distribution for the 2, 10, and 25-year storm events with the corresponding rainfall amounts 3.1", 4.6", and 5.8" respectively. Rainfall amounts are from Appendix H of the Chapter 500 for Cumberland SE.

The existing stormwater runoff eventually flows into the Washington Ave municipal system. Therefore, both the pre- and post-development conditions model the runoff into Washington Ave.

Due to the numerous variables and inherent inaccuracies with the modeling program used to calculate stormwater runoff, it is custom at Acorn Engineering, Inc. to round to the nearest whole number or to the nearest tenth for urban infill projects. Due to the small size of the project the stormwater runoff shall be rounded to the nearest tenth of a cubic foot per second (cfs).

Time of Concentration (T_c)

Due to the existing vegetated and steep conditions, apparent in three different sections to the rear of the Property, the time of concentration was calculated using sheet flow until transitioning into shallow concentrated flow once contacting paved, impervious surfaces. For subcatchments in both the pre- and post-development condition containing only paved surfaces, a time of concentration (T_c) of 5 minutes was applied.

Per the research developed by the University of New Hampshire Stormwater Center, a Tc of 790 minutes has produced good predictions of final discharge from porous pavement at 41" above top of underdrain base with proportional Tc values accepted for smaller bases as well. This would equate to 347 minutes assuming storage in the 18" filter bed only. However, to model a more conservative stormwater condition, a 5-minute Tc was used for the subcatchment tributary to the pervious concrete. The 5-minute condition would simulate the worst-case scenario of clogged pavement, preventing runoff to filter through the layers at the design flow rate. The post-development flow rates were still at or below the pre-development rates with this conservative design element.

Curve Number

Conservative curve number (CN) runoff values were used within the subcatchments for the area surrounding the buildings' footprint. The existing vegetated portions to the rear of the site are in relatively poor condition and are modelled as such in both pre- and post-development conditions. The existing landscaped strip between the lots is fully vegetated and has been modelled in fair condition.

The stormwater calculations used the following CN values in the pre- and post-development condition are as follows:

- Pavement, Concrete, Gravel
- Wood/Grass Combo – Poor, Fair, Good
- > 75% Grass Cover - Good

The stormwater calculations used the following CN values in the post-development condition, representing better draining landscaped areas, are as follows:

- Pavement, Concrete, Gravel
- Wood/Grass Combo – Poor, Good
- > 75% Grass Cover – Good

The only change in assumed CN values between the pre- and post-development conditions is the landscaped area in the middle of site transitioning from fair to good coverage; additional landscaping maintenance is to be provided in the post-development conditions and protected by a proposed easement between the two sites to ensure that the landscaped parking island remains in good condition.

It was assumed that the compacted gravel lot and concrete retaining walls have the same curve number as paved parking lots.

Pre-development Calculations

The pre-development condition was modeled as three subcatchments to determine the net impact of the development.

- Subcatchment 1 – Rear steep slopes and gravel parking area, and undeveloped brushy buffer tributary to the existing catch basin (Ex. CB-1)
- Subcatchment 2 – Rear easternmost corner to the existing catch basin (Ex. CB-2)
- Subcatchment 3 – Front paved parking area to Washington Ave

A Pre-Development Watershed Map developed for this project can be viewed in Attachment A, and a copy of the HydroCAD calculations is included within Attachment E, of this report.

Peak flow rates for the storm events are as follows:

Table 5 – Pre-Development Peak Stormwater Flows			
Drainage Area	**2 – Year Storm Event (cfs)**	**10 – Year Storm Event (cfs)**	**25 – Year Storm Event (cfs)**
Washington Ave	1.8	3.5	5.0

Post-development Calculations:

The one predevelopment subcatchment was divided into three separate subcatchments for the post-development condition.

- Subcatchment 1 – Rear areas tributary to the Infiltration Trench
- Subcatchment 2 – Areas tributary to the proposed catch basin, Prop. CB-1
- Subcatchment 3 – Areas tributary to the proposed catch basin, Prop. CB-2
- Subcatchment 4- Areas tributary to the proposed catch basin, Prop, CB-3
- Subcatchment 5 – Front paved parking area to Washington Ave

The post development calculations include changes to the land use and compensation provided by the infiltration trench orifice and the pervious surface BMP system. The following table represents comparison of predevelopment and post-development condition peak runoff rates for the proposed development and tributary area.

Table 6 – Comparison of Peak Flows						
Drainage Area	**2 – Year Storm Event (cfs)**		**10 – Year Storm Event (cfs)**		**25 – Year Storm Event (cfs)**	
Washington Ave	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
	1.8	1.7	3.5	3.5	5.0	4.9

As shown in Table 5, the net impact of the post development peak flows shall remain at or below the predevelopment levels for the two-, ten-, and twenty-five-year storms.

A Post-Development Watershed Map created for this project can be viewed in Attachment B, and a copy of the HydroCAD calculations is included within Attachment E of this report.

A stormwater maintenance agreement will be established with a third-party service in accordance with MDEP Chapter 7.7 and UNHSC standards. Maintenance activities may include inspections, sweeping, and vacuuming and specify that salt and sediment transport is to be limited on the pervious concrete surface.

SOILS

Onsite soil information includes the following:

- Soil Conservation Service Medium Intensity Soil Survey for Cumberland County.

Typical of the East End of Portland, the existing onsite soil series consists of Hinckley at slopes of 3-8% and 15-25%; the Hinckley series consists of very deep, excessively drained soils formed in glaciofluvial materials. The permeability of the Hinckley soil is rapid in the surface layer and subsoil and very rapid in the substratum with typically a low groundwater table. The area within and surrounding the project includes soils types listed in the table below. The susceptibility of soils to erosion is indicated on a relative "K" scale of values over a range of 0.02 to 0.69. Higher "K" values indicate more erodible soils.

Table 7 - "K" Value		
Soils Type	**Subsurface**	**Substratum**
Hinckley – Gravelly Sandy Loam	0.17	0.17

The soil "K" values for the soils, listed above, indicate a low susceptibility to erosion. The site's susceptibility to erosion is from the Soil Conservation Service Medium Intensity Soil Survey for Cumberland County. The site's soils map as developed from the Soil Conservation Service Medium Intensity Soil Survey for Cumberland County is included as Attachment C.

Given the soils information, listed above, the use of underdrains, and that greater than 50% of the proposed development site is currently developed, it is Acorn Engineering's professional opinion that a more intense hydric soil boundary delineation is not required because the waiver requirements set forth in the City of Portland Technical Manual – Section 7 – Soil Survey, Rev. 6/17/11 are met.

Conclusion

The proposed development was designed to meet the requirements implemented by the MDEP under the Stormwater Management Statute (38 M.R.S.A. § 420-D) as well as the City of Portland Technical Manual – Section 5 – Portland Stormwater Management Standards. Thus, the design of the proposed development and stormwater system does not anticipate to create erosion, drainage or runoff problems either in the development or with respect to adjoining properties. The proposed improvements will add previously absent stormwater quality and quantity features that will improve and attenuate site-generated runoff.

Attachments

Attachment A: Pre Development Watershed Map
Attachment B: Post Development Watershed Map
Attachment C: Soils Map
Attachment D: Surface Sketch
Attachment E: HydroCAD Calculations

SHERIDAN STREET

Temporary Benchmark: spike in utility pole elevation: 113.20'

existing guard rail prohibits access to Sheridan Street

S30°21'34"E 196.82'

1–A

1–B

1–C

N/F
JP Sheridan, LLC
32142/232

N/F
New Day Farm, LLC
32357/220

N/F
Samantha Connelly
Nathaniel Green
31941/155

N/F
Shane Dobson
23075/100

N/F
Deidre J. F
Peter J. F
31916/34

N/F
Cotton Street Holdings, LLC
31430/212

N/F
Cotton Street Holdings, LLC
31430/212

N/F
Fox Street, LLC
32142/229

N/F
Creighton &
Creighton
368/339

gravel parking lot

paved parking lot

paved parking lot

paved parking lot

no easement for overhead wire

finished floor elevation: 75.62'

Temporary Benchmark: spike in utility pole elevation: 78.00'

1 1/2" iron pipe leaning

N25°25'26"W 8.15'

N21°57'21"W 27.19'

S 21°50'29" E 61.21'

5/8" capped iron rod (PLS# 2075)

5/8" capped iron rod (PLS# 1273)

concrete retaining wall

S52°38" E 145.54'

jersey barrier

guardrail

wood stockade fence

finished floor elevation: 73.99'

N 62°32'47" E 148.00'

S 27°49'17" W 144.07'

NORTH BUILDING
121–123 WASHINGTON AVE
EXISTING 1–STORY
17,360 SF

SOUTH BUILDING
EX. OFFICE SPACE
107 WASHINGTON AVE
EXISTING 1–STORY
5,070 SF
FFE: 73.15' AVG.

finished floor elevation: 75.34'

finished floor elevation: 75.43'

concrete steps

EX. CB–1

EX. CB–2

no easement for overhead wire

finished floor elevation: 72.31'

brick walk

N 20°14'47" W 155.02'

N24°36'47"W 69.02'

POI #1

POI #2

POI #99

Temporary Benchmark: spike in utility pole elevation: 72.48'

rim: 72.56'
invert: 65.06'
invert: 65.06'

rim: 70.65'
invert: 60.25'

GENERAL NOTES:

REFER TO STORMWATER REPORT FOR MORE INFORMATION.

1 — SUBCATCHMENT NUMBER

1P — SUBCATCHMENT POND

SUBCATCHMENT EXTENTS

POI #1 — POINT OF INTEREST (POI)

PERMIT LEVEL
NOT ISSUED FOR CONSTRUCTION

ISSUED FOR	BY	DATE
FINAL APP	WHS	2/3/17
COMMENT RESPONSE	WHS	4/11/17

DRAWING NAME: PRE – DEVELOPMENT STORMWATER PLAN

PROJECT NAME: WASHINGTON AVE. PARKING LOT REDEVELOPMENT

CLIENT: CSH 123, LLC
75 WASHINGTON AVE, SUITE 2H, PORTLAND, MAINE 04101

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ACORN ENGINEERING, INC.
158 DANFORTH ST PORTLAND, MAINE 04102
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JN:	1076
SCALE:	NTS
DESIGNED BY:	WHS
DRAWN BY:	OJD
CHECKED BY:	WHS

STATE OF MAINE
WILLIAM H. SAVAGE
No. 11419
4-11-17
PROFESSIONAL ENGINEER

DRAWING NO.
PRE

SHERIDAN STREET

N/F
New Day Farm, LLC
32357/220

N/F
JP Sheridan, LLC
32142/232

N/F
Samantha Connelly
Nathaniel Green
31941/155

N/F
Shane Dobson
23075/100

N/F
Fox Street, LLC

N/F
Cotton Street Holdings, LLC
31430/212

1–A
1–B
1
2
3
4
5
1P
2P
3P
4P
2R
3R

PROPOSED INFILTRATION TRENCH

BARREL ROOM

NORTH TENANT
DISTILLERY
FFE: 75.62'

WAREHOUSE

NORTH TENANT
RETAIL/BAR
FFE: 75.19'

NORTH BUILDING
121–123 WASHINGTON AVE
CSH 123, LLC
EXISTING 1–STORY
17,360 SF

MALT ROOM

SOUTH TENANT
WHOLESALE SEAFOOD

WEST TENANT
BAKERY & CAFE
FFE 75.43'

SOUTH BUILDING
EX. OFFICE SPACE
107 WASHINGTON AVE
COTTON STREET HOLDINGS, LLC
EXISTING 1–STORY
5,070 SF
FFE: 73.15' AVG.

PROP. CB–1

PROPOSED MODULAR
PERVIOUS CONCRETE

EX. CB–2

EX. CB–1 TO
BE REMOVED

PROP. CB–2

EXISTING BITUMINOUS
PAVEMENT. EXIT DOORS
AT GRADE, TYP. OF 2.
REFER TO C–30.

Temporary Benchmark:
spike in utility pole
elevation: 113.20'

Temporary Benchmark:
spike in utility pole
elevation: 72.48'

POI #1

POI #99

PERMIT LEVEL
NOT ISSUED FOR
CONSTRUCTION

GENERAL NOTES:

1. REFER TO STORMWATER REPORT FOR MORE INFORMATION
2. GIVEN THE URBAN SETTING, SMALL WATERSHED AREA AND PREDOMINANCE OF IMPERVIOUS AREAS, SUBCATCHMENTS 2, 3, 4 & 5 WERE DEVELOPED USING A 5 MINUTE TIME OF CONCENTRATION WAS USED FOR BOTH THE PRE–DEVELOPMENT AND POST–DEVELOPMENT CONDITIONS.

1 — SUBCATCHMENT NUMBER

1P — SUBCATCHMENT POND

SUBCATCHMENT EXTENTS

POI #1 — POINT OF INTEREST (POI)

ISSUED FOR	BY	DATE
FINAL APP	WHS	2/3/17
COMMENT RESPONSE	WHS	4/11/17

DRAWING NAME: POST – DEVELOPMENT STORMWATER PLAN

PROJECT NAME: WASHINGTON AVE. PARKING LOT REDEVELOPMENT

CLIENT: CSH 123, LLC
75 WASHINGTON AVE, SUITE 2H, PORTLAND, MAINE 04101

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DRAWN BY:	OJD
CHECKED BY:	WHS

STATE OF MAINE
WILLIAM H. SAVAGE
No. 11419
4-11-17
PROFESSIONAL ENGINEER

DRAWING NO.
POST

ISSUED FOR	BY DATE
FINAL APP	WHS 2/3/17
	REV. DATE:

DRAWING NAME: SOILS MAP

PROJECT NAME: WASHINGTON AVE PARKING LOT REDEVELOPMENT

CLIENT: CSH 123, LLC

ACORN ENGINEERING, INC
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PORTLAND, MAINE 04104 (207) 775-2655

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DRAWING NO.

EX-1

FINAL

SHERIDAN STREET

LEGEND		
HATCH STYLE	SURFACE	AREA (SF)
	NEW PAVEMENT	4,083
	PARKING LOT LANDSCAPING	1,657
	NET IMPERVIOUS SURFACE INCREASE	2,386
	EXISTING COMPACTED GRAVEL (MAINTENANCE)	6,005
	EXISTING PAVEMENT (MAINTENANCE)	8,804

N/F
New Day Farm,
32357/220

N/F
Samantha Connelly
Nathaniel Green
31941/155

N/F
Shane Dobson
23075/100

N/F
Deidre J. Fogg,
Peter J. Farla
31918/344

N/F
Bay Cove,
31505/2

N/F
Cotton Street Holdings, LLC
31430/212

NORTH BUILDING
121–123 WASHINGTON AVE
EXISTING 1–STORY
17,360 SF
FFE: 75.46' AVG.

SOUTH BUILDING
107 WASHINGTON AVE
EXISTING 1–STORY
5,070 SF
FFE: 73.15' AVG.

WASHINGTON AVENUE

ISSUED FOR	BY DATE
FINAL APP	WHS 2/3/17
COMMENT RESPONSE	WHS 4/11/17
	REV. DATE

DRAWING NAME: SURFACE SKETCH

PROJECT NAME: WASHINGTON AVE PARKING LOT REDEVELOPMENT

CLIENT: CSH 123, LLC

ACORN ENGINEERING, INC
ACORN ENGINEERING, INC. P.O. BOX 3372
PORTLAND, MAINE 04104 (207) 775-2655

FILE:	1076_CIVIL
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DRAWN BY:	OJD
CHECKED BY:	WHS

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DRAWING NO.

EX–2

Drainage Diagram for PRE_4-5-17
Prepared by Acorn Engineering, Inc., Printed 4/11/2017
HydroCAD® 9.10 s/n 06436 © 2010 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.082	32	Woods/grass comb., Good, HSG A (2S)
0.004	39	>75% Grass cover, Good, HSG A (2S)
0.034	43	Woods/grass comb., Fair, HSG A (1S)
0.536	57	Woods/grass comb., Poor, HSG A (1S)
0.147	96	Gravel (1S)
0.006	98	Concrete (1S)
0.634	98	Pavement (1S, 2S, 3S)
1.444		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.656	HSG A	1S, 2S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.788	Other	1S, 2S, 3S
1.444		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Fill (inches)
1	2P	67.43	67.28	57.0	0.0026	0.010	12.0	0.0	0.0

Time span=1.00-36.00 hrs, dt=0.02 hrs, 1751 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcat 1 Runoff Area=41,599 sf 24.89% Impervious Runoff Depth=0.92"
Flow Length=436' Tc=9.4 min CN=73 Runoff=0.85 cfs 0.073 af

Subcatchment 2S: Subcat 2 Runoff Area=18,640 sf 79.82% Impervious Runoff Depth=1.67"
Tc=5.0 min CN=85 Runoff=0.87 cfs 0.060 af

Subcatchment 3S: Subcat 3 Runoff Area=2,667 sf 100.00% Impervious Runoff Depth=2.87"
Tc=5.0 min CN=98 Runoff=0.19 cfs 0.015 af

Reach 1R: POI #1 Inflow=0.19 cfs 0.015 af
Outflow=0.19 cfs 0.015 af

Reach 2R: POI #2 (Ex. CB-2) Inflow=1.59 cfs 0.133 af
Outflow=1.59 cfs 0.133 af

Reach 99R: Washington Ave Inflow=1.77 cfs 0.147 af
Outflow=1.77 cfs 0.147 af

Pond 2P: Ex. CB-1 Peak Elev=68.02' Inflow=0.85 cfs 0.073 af
12.0" Round Culvert n=0.010 L=57.0' S=0.0026 '/' Outflow=0.85 cfs 0.073 af

Total Runoff Area = 1.444 ac Runoff Volume = 0.147 af Average Runoff Depth = 1.23"
55.65% Pervious = 0.804 ac 44.35% Impervious = 0.640 ac

Summary for Subcatchment 1S: Subcat 1

Runoff = 0.85 cfs @ 12.14 hrs, Volume= 0.073 af, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	10,076	98	Pavement
*	6,418	96	Gravel
*	276	98	Concrete
	23,328	57	Woods/grass comb., Poor, HSG A
	1,501	43	Woods/grass comb., Fair, HSG A
	41,599	73	Weighted Average
	31,247		75.11% Pervious Area
	10,352		24.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	68	0.4600	0.25		**Sheet Flow, 1-AB** Woods: Light underbrush n= 0.400 P2= 3.27"
3.0	40	0.0600	0.22		**Sheet Flow, 1-BC** Grass: Short n= 0.150 P2= 3.27"
1.9	328	0.0200	2.87		**Shallow Concentrated Flow, 1-CD** Paved Kv= 20.3 fps
9.4	436	Total			

Subcatchment 1S: Subcat 1

Summary for Subcatchment 2S: Subcat 2

Runoff = 0.87 cfs @ 12.08 hrs, Volume= 0.060 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	14,878	98	Pavement
	196	39	>75% Grass cover, Good, HSG A
	3,566	32	Woods/grass comb., Good, HSG A
	18,640	85	Weighted Average
	3,762		20.18% Pervious Area
	14,878		79.82% Impervious Area

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

Subcatchment 2S: Subcat 2

Summary for Subcatchment 3S: Subcat 3

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	2,667	98	Pavement
	2,667		100.00% Impervious Area

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

Subcatchment 3S: Subcat 3

Summary for Reach 1R: POI #1

Inflow Area = 0.061 ac,100.00% Impervious, Inflow Depth = 2.87" for 2-year event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af
Outflow = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs

Reach 1R: POI #1

Summary for Reach 2R: POI #2 (Ex. CB-2)

Inflow Area = 1.383 ac, 41.88% Impervious, Inflow Depth = 1.15" for 2-year event
Inflow = 1.59 cfs @ 12.10 hrs, Volume= 0.133 af
Outflow = 1.59 cfs @ 12.10 hrs, Volume= 0.133 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs

Reach 2R: POI #2 (Ex. CB-2)

Summary for Reach 99R: Washington Ave

Inflow Area = 1.444 ac, 44.35% Impervious, Inflow Depth = 1.23" for 2-year event
Inflow = 1.77 cfs @ 12.10 hrs, Volume= 0.147 af
Outflow = 1.77 cfs @ 12.10 hrs, Volume= 0.147 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs

Reach 99R: Washington Ave

Summary for Pond 2P: Ex. CB-1

Inflow Area = 0.955 ac, 24.89% Impervious, Inflow Depth = 0.92" for 2-year event
Inflow = 0.85 cfs @ 12.14 hrs, Volume= 0.073 af
Outflow = 0.85 cfs @ 12.14 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Primary = 0.85 cfs @ 12.14 hrs, Volume= 0.073 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 68.02' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	67.43'	**12.0" Round Culvert** L= 57.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.43' / 67.28' S= 0.0026 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.84 cfs @ 12.14 hrs HW=68.02' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.84 cfs @ 2.50 fps)

Pond 2P: Ex. CB-1

Time span=1.00-36.00 hrs, dt=0.02 hrs, 1751 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcat 1 Runoff Area=41,599 sf 24.89% Impervious Runoff Depth=1.97"
Flow Length=436' Tc=9.4 min CN=73 Runoff=1.93 cfs 0.157 af

Subcatchment 2S: Subcat 2 Runoff Area=18,640 sf 79.82% Impervious Runoff Depth=3.00"
Tc=5.0 min CN=85 Runoff=1.54 cfs 0.107 af

Subcatchment 3S: Subcat 3 Runoff Area=2,667 sf 100.00% Impervious Runoff Depth>4.36"
Tc=5.0 min CN=98 Runoff=0.28 cfs 0.022 af

Reach 1R: POI #1 Inflow=0.28 cfs 0.022 af
Outflow=0.28 cfs 0.022 af

Reach 2R: POI #2 (Ex. CB-2) Inflow=3.27 cfs 0.264 af
Outflow=3.27 cfs 0.264 af

Reach 99R: Washington Ave Inflow=3.53 cfs 0.286 af
Outflow=3.53 cfs 0.286 af

Pond 2P: Ex. CB-1 Peak Elev=68.43' Inflow=1.93 cfs 0.157 af
12.0" Round Culvert n=0.010 L=57.0' S=0.0026 '/' Outflow=1.93 cfs 0.157 af

Total Runoff Area = 1.444 ac Runoff Volume = 0.286 af Average Runoff Depth = 2.38"
55.65% Pervious = 0.804 ac 44.35% Impervious = 0.640 ac

Summary for Subcatchment 1S: Subcat 1

Runoff = 1.93 cfs @ 12.14 hrs, Volume= 0.157 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	10,076	98	Pavement
*	6,418	96	Gravel
*	276	98	Concrete
	23,328	57	Woods/grass comb., Poor, HSG A
	1,501	43	Woods/grass comb., Fair, HSG A
	41,599	73	Weighted Average
	31,247		75.11% Pervious Area
	10,352		24.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	68	0.4600	0.25		**Sheet Flow, 1-AB** Woods: Light underbrush n= 0.400 P2= 3.27"
3.0	40	0.0600	0.22		**Sheet Flow, 1-BC** Grass: Short n= 0.150 P2= 3.27"
1.9	328	0.0200	2.87		**Shallow Concentrated Flow, 1-CD** Paved Kv= 20.3 fps
9.4	436	Total			

Subcatchment 1S: Subcat 1

Summary for Subcatchment 2S: Subcat 2

Runoff = 1.54 cfs @ 12.07 hrs, Volume= 0.107 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	14,878	98	Pavement
	196	39	>75% Grass cover, Good, HSG A
	3,566	32	Woods/grass comb., Good, HSG A
	18,640	85	Weighted Average
	3,762		20.18% Pervious Area
	14,878		79.82% Impervious Area

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

Subcatchment 2S: Subcat 2

Summary for Subcatchment 3S: Subcat 3

Runoff = 0.28 cfs @ 12.07 hrs, Volume= 0.022 af, Depth> 4.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	2,667	98	Pavement
	2,667		100.00% Impervious Area

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

Subcatchment 3S: Subcat 3

Summary for Reach 1R: POI #1

Inflow Area = 0.061 ac,100.00% Impervious, Inflow Depth > 4.36" for 10-year event
Inflow = 0.28 cfs @ 12.07 hrs, Volume= 0.022 af
Outflow = 0.28 cfs @ 12.07 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs

Reach 1R: POI #1

Summary for Reach 2R: POI #2 (Ex. CB-2)

Inflow Area = 1.383 ac, 41.88% Impervious, Inflow Depth = 2.29" for 10-year event
Inflow = 3.27 cfs @ 12.10 hrs, Volume= 0.264 af
Outflow = 3.27 cfs @ 12.10 hrs, Volume= 0.264 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs

Reach 2R: POI #2 (Ex. CB-2)

Summary for Reach 99R: Washington Ave

Inflow Area = 1.444 ac, 44.35% Impervious, Inflow Depth = 2.38" for 10-year event
Inflow = 3.53 cfs @ 12.10 hrs, Volume= 0.286 af
Outflow = 3.53 cfs @ 12.10 hrs, Volume= 0.286 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs

Reach 99R: Washington Ave

Summary for Pond 2P: Ex. CB-1

Inflow Area = 0.955 ac, 24.89% Impervious, Inflow Depth = 1.97" for 10-year event
Inflow = 1.93 cfs @ 12.14 hrs, Volume= 0.157 af
Outflow = 1.93 cfs @ 12.14 hrs, Volume= 0.157 af, Atten= 0%, Lag= 0.0 min
Primary = 1.93 cfs @ 12.14 hrs, Volume= 0.157 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 68.43' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	67.43'	**12.0" Round Culvert** L= 57.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.43' / 67.28' S= 0.0026 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=1.93 cfs @ 12.14 hrs HW=68.43' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.93 cfs @ 3.07 fps)

Pond 2P: Ex. CB-1

Time span=1.00-36.00 hrs, dt=0.02 hrs, 1751 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcat 1 Runoff Area=41,599 sf 24.89% Impervious Runoff Depth=2.92"
Flow Length=436' Tc=9.4 min CN=73 Runoff=2.90 cfs 0.233 af

Subcatchment 2S: Subcat 2 Runoff Area=18,640 sf 79.82% Impervious Runoff Depth=4.11"
Tc=5.0 min CN=85 Runoff=2.10 cfs 0.147 af

Subcatchment 3S: Subcat 3 Runoff Area=2,667 sf 100.00% Impervious Runoff Depth>5.56"
Tc=5.0 min CN=98 Runoff=0.36 cfs 0.028 af

Reach 1R: POI #1 Inflow=0.36 cfs 0.028 af
Outflow=0.36 cfs 0.028 af

Reach 2R: POI #2 (Ex. CB-2) Inflow=4.71 cfs 0.379 af
Outflow=4.71 cfs 0.379 af

Reach 99R: Washington Ave Inflow=5.04 cfs 0.408 af
Outflow=5.04 cfs 0.408 af

Pond 2P: Ex. CB-1 Peak Elev=68.91' Inflow=2.90 cfs 0.233 af
12.0" Round Culvert n=0.010 L=57.0' S=0.0026 '/' Outflow=2.90 cfs 0.233 af

Total Runoff Area = 1.444 ac Runoff Volume = 0.408 af Average Runoff Depth = 3.39"
55.65% Pervious = 0.804 ac 44.35% Impervious = 0.640 ac

Summary for Subcatchment 1S: Subcat 1

Runoff = 2.90 cfs @ 12.13 hrs, Volume= 0.233 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	10,076	98	Pavement
*	6,418	96	Gravel
*	276	98	Concrete
	23,328	57	Woods/grass comb., Poor, HSG A
	1,501	43	Woods/grass comb., Fair, HSG A
	41,599	73	Weighted Average
	31,247		75.11% Pervious Area
	10,352		24.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	68	0.4600	0.25		**Sheet Flow, 1-AB** Woods: Light underbrush n= 0.400 P2= 3.27"
3.0	40	0.0600	0.22		**Sheet Flow, 1-BC** Grass: Short n= 0.150 P2= 3.27"
1.9	328	0.0200	2.87		**Shallow Concentrated Flow, 1-CD** Paved Kv= 20.3 fps
9.4	436	Total			

Subcatchment 1S: Subcat 1

Summary for Subcatchment 2S: Subcat 2

Runoff = 2.10 cfs @ 12.07 hrs, Volume= 0.147 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	14,878	98	Pavement
	196	39	>75% Grass cover, Good, HSG A
	3,566	32	Woods/grass comb., Good, HSG A
	18,640	85	Weighted Average
	3,762		20.18% Pervious Area
	14,878		79.82% Impervious Area

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

Subcatchment 2S: Subcat 2

Summary for Subcatchment 3S: Subcat 3

Runoff = 0.36 cfs @ 12.07 hrs, Volume= 0.028 af, Depth> 5.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	2,667	98	Pavement
	2,667		100.00% Impervious Area

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

Subcatchment 3S: Subcat 3

Summary for Reach 1R: POI #1

Inflow Area = 0.061 ac,100.00% Impervious, Inflow Depth > 5.56" for 25-year event
Inflow = 0.36 cfs @ 12.07 hrs, Volume= 0.028 af
Outflow = 0.36 cfs @ 12.07 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs

Reach 1R: POI #1

Summary for Reach 2R: POI #2 (Ex. CB-2)

Inflow Area = 1.383 ac, 41.88% Impervious, Inflow Depth = 3.29" for 25-year event
Inflow = 4.71 cfs @ 12.10 hrs, Volume= 0.379 af
Outflow = 4.71 cfs @ 12.10 hrs, Volume= 0.379 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs

Reach 2R: POI #2 (Ex. CB-2)

Summary for Reach 99R: Washington Ave

Inflow Area = 1.444 ac, 44.35% Impervious, Inflow Depth = 3.39" for 25-year event
Inflow = 5.04 cfs @ 12.10 hrs, Volume= 0.408 af
Outflow = 5.04 cfs @ 12.10 hrs, Volume= 0.408 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs

Reach 99R: Washington Ave

Summary for Pond 2P: Ex. CB-1

Inflow Area = 0.955 ac, 24.89% Impervious, Inflow Depth = 2.92" for 25-year event
Inflow = 2.90 cfs @ 12.13 hrs, Volume= 0.233 af
Outflow = 2.90 cfs @ 12.13 hrs, Volume= 0.233 af, Atten= 0%, Lag= 0.0 min
Primary = 2.90 cfs @ 12.13 hrs, Volume= 0.233 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 68.91' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	67.43'	**12.0" Round Culvert** L= 57.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.43' / 67.28' S= 0.0026 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=2.89 cfs @ 12.13 hrs HW=68.90' (Free Discharge)
└**1=Culvert** (Barrel Controls 2.89 cfs @ 3.68 fps)

Pond 2P: Ex. CB-1

Drainage Diagram for POST_4-11-17
Prepared by Acorn Engineering, Inc., Printed 4/11/2017
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.129	32	Woods/grass comb., Good, HSG A (2S, 3S)
0.047	39	>75% Grass cover, Good, HSG A (3S, 5S)
0.432	57	Woods/grass comb., Poor, HSG A (1S)
0.009	96	Gravel (1S)
0.012	98	Concrete (2S, 3S, 5S)
0.804	98	Pavement (1S, 2S, 3S, 4S, 5S)
0.011	98	Porous Concrete (4S)
1.444		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.608	HSG A	1S, 2S, 3S, 5S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.836	Other	1S, 2S, 3S, 4S, 5S
1.444		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Fill (inches)
1	1P	71.75	69.82	170.0	0.0114	0.010	6.0	0.0	0.0
2	2P	69.72	68.30	42.0	0.0338	0.010	12.0	0.0	0.0
3	4P	68.01	67.71	15.0	0.0200	0.010	6.0	0.0	0.0

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcat 1 Runoff Area=25,081 sf 23.43% Impervious Runoff Depth=0.64"
Flow Length=109' Tc=4.7 min CN=67 Runoff=0.37 cfs 0.030 af

Subcatchment 2S: Subcat 2 Runoff Area=9,373 sf 83.99% Impervious Runoff Depth=1.83"
Tc=5.0 min CN=87 Runoff=0.48 cfs 0.033 af

Subcatchment 3S: Subcat 3 Runoff Area=21,206 sf 73.65% Impervious Runoff Depth=1.39"
Tc=5.0 min CN=81 Runoff=0.82 cfs 0.056 af

Subcatchment 4S: Subcat 4 Runoff Area=2,809 sf 100.00% Impervious Runoff Depth=2.87"
Tc=5.0 min CN=98 Runoff=0.20 cfs 0.015 af

Subcatchment 5S: Subcat 5 Runoff Area=4,437 sf 86.97% Impervious Runoff Depth=2.08"
Tc=5.0 min CN=90 Runoff=0.25 cfs 0.018 af

Reach 1R: POI #1 Inflow=0.25 cfs 0.018 af
Outflow=0.25 cfs 0.018 af

Reach 2R: Prop. CB-2 Inflow=1.49 cfs 0.134 af
Outflow=1.49 cfs 0.134 af

Reach 3R: Ex. CB-2 Inflow=1.49 cfs 0.134 af
Outflow=1.49 cfs 0.134 af

Reach 99R: Washington Ave Inflow=1.74 cfs 0.152 af
Outflow=1.74 cfs 0.152 af

Pond 1P: Infiltration Trench Peak Elev=74.31' Storage=0.009 af Inflow=0.37 cfs 0.030 af
Outflow=0.06 cfs 0.030 af

Pond 2P: Prop. CB-1 Peak Elev=70.12' Inflow=0.51 cfs 0.063 af
12.0" Round Culvert n=0.010 L=42.0' S=0.0338 '/' Outflow=0.51 cfs 0.063 af

Pond 4P: Pervious Concrete Peak Elev=68.30' Storage=107 cf Inflow=0.20 cfs 0.015 af
6.0" Round Culvert n=0.010 L=15.0' S=0.0200 '/' Outflow=0.17 cfs 0.014 af

Total Runoff Area = 1.444 ac Runoff Volume = 0.153 af Average Runoff Depth = 1.27"
42.72% Pervious = 0.617 ac 57.28% Impervious = 0.827 ac

Summary for Subcatchment 1S: Subcat 1

Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.030 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	386	96	Gravel
	18,819	57	Woods/grass comb., Poor, HSG A
*	5,876	98	Pavement
	25,081	67	Weighted Average
	19,205		76.57% Pervious Area
	5,876		23.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	68	0.4600	0.25		**Sheet Flow, 1-AB** Woods: Light underbrush n= 0.400 P2= 3.27"
0.2	41	0.0600	3.67		**Shallow Concentrated Flow, 2-BC** Grassed Waterway Kv= 15.0 fps
4.7	109	Total			

Subcatchment 1S: Subcat 1

Summary for Subcatchment 2S: Subcat 2

Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.033 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	7,743	98	Pavement
*	129	98	Concrete
	1,501	32	Woods/grass comb., Good, HSG A
	9,373	87	Weighted Average
	1,501		16.01% Pervious Area
	7,872		83.99% Impervious Area

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

Subcatchment 2S: Subcat 2

Summary for Subcatchment 3S: Subcat 3

Runoff = 0.82 cfs @ 12.08 hrs, Volume= 0.056 af, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	15,512	98	Pavement
*	106	98	Concrete
	1,471	39	>75% Grass cover, Good, HSG A
	4,117	32	Woods/grass comb., Good, HSG A
	21,206	81	Weighted Average
	5,588		26.35% Pervious Area
	15,618		73.65% Impervious Area

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

Subcatchment 3S: Subcat 3

Summary for Subcatchment 4S: Subcat 4

Runoff = 0.20 cfs @ 12.07 hrs, Volume= 0.015 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	2,329	98	Pavement
*	480	98	Porous Concrete
	2,809	98	Weighted Average
	2,809		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, "Complete Surface Runoff"**

Subcatchment 4S: Subcat 4

Summary for Subcatchment 5S: Subcat 5

Runoff = 0.25 cfs @ 12.07 hrs, Volume= 0.018 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	3,583	98	Pavement
*	276	98	Concrete
	578	39	>75% Grass cover, Good, HSG A
	4,437	90	Weighted Average
	578		13.03% Pervious Area
	3,859		86.97% Impervious Area

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

Subcatchment 5S: Subcat 5

Summary for Reach 1R: POI #1

Inflow Area = 0.102 ac, 86.97% Impervious, Inflow Depth = 2.08" for 2-year event
Inflow = 0.25 cfs @ 12.07 hrs, Volume= 0.018 af
Outflow = 0.25 cfs @ 12.07 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: POI #1

Summary for Reach 2R: Prop. CB-2

Inflow Area = 1.342 ac, 55.03% Impervious, Inflow Depth = 1.20" for 2-year event
Inflow = 1.49 cfs @ 12.08 hrs, Volume= 0.134 af
Outflow = 1.49 cfs @ 12.08 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: Prop. CB-2

Summary for Reach 3R: Ex. CB-2

Inflow Area = 1.342 ac, 55.03% Impervious, Inflow Depth = 1.20" for 2-year event
Inflow = 1.49 cfs @ 12.08 hrs, Volume= 0.134 af
Outflow = 1.49 cfs @ 12.08 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 3R: Ex. CB-2

Summary for Reach 99R: Washington Ave

Inflow Area = 1.444 ac, 57.28% Impervious, Inflow Depth = 1.26" for 2-year event
Inflow = 1.74 cfs @ 12.08 hrs, Volume= 0.152 af
Outflow = 1.74 cfs @ 12.08 hrs, Volume= 0.152 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 99R: Washington Ave

Summary for Pond 1P: Infiltration Trench

Inflow Area = 0.576 ac, 23.43% Impervious, Inflow Depth = 0.64" for 2-year event
Inflow = 0.37 cfs @ 12.09 hrs, Volume= 0.030 af
Outflow = 0.06 cfs @ 12.90 hrs, Volume= 0.030 af, Atten= 84%, Lag= 48.6 min
Primary = 0.06 cfs @ 12.90 hrs, Volume= 0.030 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 74.31' @ 12.90 hrs Surf.Area= 0.009 ac Storage= 0.009 af

Plug-Flow detention time= 78.4 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 78.2 min (966.9 - 888.7)

Volume	Invert	Avail.Storage	Storage Description
#1	74.75'	0.012 af	**3.00'W x 125.00'L x 0.75'H Storage above Trench Z=3.0**
#2	71.75'	0.010 af	**3.00'W x 125.00'L x 3.00'H Prismatoid Crushed Stone** 0.026 af Overall - 0.000 af Embedded = 0.026 af x 40.0% Voids
#3	71.75'	0.000 af	**4.0" D x 125.0'L Pipe Storage** Inside #2
		0.022 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	71.75'	**6.0" Round 6" Culvert Outlet** L= 170.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 71.75' / 69.82' S= 0.0114 '/' Cc= 0.900 n= 0.010
#2	Device 1	71.75'	**1.2" Vert. 1" Orifice/Grate** C= 0.600
#3	Device 1	74.75'	**6.0" Horiz. Field Inlet** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.06 cfs @ 12.90 hrs HW=74.31' TW=69.90' (Dynamic Tailwater)
└─**1=6" Culvert Outlet** (Passes 0.06 cfs of 1.00 cfs potential flow)
  ├─**2=1" Orifice/Grate** (Orifice Controls 0.06 cfs @ 7.63 fps)
  └─**3=Field Inlet** (Controls 0.00 cfs)

Pond 1P: Infiltration Trench

Summary for Pond 2P: Prop. CB-1

Inflow Area = 0.791 ac, 39.90% Impervious, Inflow Depth = 0.96" for 2-year event
Inflow = 0.51 cfs @ 12.08 hrs, Volume= 0.063 af
Outflow = 0.51 cfs @ 12.08 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min
Primary = 0.51 cfs @ 12.08 hrs, Volume= 0.063 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 70.12' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	69.72'	**12.0" Round Culvert** L= 42.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 69.72' / 68.30' S= 0.0338 '/' Cc= 0.900 n= 0.010

Primary OutFlow Max=0.51 cfs @ 12.08 hrs HW=70.12' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.51 cfs @ 1.71 fps)

Pond 2P: Prop. CB-1

Summary for Pond 4P: Pervious Concrete

Inflow Area = 0.064 ac,100.00% Impervious, Inflow Depth = 2.87" for 2-year event
Inflow = 0.20 cfs @ 12.07 hrs, Volume= 0.015 af
Outflow = 0.17 cfs @ 12.11 hrs, Volume= 0.014 af, Atten= 14%, Lag= 2.7 min
Primary = 0.17 cfs @ 12.11 hrs, Volume= 0.014 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 68.30' @ 12.11 hrs Surf.Area= 480 sf Storage= 107 cf

Plug-Flow detention time= 85.7 min calculated for 0.014 af (93% of inflow)
Center-of-Mass det. time= 47.0 min (803.2 - 756.1)

Volume	Invert	Avail.Storage	Storage Description
#1	71.67'	40 cf	**12.00'W x 40.00'L x 0.42'H StormCrete Layer** 202 cf Overall x 20.0% Voids
#2	71.51'	0 cf	**12.00'W x 40.00'L x 0.17'H Crushed Stone - 3/8"** 82 cf Overall x 0.1% Voids
#3	70.26'	240 cf	**12.00'W x 40.00'L x 1.25'H Reservoir Course - 3/4"** 600 cf Overall x 40.0% Voids
#4	68.76'	36 cf	**12.00'W x 40.00'L x 1.50'H Filter Course - MDOT Type D** 720 cf Overall x 5.0% Voids
#5	67.76'	189 cf	**12.00'W x 40.00'L x 1.00'H Crushed Stone - 3/4"** 480 cf Overall - 8 cf Embedded = 472 cf x 40.0% Voids
#6	68.01'	8 cf	**6.0" D x 40.0'L Pipe Storage - 6" UD** Inside #5
		513 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	68.01'	**6.0" Round 6" SD to Prop. CB-2** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 68.01' / 67.71' S= 0.0200 '/' Cc= 0.900 n= 0.010

Primary OutFlow Max=0.17 cfs @ 12.11 hrs HW=68.30' TW=0.00' (Dynamic Tailwater)
└─**1=6" SD to Prop. CB-2** (Inlet Controls 0.17 cfs @ 1.45 fps)

Pond 4P: Pervious Concrete

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcat 1 Runoff Area=25,081 sf 23.43% Impervious Runoff Depth=1.53"
Flow Length=109' Tc=4.7 min CN=67 Runoff=1.03 cfs 0.073 af

Subcatchment 2S: Subcat 2 Runoff Area=9,373 sf 83.99% Impervious Runoff Depth=3.19"
Tc=5.0 min CN=87 Runoff=0.82 cfs 0.057 af

Subcatchment 3S: Subcat 3 Runoff Area=21,206 sf 73.65% Impervious Runoff Depth=2.63"
Tc=5.0 min CN=81 Runoff=1.56 cfs 0.107 af

Subcatchment 4S: Subcat 4 Runoff Area=2,809 sf 100.00% Impervious Runoff Depth=4.36"
Tc=5.0 min CN=98 Runoff=0.30 cfs 0.023 af

Subcatchment 5S: Subcat 5 Runoff Area=4,437 sf 86.97% Impervious Runoff Depth=3.49"
Tc=5.0 min CN=90 Runoff=0.42 cfs 0.030 af

Reach 1R: POI #1 Inflow=0.42 cfs 0.030 af
Outflow=0.42 cfs 0.030 af

Reach 2R: Prop. CB-2 Inflow=3.07 cfs 0.260 af
Outflow=3.07 cfs 0.260 af

Reach 3R: Ex. CB-2 Inflow=3.07 cfs 0.260 af
Outflow=3.07 cfs 0.260 af

Reach 99R: Washington Ave Inflow=3.48 cfs 0.290 af
Outflow=3.48 cfs 0.290 af

Pond 1P: Infiltration Trench Peak Elev=75.08' Storage=0.014 af Inflow=1.03 cfs 0.073 af
Outflow=0.61 cfs 0.073 af

Pond 2P: Prop. CB-1 Peak Elev=70.41' Inflow=1.29 cfs 0.131 af
12.0" Round Culvert n=0.010 L=42.0' S=0.0338 '/' Outflow=1.29 cfs 0.131 af

Pond 4P: Pervious Concrete Peak Elev=68.39' Storage=124 cf Inflow=0.30 cfs 0.023 af
6.0" Round Culvert n=0.010 L=15.0' S=0.0200 '/' Outflow=0.26 cfs 0.022 af

Total Runoff Area = 1.444 ac Runoff Volume = 0.291 af Average Runoff Depth = 2.42"
42.72% Pervious = 0.617 ac 57.28% Impervious = 0.827 ac

Summary for Subcatchment 1S: Subcat 1

Runoff = 1.03 cfs @ 12.08 hrs, Volume= 0.073 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	386	96	Gravel
	18,819	57	Woods/grass comb., Poor, HSG A
*	5,876	98	Pavement
	25,081	67	Weighted Average
	19,205		76.57% Pervious Area
	5,876		23.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	68	0.4600	0.25		**Sheet Flow, 1-AB** Woods: Light underbrush n= 0.400 P2= 3.27"
0.2	41	0.0600	3.67		**Shallow Concentrated Flow, 2-BC** Grassed Waterway Kv= 15.0 fps
4.7	109	Total			

Subcatchment 1S: Subcat 1

Summary for Subcatchment 2S: Subcat 2

Runoff = 0.82 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	7,743	98	Pavement
*	129	98	Concrete
	1,501	32	Woods/grass comb., Good, HSG A
	9,373	87	Weighted Average
	1,501		16.01% Pervious Area
	7,872		83.99% Impervious Area

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

Subcatchment 2S: Subcat 2

Summary for Subcatchment 3S: Subcat 3

Runoff = 1.56 cfs @ 12.07 hrs, Volume= 0.107 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	15,512	98	Pavement
*	106	98	Concrete
	1,471	39	>75% Grass cover, Good, HSG A
	4,117	32	Woods/grass comb., Good, HSG A
	21,206	81	Weighted Average
	5,588		26.35% Pervious Area
	15,618		73.65% Impervious Area

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

Subcatchment 3S: Subcat 3

Summary for Subcatchment 4S: Subcat 4

Runoff = 0.30 cfs @ 12.07 hrs, Volume= 0.023 af, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	2,329	98	Pavement
*	480	98	Porous Concrete
	2,809	98	Weighted Average
	2,809		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, "Complete Surface Runoff"**

Subcatchment 4S: Subcat 4

Summary for Subcatchment 5S: Subcat 5

Runoff = 0.42 cfs @ 12.07 hrs, Volume= 0.030 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	3,583	98	Pavement
*	276	98	Concrete
	578	39	>75% Grass cover, Good, HSG A
	4,437	90	Weighted Average
	578		13.03% Pervious Area
	3,859		86.97% Impervious Area

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

Subcatchment 5S: Subcat 5

Summary for Reach 1R: POI #1

Inflow Area = 0.102 ac, 86.97% Impervious, Inflow Depth = 3.49" for 10-year event
Inflow = 0.42 cfs @ 12.07 hrs, Volume= 0.030 af
Outflow = 0.42 cfs @ 12.07 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: POI #1

Summary for Reach 2R: Prop. CB-2

Inflow Area = 1.342 ac, 55.03% Impervious, Inflow Depth = 2.32" for 10-year event
Inflow = 3.07 cfs @ 12.09 hrs, Volume= 0.260 af
Outflow = 3.07 cfs @ 12.09 hrs, Volume= 0.260 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: Prop. CB-2

Summary for Reach 3R: Ex. CB-2

Inflow Area = 1.342 ac, 55.03% Impervious, Inflow Depth = 2.32" for 10-year event
Inflow = 3.07 cfs @ 12.09 hrs, Volume= 0.260 af
Outflow = 3.07 cfs @ 12.09 hrs, Volume= 0.260 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 3R: Ex. CB-2

Summary for Reach 99R: Washington Ave

Inflow Area = 1.444 ac, 57.28% Impervious, Inflow Depth = 2.41" for 10-year event
Inflow = 3.48 cfs @ 12.09 hrs, Volume= 0.290 af
Outflow = 3.48 cfs @ 12.09 hrs, Volume= 0.290 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 99R: Washington Ave

Summary for Pond 1P: Infiltration Trench

Inflow Area = 0.576 ac, 23.43% Impervious, Inflow Depth = 1.53" for 10-year event
Inflow = 1.03 cfs @ 12.08 hrs, Volume= 0.073 af
Outflow = 0.61 cfs @ 12.18 hrs, Volume= 0.073 af, Atten= 41%, Lag= 6.5 min
Primary = 0.61 cfs @ 12.18 hrs, Volume= 0.073 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 75.08' @ 12.18 hrs Surf.Area= 0.023 ac Storage= 0.014 af

Plug-Flow detention time= 64.8 min calculated for 0.073 af (100% of inflow)
Center-of-Mass det. time= 64.7 min (924.0 - 859.3)

Volume	Invert	Avail.Storage	Storage Description
#1	74.75'	0.012 af	**3.00'W x 125.00'L x 0.75'H Storage above Trench Z=3.0**
#2	71.75'	0.010 af	**3.00'W x 125.00'L x 3.00'H Prismatoid Crushed Stone** 0.026 af Overall - 0.000 af Embedded = 0.026 af x 40.0% Voids
#3	71.75'	0.000 af	**4.0" D x 125.0'L Pipe Storage** Inside #2
		0.022 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	71.75'	**6.0" Round 6" Culvert Outlet** L= 170.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 71.75' / 69.82' S= 0.0114 '/' Cc= 0.900 n= 0.010
#2	Device 1	71.75'	**1.2" Vert. 1" Orifice/Grate** C= 0.600
#3	Device 1	74.75'	**6.0" Horiz. Field Inlet** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.61 cfs @ 12.18 hrs HW=75.08' TW=70.33' (Dynamic Tailwater)
└─**1=6" Culvert Outlet** (Passes 0.61 cfs of 1.09 cfs potential flow)
  ├─**2=1" Orifice/Grate** (Orifice Controls 0.07 cfs @ 8.72 fps)
  └─**3=Field Inlet** (Orifice Controls 0.54 cfs @ 2.77 fps)

Pond 1P: Infiltration Trench

Summary for Pond 2P: Prop. CB-1

Inflow Area = 0.791 ac, 39.90% Impervious, Inflow Depth = 1.98" for 10-year event
Inflow = 1.29 cfs @ 12.10 hrs, Volume= 0.131 af
Outflow = 1.29 cfs @ 12.10 hrs, Volume= 0.131 af, Atten= 0%, Lag= 0.0 min
Primary = 1.29 cfs @ 12.10 hrs, Volume= 0.131 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 70.41' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	69.72'	**12.0" Round Culvert** L= 42.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 69.72' / 68.30' S= 0.0338 '/' Cc= 0.900 n= 0.010

Primary OutFlow Max=1.29 cfs @ 12.10 hrs HW=70.41' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.29 cfs @ 2.23 fps)

Pond 2P: Prop. CB-1

Summary for Pond 4P: Pervious Concrete

Inflow Area = 0.064 ac,100.00% Impervious, Inflow Depth = 4.36" for 10-year event
Inflow = 0.30 cfs @ 12.07 hrs, Volume= 0.023 af
Outflow = 0.26 cfs @ 12.11 hrs, Volume= 0.022 af, Atten= 12%, Lag= 2.5 min
Primary = 0.26 cfs @ 12.11 hrs, Volume= 0.022 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 68.39' @ 12.11 hrs Surf.Area= 480 sf Storage= 124 cf

Plug-Flow detention time= 65.7 min calculated for 0.022 af (95% of inflow)
Center-of-Mass det. time= 37.8 min (786.3 - 748.5)

Volume	Invert	Avail.Storage	Storage Description
#1	71.67'	40 cf	**12.00'W x 40.00'L x 0.42'H StormCrete Layer** 202 cf Overall x 20.0% Voids
#2	71.51'	0 cf	**12.00'W x 40.00'L x 0.17'H Crushed Stone - 3/8"** 82 cf Overall x 0.1% Voids
#3	70.26'	240 cf	**12.00'W x 40.00'L x 1.25'H Reservoir Course - 3/4"** 600 cf Overall x 40.0% Voids
#4	68.76'	36 cf	**12.00'W x 40.00'L x 1.50'H Filter Course - MDOT Type D** 720 cf Overall x 5.0% Voids
#5	67.76'	189 cf	**12.00'W x 40.00'L x 1.00'H Crushed Stone - 3/4"** 480 cf Overall - 8 cf Embedded = 472 cf x 40.0% Voids
#6	68.01'	8 cf	**6.0" D x 40.0'L Pipe Storage - 6" UD** Inside #5
		513 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	68.01'	**6.0" Round 6" SD to Prop. CB-2** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 68.01' / 67.71' S= 0.0200 '/' Cc= 0.900 n= 0.010

Primary OutFlow Max=0.26 cfs @ 12.11 hrs HW=68.39' TW=0.00' (Dynamic Tailwater)
└─**1=6" SD to Prop. CB-2** (Inlet Controls 0.26 cfs @ 1.65 fps)

Pond 4P: Pervious Concrete

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcat 1 Runoff Area=25,081 sf 23.43% Impervious Runoff Depth=2.38"
Flow Length=109' Tc=4.7 min CN=67 Runoff=1.66 cfs 0.114 af

Subcatchment 2S: Subcat 2 Runoff Area=9,373 sf 83.99% Impervious Runoff Depth=4.33"
Tc=5.0 min CN=87 Runoff=1.10 cfs 0.078 af

Subcatchment 3S: Subcat 3 Runoff Area=21,206 sf 73.65% Impervious Runoff Depth=3.70"
Tc=5.0 min CN=81 Runoff=2.18 cfs 0.150 af

Subcatchment 4S: Subcat 4 Runoff Area=2,809 sf 100.00% Impervious Runoff Depth=5.56"
Tc=5.0 min CN=98 Runoff=0.38 cfs 0.030 af

Subcatchment 5S: Subcat 5 Runoff Area=4,437 sf 86.97% Impervious Runoff Depth=4.65"
Tc=5.0 min CN=90 Runoff=0.55 cfs 0.039 af

Reach 1R: POI #1 Inflow=0.55 cfs 0.039 af
Outflow=0.55 cfs 0.039 af

Reach 2R: Prop. CB-2 Inflow=4.35 cfs 0.371 af
Outflow=4.35 cfs 0.371 af

Reach 3R: Ex. CB-2 Inflow=4.35 cfs 0.371 af
Outflow=4.35 cfs 0.371 af

Reach 99R: Washington Ave Inflow=4.90 cfs 0.410 af
Outflow=4.90 cfs 0.410 af

Pond 1P: Infiltration Trench Peak Elev=75.50' Storage=0.022 af Inflow=1.66 cfs 0.114 af
Outflow=0.89 cfs 0.114 af

Pond 2P: Prop. CB-1 Peak Elev=70.61' Inflow=1.87 cfs 0.192 af
12.0" Round Culvert n=0.010 L=42.0' S=0.0338 '/' Outflow=1.87 cfs 0.192 af

Pond 4P: Pervious Concrete Peak Elev=68.46' Storage=138 cf Inflow=0.38 cfs 0.030 af
6.0" Round Culvert n=0.010 L=15.0' S=0.0200 '/' Outflow=0.33 cfs 0.029 af

Total Runoff Area = 1.444 ac Runoff Volume = 0.411 af Average Runoff Depth = 3.42"
42.72% Pervious = 0.617 ac 57.28% Impervious = 0.827 ac

Summary for Subcatchment 1S: Subcat 1

Runoff = 1.66 cfs @ 12.07 hrs, Volume= 0.114 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	386	96	Gravel
	18,819	57	Woods/grass comb., Poor, HSG A
*	5,876	98	Pavement
	25,081	67	Weighted Average
	19,205		76.57% Pervious Area
	5,876		23.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	68	0.4600	0.25		**Sheet Flow, 1-AB** Woods: Light underbrush n= 0.400 P2= 3.27"
0.2	41	0.0600	3.67		**Shallow Concentrated Flow, 2-BC** Grassed Waterway Kv= 15.0 fps
4.7	109	Total			

Subcatchment 1S: Subcat 1

Summary for Subcatchment 2S: Subcat 2

Runoff = 1.10 cfs @ 12.07 hrs, Volume= 0.078 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	7,743	98	Pavement
*	129	98	Concrete
	1,501	32	Woods/grass comb., Good, HSG A
	9,373	87	Weighted Average
	1,501		16.01% Pervious Area
	7,872		83.99% Impervious Area

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

Subcatchment 2S: Subcat 2

Summary for Subcatchment 3S: Subcat 3

Runoff = 2.18 cfs @ 12.07 hrs, Volume= 0.150 af, Depth= 3.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	15,512	98	Pavement
*	106	98	Concrete
	1,471	39	>75% Grass cover, Good, HSG A
	4,117	32	Woods/grass comb., Good, HSG A
	21,206	81	Weighted Average
	5,588		26.35% Pervious Area
	15,618		73.65% Impervious Area

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

Subcatchment 3S: Subcat 3

Summary for Subcatchment 4S: Subcat 4

Runoff = 0.38 cfs @ 12.07 hrs, Volume= 0.030 af, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	2,329	98	Pavement
*	480	98	Porous Concrete
	2,809	98	Weighted Average
	2,809		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, "Complete Surface Runoff"**

Subcatchment 4S: Subcat 4

Summary for Subcatchment 5S: Subcat 5

Runoff = 0.55 cfs @ 12.07 hrs, Volume= 0.039 af, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	3,583	98	Pavement
*	276	98	Concrete
	578	39	>75% Grass cover, Good, HSG A
	4,437	90	Weighted Average
	578		13.03% Pervious Area
	3,859		86.97% Impervious Area

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

Subcatchment 5S: Subcat 5

Summary for Reach 1R: POI #1

Inflow Area = 0.102 ac, 86.97% Impervious, Inflow Depth = 4.65" for 25-year event
Inflow = 0.55 cfs @ 12.07 hrs, Volume= 0.039 af
Outflow = 0.55 cfs @ 12.07 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: POI #1

Summary for Reach 2R: Prop. CB-2

Inflow Area = 1.342 ac, 55.03% Impervious, Inflow Depth = 3.31" for 25-year event
Inflow = 4.35 cfs @ 12.08 hrs, Volume= 0.371 af
Outflow = 4.35 cfs @ 12.08 hrs, Volume= 0.371 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: Prop. CB-2

Summary for Reach 3R: Ex. CB-2

Inflow Area = 1.342 ac, 55.03% Impervious, Inflow Depth = 3.31" for 25-year event
Inflow = 4.35 cfs @ 12.08 hrs, Volume= 0.371 af
Outflow = 4.35 cfs @ 12.08 hrs, Volume= 0.371 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 3R: Ex. CB-2

Summary for Reach 99R: Washington Ave

Inflow Area = 1.444 ac, 57.28% Impervious, Inflow Depth = 3.41" for 25-year event
Inflow = 4.90 cfs @ 12.08 hrs, Volume= 0.410 af
Outflow = 4.90 cfs @ 12.08 hrs, Volume= 0.410 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 99R: Washington Ave

Summary for Pond 1P: Infiltration Trench

Inflow Area = 0.576 ac, 23.43% Impervious, Inflow Depth = 2.38" for 25-year event
Inflow = 1.66 cfs @ 12.07 hrs, Volume= 0.114 af
Outflow = 0.89 cfs @ 12.20 hrs, Volume= 0.114 af, Atten= 46%, Lag= 7.7 min
Primary = 0.89 cfs @ 12.20 hrs, Volume= 0.114 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 75.50' @ 12.20 hrs Surf.Area= 0.031 ac Storage= 0.022 af

Plug-Flow detention time= 54.3 min calculated for 0.114 af (100% of inflow)
Center-of-Mass det. time= 54.4 min (900.3 - 845.9)

Volume	Invert	Avail.Storage	Storage Description
#1	74.75'	0.012 af	**3.00'W x 125.00'L x 0.75'H Storage above Trench Z=3.0**
#2	71.75'	0.010 af	**3.00'W x 125.00'L x 3.00'H Prismatoid Crushed Stone** 0.026 af Overall - 0.000 af Embedded = 0.026 af x 40.0% Voids
#3	71.75'	0.000 af	**4.0" D x 125.0'L Pipe Storage** Inside #2
		0.022 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	71.75'	**6.0" Round 6" Culvert Outlet** L= 170.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 71.75' / 69.82' S= 0.0114 '/' Cc= 0.900 n= 0.010
#2	Device 1	71.75'	**1.2" Vert. 1" Orifice/Grate** C= 0.600
#3	Device 1	74.75'	**6.0" Horiz. Field Inlet** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.89 cfs @ 12.20 hrs HW=75.50' TW=70.46' (Dynamic Tailwater)
└─**1=6" Culvert Outlet** (Passes 0.89 cfs of 1.13 cfs potential flow)
  ├─**2=1" Orifice/Grate** (Orifice Controls 0.07 cfs @ 9.26 fps)
  └─**3=Field Inlet** (Orifice Controls 0.82 cfs @ 4.16 fps)

Pond 1P: Infiltration Trench

Summary for Pond 2P: Prop. CB-1

Inflow Area = 0.791 ac, 39.90% Impervious, Inflow Depth = 2.91" for 25-year event
Inflow = 1.87 cfs @ 12.08 hrs, Volume= 0.192 af
Outflow = 1.87 cfs @ 12.08 hrs, Volume= 0.192 af, Atten= 0%, Lag= 0.0 min
Primary = 1.87 cfs @ 12.08 hrs, Volume= 0.192 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 70.61' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	69.72'	**12.0" Round Culvert** L= 42.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 69.72' / 68.30' S= 0.0338 '/' Cc= 0.900 n= 0.010

Primary OutFlow Max=1.87 cfs @ 12.08 hrs HW=70.61' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.87 cfs @ 2.53 fps)

Pond 2P: Prop. CB-1

Summary for Pond 4P: Pervious Concrete

Inflow Area = 0.064 ac,100.00% Impervious, Inflow Depth = 5.56" for 25-year event
Inflow = 0.38 cfs @ 12.07 hrs, Volume= 0.030 af
Outflow = 0.33 cfs @ 12.11 hrs, Volume= 0.029 af, Atten= 13%, Lag= 2.5 min
Primary = 0.33 cfs @ 12.11 hrs, Volume= 0.029 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 68.46' @ 12.11 hrs Surf.Area= 480 sf Storage= 138 cf

Plug-Flow detention time= 55.5 min calculated for 0.029 af (96% of inflow)
Center-of-Mass det. time= 33.0 min (777.7 - 744.7)

Volume	Invert	Avail.Storage	Storage Description
#1	71.67'	40 cf	**12.00'W x 40.00'L x 0.42'H StormCrete Layer** 202 cf Overall x 20.0% Voids
#2	71.51'	0 cf	**12.00'W x 40.00'L x 0.17'H Crushed Stone - 3/8"** 82 cf Overall x 0.1% Voids
#3	70.26'	240 cf	**12.00'W x 40.00'L x 1.25'H Reservoir Course - 3/4"** 600 cf Overall x 40.0% Voids
#4	68.76'	36 cf	**12.00'W x 40.00'L x 1.50'H Filter Course - MDOT Type D** 720 cf Overall x 5.0% Voids
#5	67.76'	189 cf	**12.00'W x 40.00'L x 1.00'H Crushed Stone - 3/4"** 480 cf Overall - 8 cf Embedded = 472 cf x 40.0% Voids
#6	68.01'	8 cf	**6.0" D x 40.0'L Pipe Storage - 6" UD** Inside #5
		513 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	68.01'	**6.0" Round 6" SD to Prop. CB-2** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 68.01' / 67.71' S= 0.0200 '/' Cc= 0.900 n= 0.010

Primary OutFlow Max=0.33 cfs @ 12.11 hrs HW=68.46' TW=0.00' (Dynamic Tailwater)
└─**1=6" SD to Prop. CB-2** (Inlet Controls 0.33 cfs @ 1.79 fps)

Pond 4P: Pervious Concrete