RANSOM Consulting, Inc.

Consulting Engineers and Scientists

Bishop Street Stormwater Management Report

Date:	May 22, 2015
To:	City of Portland
From:	Stephen J. Bradstreet, P.E.
Peer Review:	Maureen P. McGlone, P.E.
Location:	72 Bishop Street, Portland, Maine

List of Appendices:

Appendix A: Post Construction Stormwater Compliance Requirements
Appendix B: Stormwater BMP Inspection and Maintenance Requirements
Appendix C: Stormwater Quality Calculations
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Existing Conditions:

The site is a 52,383 SF (1.203 acre) lot located on the south side of 72 Bishop Street, west of Mayfield Street and adjacent to the Masonic Lodge. The parcel is trapezoidal in shape and is primarily vegetated (wooded/scrub brush) on the southern 2/3 of the site and grass on the northern 1/3 of the site adjacent to Bishop Street. The northern portion appears to be a fill area and fairly flat though sloping in a south-southeasterly direction into a wetland area. The southern portion of the site is primarily wetlands with some upland area sloping steeply up to the adjacent Masonic Lodge site. The parcel is at the headwaters of the Capisic Brook which is an impaired stream. Stormwater runoff from the site flows into the on-site wetlands and then off-site and onto the abutting property of the University of New England.

Proposed Development:

The applicant, Avesta Housing proposes to construct a 3 story building and housing for the homeless. The site will have 12 spaces of parking, access aisle, sidewalk, outdoor sitting spaces and landscaped areas. The proposed building, pavement and sidewalk areas will increase the impervious area from 1,206 SF to 20,659 SF.

Stormwater Management – Basic Standards:

Erosion and sedimentation control measures are detailed within the design plans. Good housekeeping practices will be in accordance with Maine DEP Best Management Practices. A post construction

stormwater management plan is provided in *Appendix A*. Stormwater BMP inspection and maintenance requirements are provided in *Appendix B*.

Stormwater Management – Quality (General Standards):

The existing site is currently a mix of grass and vegetated (wooded/scrub brush) upland areas and wetlands with a small area of impervious (1,206 SF). The site currently drains to the wetlands on site which is also the headwaters of the Capisic Brook, an impaired stream. The site's new impervious area is now 19,453 SF. For water quality treatment, the site design incorporates a paver drain system along the retaining wall and on the southeast side of the parking area and drive aisle. This will capture the sidewalk and parking area runoff, with only a small area exiting the site toward Bishop Street. The paver drain system is comprised of the pavers underlain by a layer of 3/8" stone, then a layer of 3/4" crushed stone and finally a layer of bio-filter media for filtration for the stormwater runoff. The paver drain system overlays an R-Tank system that will be used for detention during larger storm events. The roof will drain internal to the building and will be filtered through filter cartridges. The roof drains will then outlet into a separate set of R-Tanks for detention. Calculations have been included in Appendix C.

Stormwater Management – Quantity (Flooding Standards):

The use of the R-Tanks will detain the stormwater runoff to below pre-development conditions. The proposed detention system consists of a series of R-Tanks adjacent to the retaining wall and under the paver drains. These R-Tanks are then connected into a supplemental R-Tank system at the outlets of the roof leader and vegetated filter swale. The additional storage is required for site stormwater capacity reasons. The roof drains outlet at the south end of the building into a separate set of R-Tanks for detention. The parking lot R-Tanks and roof drain R-Tanks are connected with an equalizing pipe. Stormwater from the downstream roof drain R-Tanks will flow into an outlet control structure that will control the flow with orifices and a weir. The stormwater then discharges into the upland area at the southwest area of the developed site. During larger storm events there is a catch basin in the southern most area of the parking lot that will collect the additional stormwater and direct it into the R-Tank system for detention.

Hydraulic Analysis:

Stormwater runoff calculations for quantity were made using the HydroCAD 10.0 computer program, which is based on the Soil Conservation Service's TR-20 methodology. Runoff hydrographs are generated based on a standard Type III 24 hour storm.

Five storm events were modeled as follows:

1. 1" storm: The 1" storm event was analyzed to simulate a heavy weather event that would typically happen multiple times over a given year and may impact the CSO frequency and volume.

2. 2-year frequency flood event: 3" rainfall

3. 10-year frequency flood event: 4.7" rainfall
4. 25-year frequency flood event: 5.5" rainfall
5. 100-year frequency flood event: 6.7" rainfall

Runoff Curve numbers were determined based on land coverage and hydro-geological soil type D. Times of concentration were developed based on runoff flow paths for each subarea and shown on the Pre and Post-Development plans. A minimum Tc of 6 minutes was set in the HydroCAD model.

Peak runoff flow rates and runoff volumes are provided at the analysis point, which is identified on the Pre and Post-Development plans.

Storm Event	PRE-Development Peak Runoff RATES cubic feet per second (CFS)
	Analysis Point A Upland
1" Storm	0.25
2 Year Frequency Storm	1.99
10 Year Frequency Storm	3.65
25 Year Frequency Storm	4.44
100 Year Frequency Storm	5.61

Storm Event	POST-Development Peak Runoff RATES cubic feet per second (CFS)
	Analysis Point A Upland
1" Storm	0.38
2 Year Frequency Storm	1.98
10 Year Frequency Storm	3.37
25 Year Frequency Storm	4.01
100 Year Frequency Storm	4.98

Storm Event	PRE-Development Runoff VOLUMES acre feet (AF) volume of water 1' deep over one acre
	Analysis Point A Upland
1" Storm	0.02
2 Year Frequency Storm	0.17
10 Year Frequency Storm	0.32
25 Year Frequency Storm	0.39
100 Year Frequency Storm	0.50

Storm Event	POST-Development Runoff VOLUMES acre feet (AF) volume of water 1' deep over one acre
	Analysis Point A Upland
1" Storm	0.02
2 Year Frequency Storm	0.123
10 Year Frequency Storm	0.259
25 Year Frequency Storm	0.307
100 Year Frequency Storm	0.414

Urban Impaired Stream Standard:

The project is located within the Capisic Brook watershed. Section 5 of the City of Portland's Technical Manual requires that all development within the Capisic Brook watershed (except single and two family homes) comply with the urban impaired stream standards. As such, an in-lieu compensation and mitigation credits have been determined. A compensation fee has been determined to be $1,927. Those calculations are included in *Appendix C.*

APPENDIX A

Post Construction Stormwater Compliance Requirements

City of Portland
72 Bishop Street
Portland, Maine

Ransom Consulting, Inc.
Project 141.06146

Bishop Street Post-Construction Stormwater Compliance Requirements

The Applicant shall maintain the BMPs in accordance with the approved plan and shall demonstrate compliance with the plan as follows:

(a) *Inspections.* The owner or operator of a BMP shall hire a qualified post-construction stormwater inspector to at least annually, inspect the BMPs, including but not limited to any parking areas, catch basins, drainage swales, detention basins and ponds, pipes and related structures, in accordance with all municipal and state inspection, cleaning and maintenance requirements of the approved post-construction stormwater management plan.

(b) *Maintenance and repair.* If the BMP requires maintenance, repair or replacement to function as intended by the approved post-construction stormwater management plan, the owner or operator of the BMP shall take corrective action(s) to address the deficiency or deficiencies as soon as possible after the deficiency is discovered and shall provide a record of the deficiency and corrective action(s) to the department of public services ("DPS") in the annual report.

(c) *Annual report.* The owner or operator of a BMP or a qualified post-construction stormwater inspector hired by that person, shall, on or by June 30 of each year, provide a completed and signed certification to DPS in a form provided by DPS, certifying that the person has inspected the BMP(s) and that they are adequately maintained and functioning as intended by the approved post-construction stormwater management plan, or that they require maintenance or repair, including the record of the deficiency and corrective action(s) taken.

(d) *Filing fee.* Any persons required to file and annual certification under this section shall include with the annual certification a filing fee established by DPS to pay the administrative and technical costs of review of the annual certification.

(e) *Right of entry.* In order to determine compliance with this article and with the post-construction stormwater management plan, DPS may enter upon property at reasonable hours with the consent of the owner, occupant or agent to inspect the BMPs.

APPENDIX B

Stormwater BMP Inspection and Maintenance Log

City of Portland
72 Bishop Street
Portland, Maine

Bishop Street: Stormwater BMP Inspection Log

The City of Portland, ME requires ongoing annual inspections to ensure the proper maintenance and operation of stormwater management facilities. Inspections must be conducted by third parties qualified by the City.

A. General Information

Use only one Cover Sheet per site with as many specific structural BMP Inspection Report attachments as needed. Attach required color digital photos of site, structures and devices as applicable with captions.

Project Name:	**Bishop Street**	**Inspection Date:**	
Parcel Map, Block and Lot:		**Current Weather:**	
BMP Owner:	**Avesta Housing**	**Date / Amount Last Precip:**	
Owner Mailing Address:	**307 Cumberland Avenue Portland, Maine**		
		3PI Mailing Address:	
Owner Phone #:			
Owner Email:		**Inspector Name:**	
		Inspector Phone #:	
		Inspector Email:	

B. Inspection Report Attachments

Please document the number of each structural BMP type found at this site in the blank spaces provided below. Use additional Attachments if / as needed and submit all Attachments together with the Cover Sheet as a single report.

BMP Type	Number BMPs at site
Vegetated Areas	-
Stormdrain Outlets	1
Stormdrain Structures: Overflow Control and Catch Basin	2
R-Tank Subsurface Detention-Infiltration System	1

Other (describe	

C. Inspection Results

FAIL** ☐

** If any one item on an Inspection Report attachment is coded as "Work Needed" then entire BMP fails inspection.

** If a site has multiple BMPs and one fails inspection, mark as "Fail" until all BMPs pass inspection.

Note: Applicable BMP Inspection Reports and confirmatory color digital photos summarizing required repairs must be submitted to the City following completion of the preliminary inspection. A re-inspection and certification must be completed within 60 days of the failed preliminary report. It is recommended that the inspector be part of the repair / maintenance process to ensure that repairs are performed properly.

PASS ☐

Note: a qualified professional (as determined by the City) must sign below and include all applicable Inspection Report attachments and confirmatory digital color photos with captions.

D. Professional Certification (as qualified by City of Portland Stormwater Program Coordinator)

To be completed only when all BMPs at this site are functioning as designed with no outstanding maintenance issues.

I, _____, as a duly qualified third party inspector attest that a thorough inspection has been completed for ALL applicable BMPs that are associated with this particular site. All inspected structural BMPs are performing as designed and intended and are in compliance with the provisions of the City Portland's Standards

Signature: _____

Date: _____

Form Adapted from the City of South Portland's Annual Structural BMP Inspection Report Cover Sheet

Owner: Avesta Housing	**Operator:**
Location & Parcel Id:	**Inspector:**
	Date:

General Information	**Observations**
Inspection duration (hours)	
Days since last precipitation	
Quantity of last precipitation (in)	
Type of inspection	
Storm event	
Current weather	
Photos taken	☐ Yes ☐ No ☐ NA
Nearby natural resources	☐ Yes ☐ No ☐ NA
Copy of ESC plan	☐ Yes ☐ No ☐ NA
MEDEP Permit # (*if applicable*)	
General info notes	

Vegetated Areas	**Observations**
Condition of slopes and embankment is good	☐ Yes ☐ No ☐ NA
No bare areas (< 90% covered) with sparse growth	☐ Yes ☐ No ☐ NA
Armored areas have no rill erosion or the flow diverted to onsite areas can withstand concentrated flows	☐ Yes ☐ No ☐ NA
Vegetated area notes	

Stormdrain outlets	**Observations**
Accumulated sediments and debris at the outlet and within the conduit have been removed.	☐ Yes ☐ No ☐ NA
Erosion damage at the outlet have been repaired	☐ Yes ☐ No ☐ NA
Outlet notes	

Stormdrain Structures (Require inspection TWICE per year)	**Observations**
Accumulated sediments from inflow channels, pipes and sumps between basins have been removed and legally disposed of.	☐ Yes ☐ No ☐ NA
Floating debris and floating oils have been removed.	☐ Yes ☐ No ☐ NA
Debris and Sediment Removed From Outlet Control Structure	☐ Yes ☐ No ☐ NA

Other Comments	**Observations**
Corrective action needed	☐ Yes ☐ No ☐ NA
If corrective action in needed, please explain detail	
Verbal notification provided to responsible party	☐ Yes ☐ No
Verbal notification contact	
Follow up required	☐ Yes ☐ No
Final comment notes	

Photos (*use additional pages as needed*)

Review Notes
Date Reviewed: Reviewed by: Date entered: Date edited: Edited by:

APPENDIX C

Stormwater Quality Calculations

City of Portland
72 Bishop Street
Portland, Maine

RANSOM
Consulting, Inc.

Byfield, Massachusetts 978-465-1822
Providence, Rhode Island 401-433-2160
Portsmouth, New Hampshire 603-436-1490
Portland, Maine 207-772-2891
Hamilton, New Jersey 609-584-0090

PROJECT NO. 141.06146 SITE Bishop St.
SHEET NO. 1 OF
CALCULATED BY MPM DATE 4/9/15
CHECKED BY JGB 5/22/15 DATE Rev. 5/20/15
SCALE N/A

Objective: Determine water quality requirements

Developed Area: 28,407 sf.

Paved: 9,364 sf. 9669 + 471 (wall) = 10140

Sidewalk: 1308 + 105 = ~~1413 sf~~ 2715

~~7774 sf~~ 12885

Building: ~~7811 sf~~ Treated w/ drip edge: 1432
Treated w/ Roof drains: 6342
~~treated w/ landscape:~~

Total impervious = ~~18588 sf~~ 20659

Landscaped = 9819 sf (assume 75%)

See Revised Begin. P.S

* Volume of Quality treatment = 1" over impervious / 0.4" over landscaped

18588 sf x 1"/12" = 1549 cf

9819 sf x 0.4"/12" = 327.3 cf

1876.3 cf ~~treatment~~ volume

Hydrocad / Water Quantity calcs.

Existing conditions: assume Scantic 'C' soils

Lot size: 52,383 sf
Roof = 826 sf
Gravel drive = 380 sf] 1206 sf

Grass (assume 50-75%) 5852 - 826 - 380 = 14646 sf

Vegetated (woodland) 36531 sf
assumed CN of 92

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Hamilton, New Jersey 609-584-0090

PROJECT NO. 141 06146 SITE Bishop St
SHEET NO. 2 OF
CALCULATED BY MPM DATE 5/20/15
CHECKED BY DATE
SCALE N/A

Objective: Redefine areas of Development

- Roof impervious: 7774 sf +
  (new Roof plan)

  Roof area to drip edge: 1123sf

  Roof area by roof drains: 7774 - 1123 = 6651 sf

- Paved Impervious:

4x4 conc. pad	: 16sf
Patio/walk	: 2729 sf
Parking/drive	: 9669 sf
Wall	: 471 sf
	12885 sf

Total impervious = 20659 sf

Developed Area: 28,098 sf

∴ Landscaped area = 28,098 sf
- 20659 sf
= 7439 sf

existing impervious = 826sf + 380sf = 1206sf

∴ new impervious = 19453 sf

Impervious Area left untreated:

(driveway to street/ walkway to street)	752sf + 30sf	782sf

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PROJECT NO. KH.06146 SITE Bishop St.
SHEET NO. 3 OF
CALCULATED BY MPM DATE 5/20/15
CHECKED BY DATE
SCALE N/A

% new impervious area being treated:

19453 sf − 782 sf = 18671 / 19453

= 96% > 95%

Removing the Roof impervious (treated by other means) the amount of impervious for treatment by swale & pavers = 18671 − 7774 = 10897 sf

Untreated landscaped area:

785
+ 113
792
15
82
1787

% treated developed area

Developed Area − untreated area =

28098 − 782 (paved) − 1787 (unpaved) = 25529 / 28098

= 91% > 80%

Treatment by filtration swale:

Total area: 2762

Impervious: 157 + 306 + 16 = 479

∴ Landscaped: 2283 sf

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PROJECT NO. 141.06146 SITE Bishop St
SHEET NO. 4 OF
CALCULATED BY MPM DATE 5/20/15
CHECKED BY DATE
SCALE N/A

Grassed underdrain Filter treatment Volume:

1" over impervious and 0.4" over landscaped

$479sf \times 1''/12' = 39.9cf$

$\frac{2283(0.4)}{12} = 76.1cf$

$116cf$

Filter Area: 5% of imperv. + 2% of landscaped

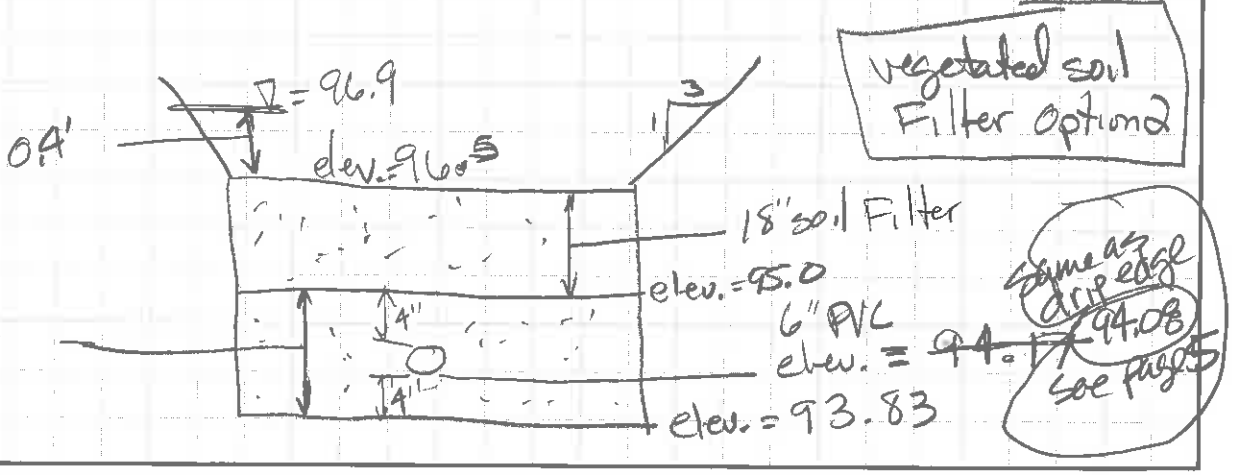
$0.05(479)+0.02(2223) = 68.4sf$

Filter @ elevation 96.5

Surface area (polylines in ACAD) =

$41+252 = 293sf \times .4'$ water depth

$= 118cf$ storage $> 116cf$ Okay



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Hamilton, New Jersey	609-584-0090

PROJECT NO. 141.06A16 SITE Bishop St.
SHEET NO. 5 OF
CALCULATED BY MPM DATE 5/21/15
CHECKED BY DATE
SCALE N/A

- Roof Dripline BMP:

Roof being treated by dripedge = 1123sf

Treatment volume = 1123 sf x 1"/12" = 93.58 cf

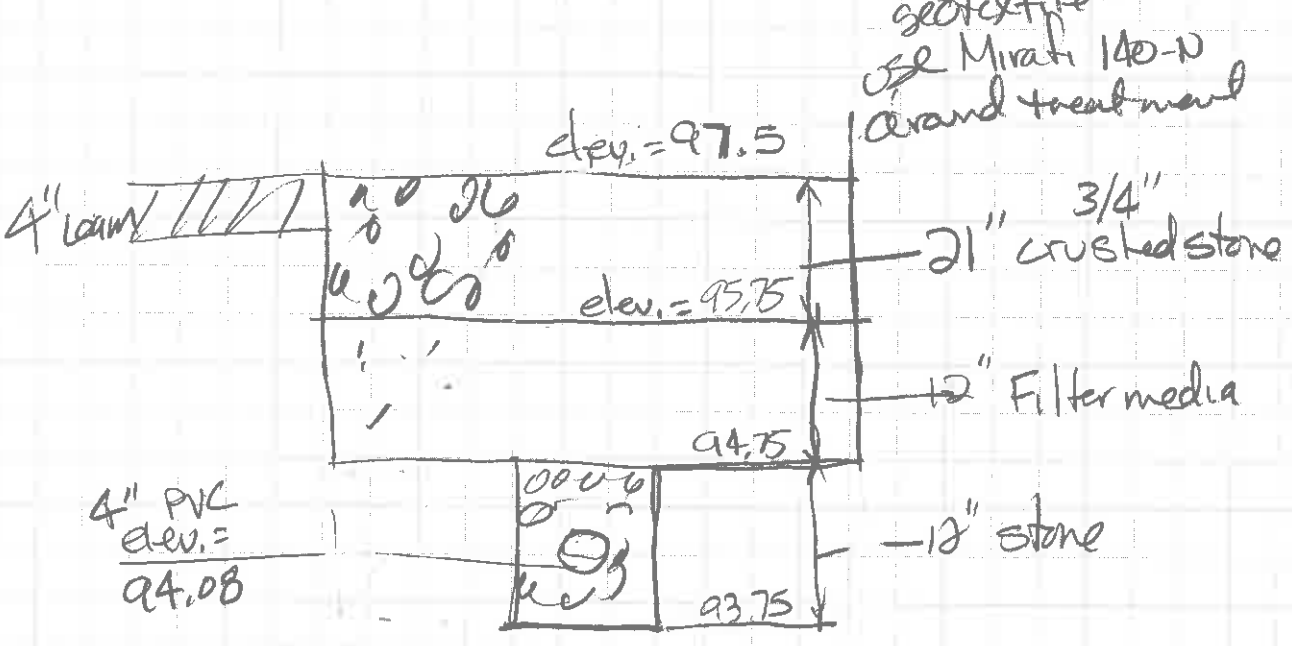
Assuming 40% voids Required storage volume

= 93.58 / 0.4 = 234 cf

Surface area of Dripedge treatment = 139sf

∴ 234cf / 139sf = 1.7' depth min. (21")

Assume 12" soil filter



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PROJECT NO. 141.06146 SITE Bishop St.
SHEET NO. 6 OF
CALCULATED BY MPM DATE 5/21/15
CHECKED BY DATE
SCALE N/A

Vegetated underdrain soil filter @ building front

Landscaped area: 1324sf

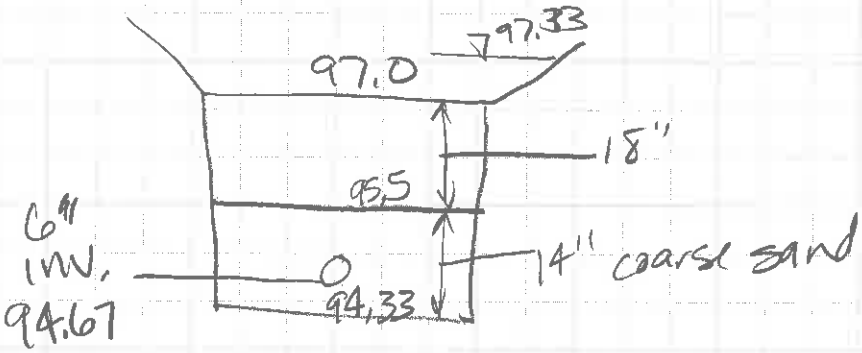
Treatment volume = $\frac{1324\,sf\,(0.4')}{12''}$ = 44cf

Filter area Req'd: 2% (1324sf) = 26.5sf

Filter area provided = 168sf

assume level of channel protection
Volume = 4inches = 0.33ft,

168sf x 0.33 = 56 cf > 44cf req'd



- Manmade Pervious Surfaces - based on April 2015 Revision to Section 7.7 (attached)

Impervious Area to be treated by Pavers

Total new impervious: 19453sf

- Imp. Untreated	7893sf	
- treatment by Roof	7774sf	= 10,418sf
- treatment by swale	479sf	

Section 7.7
Manmade Pervious Surfaces

Revised April 2015

7.7.1 Description

A porous surface consists of the use of a permeable surface material and mineral base and subbase materials which allow penetration of runoff and into the underlying soils.
The efficiency of pavement alternative systems will depend on whether the surface is designed to store and infiltrate most runoff with the remainder discharged to a storm drainage system or over-land flow. The effectiveness of pervious alternatives will also depend on their long term maintenance and serviceability.

7.7.2 General Design Criteria

A typical permeable pavement alternative consists of a top porous structure that is providing structural strength and will allow the infiltration of runoff, a filter course, a reservoir course (with drainage if needed), a geotextile fabric and existing soil or subbase material. The following surface alternatives are example of pervious surfaces:
Porous Asphalt and Concrete: Porous asphalt is similar to conventional asphalt except that it contains very few particles smaller than coarse sand (less than # 30 sieve). Without these finer particles, water is able to infiltrate and into the subsurface.
Block pavers: Block paves are interlocking concrete blocks that leave void spaces between which water can infiltrate. The void spaces can be filled with gravel or soil and grass.
Plastic grid Pavers: These are often constructed from recycled material and come in a honeycomb pattern. The voids are filled with gravel or may be grassed.
Artificial ball fields (turf ballfields): These are also considered pervious surfaces that require similar design considerations. The synthetic nature of the turf may be a concern for the infiltration of chemical into the subsurface; however, no restriction will be applied until more data is available on this subject.

Any manmade pervious surface shall be subject to the General Standards of Chapter 500, Stormwater Management Rules and the DEP licensing staff must be consulted for permitting requirements. However, the use of this technology will provide needed level of treatment to meet the General Standards if designed as below.

7.7.3 Specific Design Criteria

Traffic Volumes: Pavement alternatives are limited to areas with light to moderate traffic. They are not recommended for most roadways, and cannot withstand heavy vehicles.
Grading: The site should slope with less than 5% and preferably closer to 1%.
Sediment loading: Pavement should not be used in areas expected to receive high levels of sediments as they are highly susceptible to clogging. Also alternative measures such as salt should be implemented over these areas in the winter.
Reservoir Course: The reservoir course should consist of clean washed 11/2-inch to 3-inch aggregate that is free of debris. The depth of the reservoir course shall be based on the desired storage volume and frost penetration.

7.7.3 Design Criteria for Infiltration

- All specifications from SW rules, Appendix D, Section 2 apply.
- At a minimum, one foot separation is needed below the road subbase and above the groundwater table. The depth of the water table elevation needs to be considered in designing the road for sufficient frost protection depth.
- A filter layer providing pretreatment before infiltration to groundwater needs to be included in the road design and can be part of the subbase and base. The media must be a mineral soil with between 4 and 7% fines (passing #200 sieve) and should be a minimum of 8 inches thick.
- To meet the General Standards requirements (1 inch infiltration), a minimum storage capacity within the filter layer or subbase and base is needed to allow the direct entry of one inch or more.
- To meet the Flooding Standards requirements, the road design needs to provide a minimum storage capacity for the direct entry of the rain precipitation from a 24-hour, 25-year storm (5 + inches).
- Infiltration rate should be confirmed with a double ring infiltrometer test to determine the soils ability to accept water. The test needs to be on native subgrade even if there is fill above it, and not on the fill itself. Recommended infiltration should be less than 2.41 inches per hour but great enough that the inch of stored precipitation infiltrates in 24 hours (i.e. >0.04 inches per hour).
- The stored volume needs to fully infiltrate within 24-48 hours
- Provide appropriate drainage and discharge of flows from larger storms where is needed.

7.7.4 Design Criteria for Storage and Filtration

- Appropriate specifications from SW rules, Appendix E and BMP design standards for an underdrained filter bed apply
- To meet the General Standards requirements (treatment of 1 inch of runoff), a minimum storage capacity within the filter layer or subbase and base is needed to allow the treatment of one inch or more.
- To meet the Flooding Standards requirements, the road design needs to provide a minimum storage capacity for the direct entry of the rain precipitation from a 24-hour, 25-year storm (5 + inches).
- The filter bed may be part of the road base and subbase horizon. The filter media must be a mineral soil with between 4 and 7% fines (passing #200 sieve) and must be a minimum of 4 inches thick.
- An underdrained bed consisting of a minimum of 12 inches of underdrain gravel meeting the MDOT Specification 703.22, Type B should be a minimum of 12 inches to provide sufficient coverage for the underdrain piping.
- An underdrain pipe network is needed to drain adequately the underdrain bed. Pipes should be placed perpendicular to the slope and should be spaced no further apart than 20 feet. An orifice may be needed to control the outflow.
- Stored volume needs to fully drain within 24-48 hours.
- Provide appropriate drainage and discharge of flows from larger storms where is needed.

7.7.5 Modular Pervious Pavement

In addition to the design guidelines from above, an area of modular pervious pavement structure may be used to provide the treatment of impervious pavement where the area of pervious pavement is 20% of the impervious area that drains to it, if the thickness of the filter sand layer is equivalently increased and meet the following sizing criteria:

- The flow path over the impervious area should not exceed 50 feet before reaching the pervious pavement section for treatment.
- The thickness of the filter layer should be increased exponentially from 4 inches for a full (100%) pervious pavement section with no run-on from other areas to 18 inches for a pervious section and treatment system that is no less than 20% of the impervious area draining into it.
- Long-term inspection and maintenance by a DEP approved stormwater maintenance inspector will be regularly provided under a five-year binding inspection and maintenance contract that is renewed before contract expiration.
- The replacement of the modular pervious system will be provided when more than 40% of the pervious system shows signs of clogging.

Pervious surfaces and pavement, whether asphalt, concrete or paving stones, have the potential to become impervious if not properly maintained. The following need to be planned for and be met:

- Design pervious pavement structures to prevent erosion from surrounding areas from reaching the pavement and sediment deposition.
- Restrain vehicles with muddy wheels from accessing pervious pavement areas.
- Limit salt use for deicing and do not use sand.
- Remove leaves and organic debris in the fall.
- Sweep, vacuum and/or pressure wash pavement **twice** annually at a minimum.

7.7.6 Maintenance Criteria

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Providence, Rhode Island 401-433-2160
Portsmouth, New Hampshire 603-436-1490
Portland, Maine 207-772-2891
Hamilton, New Jersey 609-584-0090

PROJECT NO. 14/.06146 SITE Bishop St.
SHEET NO. 10 OF
CALCULATED BY MPM DATE 5/21/15
CHECKED BY DATE
SCALE N/A

Landscaped Area to be Treated by Pavers

Total = 7439 sf
- untreated: 1787 sf
- treated by swale: 2283
- treated by front filter: 1324

0.4"/1"

= 2045 sf Remaining x (0.4)

= 818 sf

Total area to be treated by pavers

10,418 + 818 = 11,236 sf x 0.2

= 2247 sf of pavers Reqd.

Pavers are 1'x1' and will be placed over R-Tanks

R-Tanks: 15.75'W x 28.15'L height varies

(1.31) x (2.35)

Paver Area provided = 2280 sf > 2247 sf

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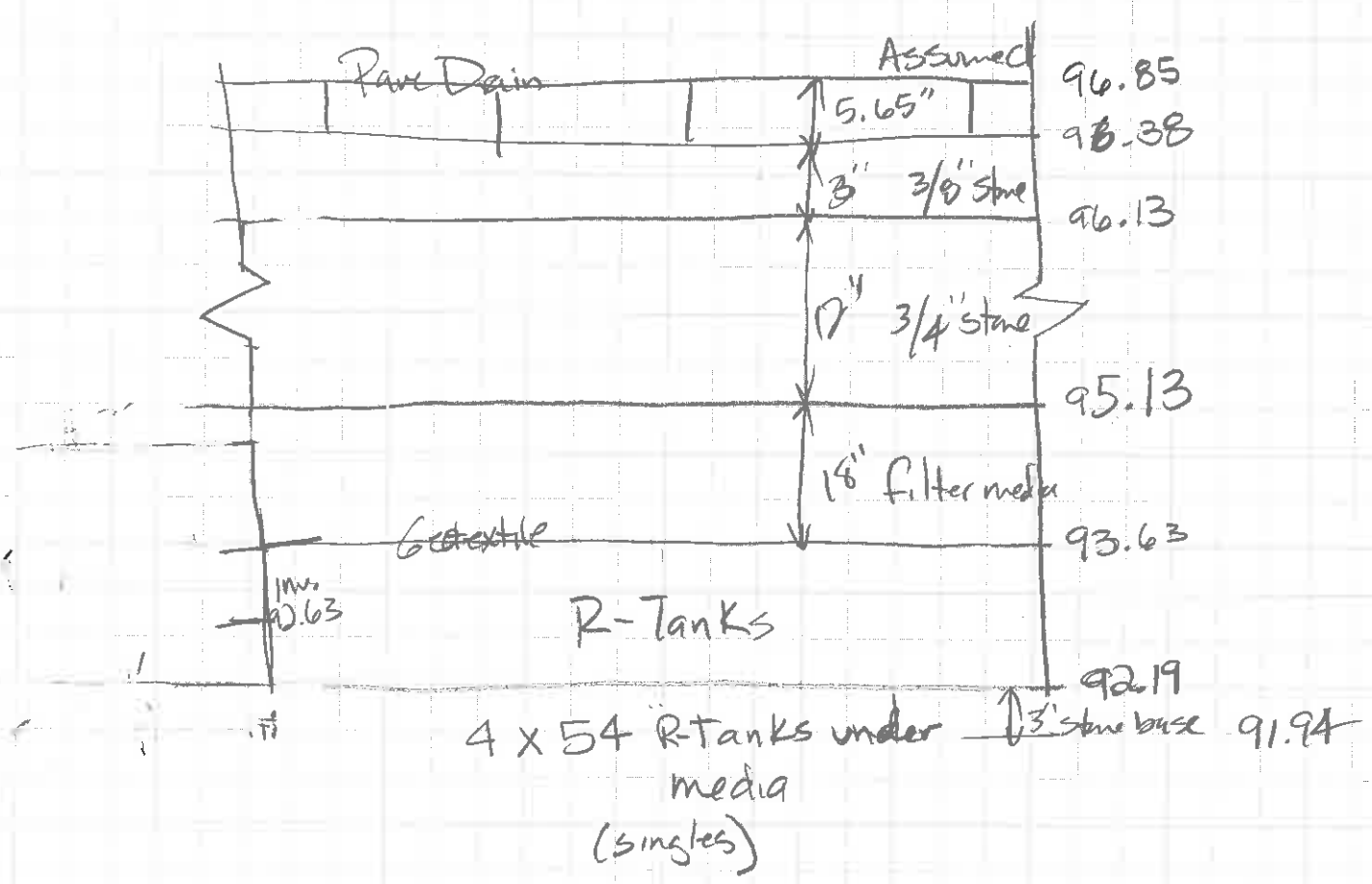
Portland, Maine 207-772-2891
Hamilton, New Jersey 609-584-0090

PROJECT NO. 141.06 K46 SITE Bishop St.
SHEET NO. 11 OF
CALCULATED BY MPM DATE 4/10/15
CHECKED BY DATE
SCALE N/A



weir = 94.3

4" = 93.8

4" = 93.3

(2) 4" = 92.8

R-Tanks – Single (1)

4 x 106 = 424 (5.25 x 24 ft)

+ 5 x 53 = 265 (6.55 x 148)

689

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Byfield, Massachusetts 978-465-1822
Providence, Rhode Island 401-433-2160
Portsmouth, New Hampshire 603-436-1490
Portland, Maine 207-772-2891
Hamilton, New Jersey 609-584-0090

PROJECT NO. 141.06146 SITE Bishop St.
SHEET NO. 12 OF
CALCULATED BY MPM DATE 5/21/15
CHECKED BY DATE
SCALE N/A

HydroCAD Inputs

Subcatchment No. 1 - Areas Draining to Pervious Pavers

Total Area: 15022

Impervious (add in untreated): 19453 - 7774 - 479 = 11,200

Landscaped (add in Untreated): 3822 + 1324 from front = 5146

Tc assumed 6 min.

Subcatchment No. 2 - Roof & swale

Roof impervious: 7774

Swale: Impervious = 479
Landscaped = 2283

Total impervious	8253
" Landscaped	2283
	10536

Subcatchment No. 3:

52383 - 28092 = 24291 sf

RANSOM
Consulting, Inc.

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Providence, Rhode Island 401-433-2160
Portsmouth, New Hampshire 603-436-1490
Portland, Maine 207-772-2891
Hamilton, New Jersey 609-584-0090

PROJECT NO. 141.06146 SITE Bishop St.
SHEET NO. 13 OF
CALCULATED BY MPM DATE 5/14/15
CHECKED BY DATE
SCALE

Objective: Determine compensation fees or mitigation credits required

Non Impervious Roof Area: Assumes pre-existing area exempt.

Paved: 12805 sf − 300sf (existing gravel)

= 12505 sf / 43560 sf/Ac = 0.29 AC

compensation: $5000 x 0.29 = $ 1435

Mitigation: 0.5 credits x 0.29 = 0.15 credits

Roof area: 7774 sf − 826 (existing roof) = 6948 sf

6948 sf / 43560 sf/Ac = 0.16 AC

Compensation: $2000 x 0.16 = $ 321

Mitigation: 0.2 credits x 0.16 = 0.03 credits

Landscaping: New developed area - 7439 sf / 43560 sf/Ac = 0.17 Ac

Compensation: $1000 x 0.17 = $ 171

Mitigation: 0.1 credits x 0.17 = 0.02 credits

Total compensation: $1927

Mitigation: 0.2 credits

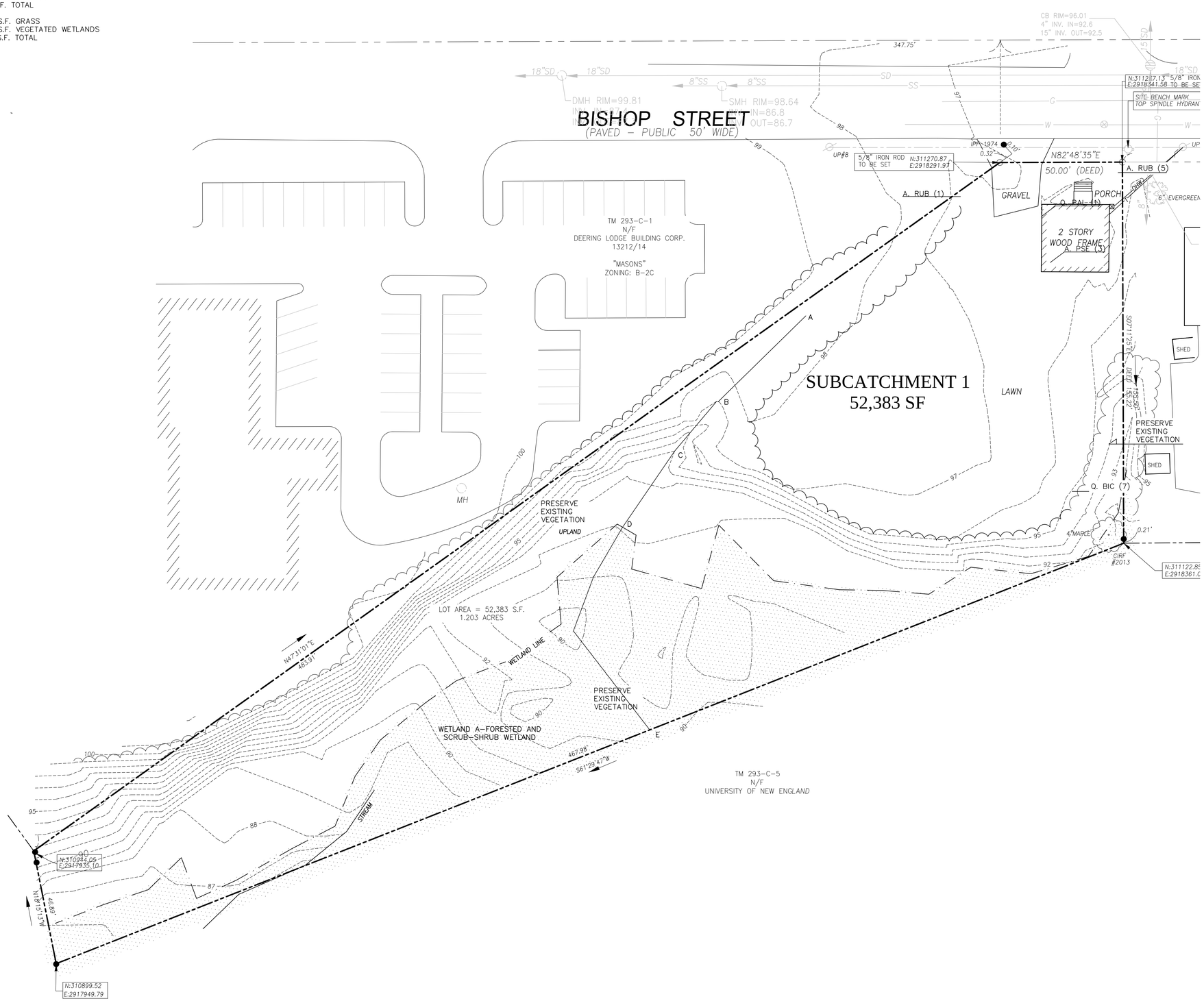
APPENDIX D

Pre-Development Stormwater Calculations

City of Portland
72 Bishop Street
Portland, Maine

GENERAL NOTES:

1. SITE AREA: 52,383 SF OR 1.20 ACRES
2. IMPERVIOUS AREA: 826 S.F. BUILDING
   380 S.F. GRAVEL DRIVE
   1,206 S.F. TOTAL
3. LANDSCAPED AREA: 14,646 S.F. GRASS
   36,531 S.F. VEGETATED WETLANDS
   51,177 S.F. TOTAL



STATE OF MAINE
STEPHEN J. BRADSTREET
#5740
LICENSED PROFESSIONAL ENGINEER

Prepared For:
Owner:
AVESTA BISHOP STREET LP
307 Cumberland Avenue
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Prepared By:
RANSOM
Consulting Engineers and Scientists
MITCHELL & ASSOCIATES
Landscape Architects
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72 BISHOP STREET

Bishop Street

Portland, Maine

Date: April 10, 2015

Issued For: Site Plan and Subdivision Plan Review

Revisions:

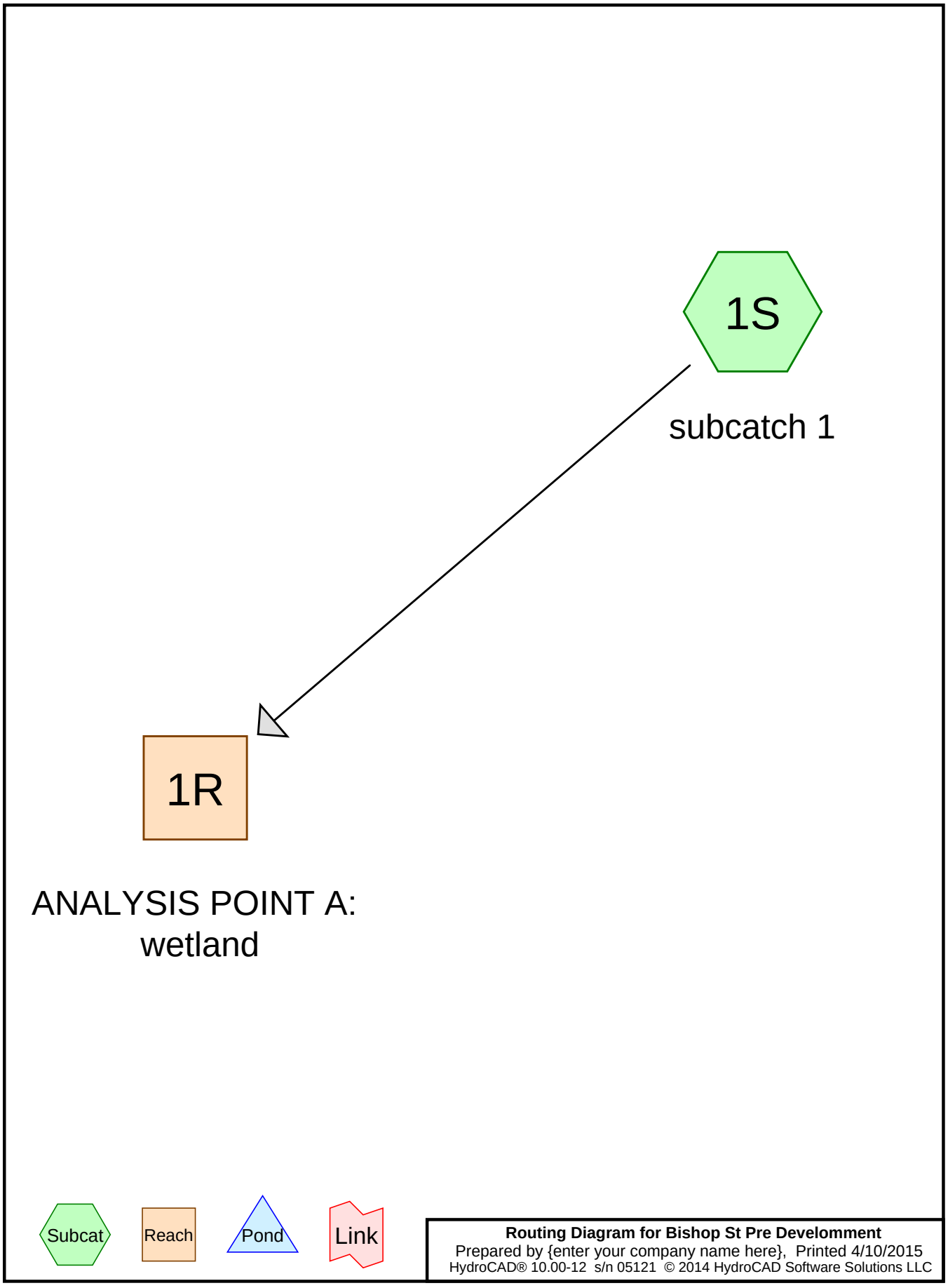
Title: PRE-DEVELOPMENT STORMWATER PLAN

Scale: 1"= 20'

0 10 20 40 ft.

North:

Sheet No.: SW 1


1S
subcatch 1
1R
ANALYSIS POINT A:
wetland
Subcat
Reach
Pond
Link
Routing Diagram for Bishop St Pre Develomment
Prepared by {enter your company name here}, Printed 4/10/2015
HydroCAD® 10.00-12 s/n 05121 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.336	79	50-75% Grass cover, Fair, HSG C (1S)
0.009	96	Gravel surface, HSG C (1S)
0.019	98	Paved parking & roofs (1S)
0.839	92	wooded wetlands area (1S)
1.203	**88**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.345	HSG C	1S
0.000	HSG D	
0.858	Other	1S
1.203		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.336	0.000	0.000	0.336	50-75% Grass cover, Fair	1S
0.000	0.000	0.009	0.000	0.000	0.009	Gravel surface	1S
0.000	0.000	0.000	0.000	0.019	0.019	Paved parking & roofs	1S
0.000	0.000	0.000	0.000	0.839	0.839	wooded wetlands area	1S
0.000	**0.000**	**0.345**	**0.000**	**0.858**	**1.203**	**TOTAL AREA**	

Time span=2.00-20.00 hrs, dt=0.01 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: subcatch1 Runoff Area=52,383 sf 1.58% Impervious Runoff Depth>0.23"
Flow Length=213' Tc=14.0 min CN=88 Runoff=0.24 cfs 0.023 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=0.24 cfs 0.023 af
Outflow=0.24 cfs 0.023 af

Total Runoff Area = 1.203 ac Runoff Volume = 0.023 af Average Runoff Depth = 0.23"
98.42% Pervious = 1.184 ac 1.58% Impervious = 0.019 ac

Summary for Subcatchment 1S: subcatch 1

Runoff = 0.24 cfs @ 12.21 hrs, Volume= 0.023 af, Depth> 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-inch Rainfall=1.00"

	Area (sf)	CN	Description
	826	98	Paved parking & roofs
	380	96	Gravel surface, HSG C
	14,646	79	50-75% Grass cover, Fair, HSG C
*	36,531	92	wooded wetlands area
	52,383	88	Weighted Average
	51,557		98.42% Pervious Area
	826		1.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.00"
0.3	27	0.1110	1.67		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	38	0.0530	1.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
2.3	98	0.0200	0.71		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
14.0	213	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.203 ac, 1.58% Impervious, Inflow Depth > 0.23" for 1-inch event
Inflow = 0.24 cfs @ 12.21 hrs, Volume= 0.023 af
Outflow = 0.24 cfs @ 12.21 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs / 3

Time span=2.00-20.00 hrs, dt=0.01 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: subcatch1 Runoff Area=52,383 sf 1.58% Impervious Runoff Depth>1.70"
Flow Length=213' Tc=14.0 min CN=88 Runoff=1.99 cfs 0.170 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=1.99 cfs 0.170 af
Outflow=1.99 cfs 0.170 af

Total Runoff Area = 1.203 ac Runoff Volume = 0.170 af Average Runoff Depth = 1.70"
98.42% Pervious = 1.184 ac 1.58% Impervious = 0.019 ac

Summary for Subcatchment 1S: subcatch 1

Runoff = 1.99 cfs @ 12.19 hrs, Volume= 0.170 af, Depth> 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.00"

	Area (sf)	CN	Description
	826	98	Paved parking & roofs
	380	96	Gravel surface, HSG C
	14,646	79	50-75% Grass cover, Fair, HSG C
*	36,531	92	wooded wetlands area
	52,383	88	Weighted Average
	51,557		98.42% Pervious Area
	826		1.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.00"
0.3	27	0.1110	1.67		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	38	0.0530	1.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
2.3	98	0.0200	0.71		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
14.0	213	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.203 ac, 1.58% Impervious, Inflow Depth > 1.70" for 2-Year event
Inflow = 1.99 cfs @ 12.19 hrs, Volume= 0.170 af
Outflow = 1.99 cfs @ 12.19 hrs, Volume= 0.170 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs / 3

Time span=2.00-20.00 hrs, dt=0.01 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: subcatch1 Runoff Area=52,383 sf 1.58% Impervious Runoff Depth>3.18"
Flow Length=213' Tc=14.0 min CN=88 Runoff=3.65 cfs 0.319 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=3.65 cfs 0.319 af
Outflow=3.65 cfs 0.319 af

Total Runoff Area = 1.203 ac Runoff Volume = 0.319 af Average Runoff Depth = 3.18"
98.42% Pervious = 1.184 ac 1.58% Impervious = 0.019 ac

Summary for Subcatchment 1S: subcatch 1

Runoff = 3.65 cfs @ 12.18 hrs, Volume= 0.319 af, Depth> 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
	826	98	Paved parking & roofs
	380	96	Gravel surface, HSG C
	14,646	79	50-75% Grass cover, Fair, HSG C
*	36,531	92	wooded wetlands area
	52,383	88	Weighted Average
	51,557		98.42% Pervious Area
	826		1.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.00"
0.3	27	0.1110	1.67		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	38	0.0530	1.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
2.3	98	0.0200	0.71		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
14.0	213	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.203 ac, 1.58% Impervious, Inflow Depth > 3.18" for 10-Year event
Inflow = 3.65 cfs @ 12.18 hrs, Volume= 0.319 af
Outflow = 3.65 cfs @ 12.18 hrs, Volume= 0.319 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs / 3

Time span=2.00-20.00 hrs, dt=0.01 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: subcatch 1 Runoff Area=52,383 sf 1.58% Impervious Runoff Depth>3.91"
Flow Length=213' Tc=14.0 min CN=88 Runoff=4.44 cfs 0.391 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=4.44 cfs 0.391 af
Outflow=4.44 cfs 0.391 af

Total Runoff Area = 1.203 ac Runoff Volume = 0.391 af Average Runoff Depth = 3.91"
98.42% Pervious = 1.184 ac 1.58% Impervious = 0.019 ac

Summary for Subcatchment 1S: subcatch 1

Runoff = 4.44 cfs @ 12.18 hrs, Volume= 0.391 af, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
	826	98	Paved parking & roofs
	380	96	Gravel surface, HSG C
	14,646	79	50-75% Grass cover, Fair, HSG C
*	36,531	92	wooded wetlands area
	52,383	88	Weighted Average
	51,557		98.42% Pervious Area
	826		1.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.00"
0.3	27	0.1110	1.67		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	38	0.0530	1.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
2.3	98	0.0200	0.71		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
14.0	213	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.203 ac, 1.58% Impervious, Inflow Depth > 3.91" for 25-Year event
Inflow = 4.44 cfs @ 12.18 hrs, Volume= 0.391 af
Outflow = 4.44 cfs @ 12.18 hrs, Volume= 0.391 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs / 3

Time span=2.00-20.00 hrs, dt=0.01 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: subcatch1 Runoff Area=52,383 sf 1.58% Impervious Runoff Depth>5.01"
Flow Length=213' Tc=14.0 min CN=88 Runoff=5.61 cfs 0.502 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=5.61 cfs 0.502 af
Outflow=5.61 cfs 0.502 af

Total Runoff Area = 1.203 ac Runoff Volume = 0.502 af Average Runoff Depth = 5.01"
98.42% Pervious = 1.184 ac 1.58% Impervious = 0.019 ac

Summary for Subcatchment 1S: subcatch 1

Runoff = 5.61 cfs @ 12.18 hrs, Volume= 0.502 af, Depth> 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	826	98	Paved parking & roofs
	380	96	Gravel surface, HSG C
	14,646	79	50-75% Grass cover, Fair, HSG C
*	36,531	92	wooded wetlands area
	52,383	88	Weighted Average
	51,557		98.42% Pervious Area
	826		1.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.00"
0.3	27	0.1110	1.67		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	38	0.0530	1.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
2.3	98	0.0200	0.71		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
14.0	213	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.203 ac, 1.58% Impervious, Inflow Depth > 5.01" for 100-Year event
Inflow = 5.61 cfs @ 12.18 hrs, Volume= 0.502 af
Outflow = 5.61 cfs @ 12.18 hrs, Volume= 0.502 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-20.00 hrs, dt= 0.01 hrs / 3

APPENDIX E

Post-Development Stormwater Calculations

City of Portland
72 Bishop Street
Portland, Maine

GENERAL NOTES:

1. SITE AREA: 52,383 SF OR 1.20 ACRES

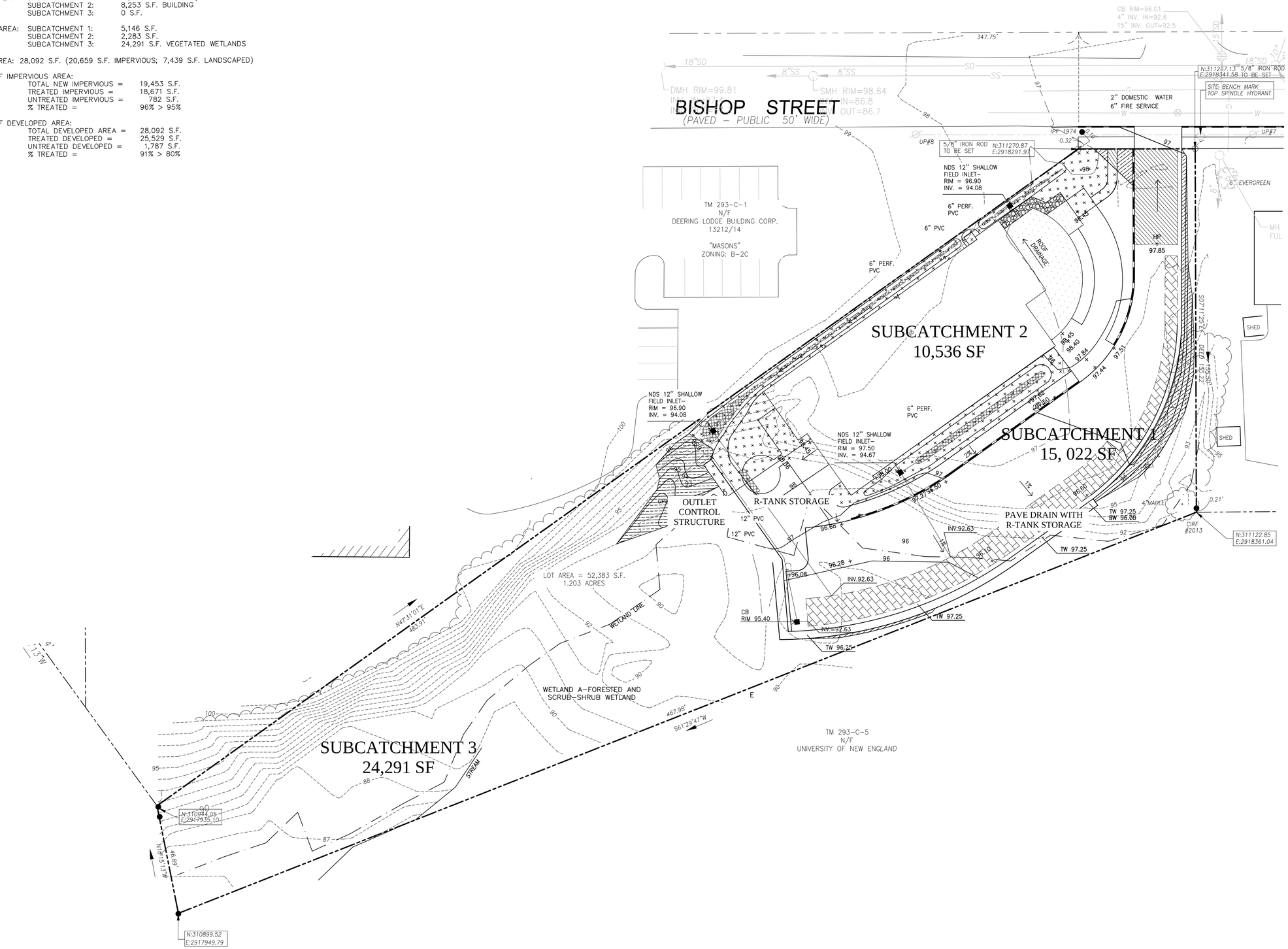
2. IMPERVIOUS AREA: SUBCATCHMENT 1: 11,200 S.F. PARKING/SIDEWALK
   SUBCATCHMENT 2: 8,253 S.F. BUILDING
   SUBCATCHMENT 3: 0 S.F.

3. LANDSCAPED AREA: SUBCATCHMENT 1: 5,146 S.F.
   SUBCATCHMENT 2: 2,283 S.F.
   SUBCATCHMENT 3: 24,291 S.F. VEGETATED WETLANDS

4. DEVELOPED AREA: 28,092 S.F. (20,659 S.F. IMPERVIOUS; 7,439 S.F. LANDSCAPED)

5. TREATMENT OF IMPERVIOUS AREA:
   TOTAL NEW IMPERVIOUS = 19,453 S.F.
   TREATED IMPERVIOUS = 18,671 S.F.
   UNTREATED IMPERVIOUS = 782 S.F.
   % TREATED = 96% > 95%

6. TREATMENT OF DEVELOPED AREA:
   TOTAL DEVELOPED AREA = 28,092 S.F.
   TREATED DEVELOPED = 25,529 S.F.
   UNTREATED DEVELOPED = 1,787 S.F.
   % TREATED = 91% > 80%



STATE OF MAINE
STEPHEN J. BRADSTREET #5740 LICENSED PROFESSIONAL ENGINEER

RANSOM
Consulting Engineers and Scientists

Prepared For:

Owner:

AVESTA BISHOP STREET LP
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Tel.: 207-553-7777

Prepared By:
MITCHELL & ASSOCIATES
Landscape Architects
The Staples School
70 Center Street
Portland, Maine 04101
Tel.: 207-774-4427

72 BISHOP STREET

Portland, Maine

Bishop Street

Date:
April 10, 2015

Issued For:
Site Plan and Subdivision Plan Review

Revisions:

Title:
POST DEVELOPMENT STORMWATER PLAN

Scale: 1"= 20'

0 10 20 40 ft.

North:

Sheet No.:
SW 2

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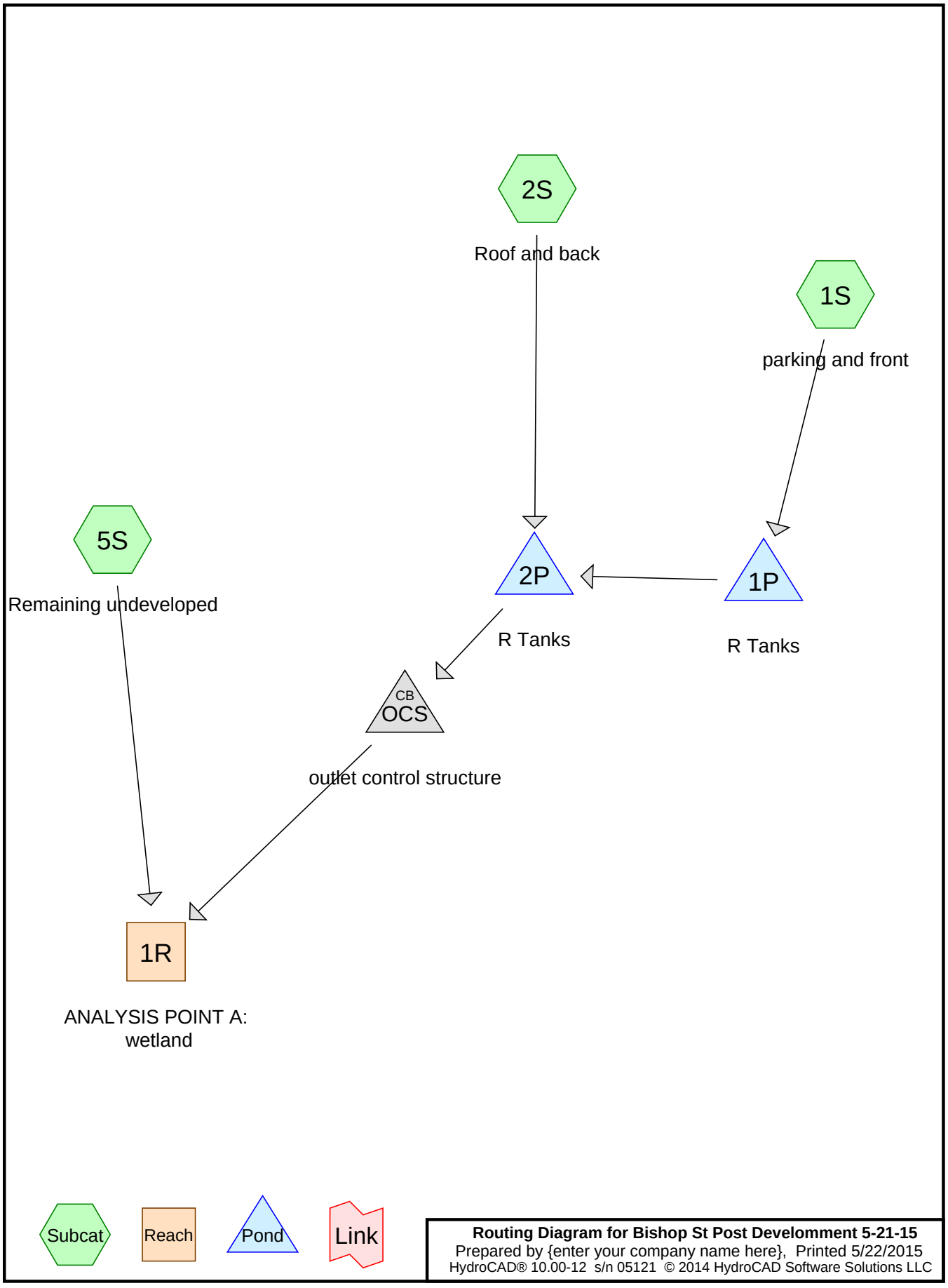

Routing Diagram for Bishop St Post Develomment 5-21-15
Prepared by {enter your company name here}, Printed 5/22/2015

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.171	74	>75% Grass cover, Good, HSG C (1S, 2S)
0.257	98	Paved parking & roofs (1S)
0.189	98	Unconnected roofs, HSG C (2S)
0.558	92	wooded wetland (5S)
1.175	**92**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.360	HSG C	1S, 2S
0.000	HSG D	
0.815	Other	1S, 5S
1.175		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.171	0.000	0.000	0.171	>75% Grass cover, Good	1S, 2S
0.000	0.000	0.000	0.000	0.257	0.257	Paved parking & roofs	1S
0.000	0.000	0.189	0.000	0.000	0.189	Unconnected roofs	2S
0.000	0.000	0.000	0.000	0.558	0.558	wooded wetland	5S
0.000	**0.000**	**0.360**	**0.000**	**0.815**	**1.175**	**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)	Inside-Fill (inches)
1	1P	92.63	92.63	80.0	0.0000	0.013	12.0	0.0	0.0
2	2P	92.63	92.63	20.0	0.0000	0.013	12.0	0.0	0.0

Time span=3.00-15.00 hrs, dt=0.01 hrs, 1201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: parking and front Runoff Area=16,346 sf 68.52% Impervious Runoff Depth>0.23"
Tc=6.0 min CN=90 Runoff=0.13 cfs 0.007 af

Subcatchment2S: Roof and back Runoff Area=10,536 sf 78.33% Impervious Runoff Depth>0.34"
Tc=6.0 min CN=93 Runoff=0.13 cfs 0.007 af

Subcatchment5S: Remaining undeveloped Runoff Area=24,285 sf 0.00% Impervious Runoff Depth>0.30"
Flow Length=90' Slope=0.0300 '/' Tc=6.5 min CN=92 Runoff=0.25 cfs 0.014 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=0.38 cfs 0.020 af
Outflow=0.38 cfs 0.020 af

Pond 1P: R Tanks Peak Elev=92.21' Storage=309 cf Inflow=0.13 cfs 0.007 af
12.0" Round Culvert n=0.013 L=80.0' S=0.0000 '/' Outflow=0.00 cfs 0.000 af

Pond 2P: R Tanks Peak Elev=92.90' Storage=52 cf Inflow=0.13 cfs 0.007 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0000 '/' Outflow=0.12 cfs 0.006 af

Pond OCS: outlet control structure Peak Elev=92.97' Inflow=0.12 cfs 0.006 af
Outflow=0.12 cfs 0.006 af

Total Runoff Area = 1.175 ac Runoff Volume = 0.028 af Average Runoff Depth = 0.28"
61.98% Pervious = 0.728 ac 38.02% Impervious = 0.447 ac

Summary for Subcatchment 1S: parking and front

Runoff = 0.13 cfs @ 12.10 hrs, Volume= 0.007 af, Depth> 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-inch Rainfall=1.00"

Area (sf)	CN	Description
11,200	98	Paved parking & roofs
5,146	74	>75% Grass cover, Good, HSG C
16,346	90	Weighted Average
5,146		31.48% Pervious Area
11,200		68.52% Impervious Area

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

Summary for Subcatchment 2S: Roof and back

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.007 af, Depth> 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-inch Rainfall=1.00"

Area (sf)	CN	Description
8,253	98	Unconnected roofs, HSG C
2,283	74	>75% Grass cover, Good, HSG C
10,536	93	Weighted Average
2,283		21.67% Pervious Area
8,253		78.33% Impervious Area
8,253		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Remaining undeveloped

Runoff = 0.25 cfs @ 12.10 hrs, Volume= 0.014 af, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-inch Rainfall=1.00"

	Area (sf)	CN	Description
*	24,285	92	wooded wetland
	24,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	20	0.0300	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
1.3	70	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.5	90	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

Inflow Area = 1.175 ac, 38.02% Impervious, Inflow Depth > 0.20" for 1-inch event
Inflow = 0.38 cfs @ 12.10 hrs, Volume= 0.020 af
Outflow = 0.38 cfs @ 12.10 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2

Summary for Pond 1P: R Tanks

Inflow Area = 0.375 ac, 68.52% Impervious, Inflow Depth > 0.23" for 1-inch event
Inflow = 0.13 cfs @ 12.10 hrs, Volume= 0.007 af
Outflow = 0.00 cfs @ 3.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 3.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 92.21' @ 15.00 hrs Surf.Area= 2,703 sf Storage= 309 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	1,687 cf	**21.06'W x 128.33'L x 2.69'H Field A** 7,280 cf Overall - 3,062 cf Embedded = 4,218 cf x 40.0% Voids
#2A	92.19'	2,909 cf	**ACF R-Tank HD 1.0** x 689 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 13 Rows of 53 Chambers
		4,596 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 3.00 hrs HW=91.94' TW=91.94' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)

Summary for Pond 2P: R Tanks

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 0.13" for 1-inch event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.007 af
Outflow = 0.12 cfs @ 12.11 hrs, Volume= 0.006 af, Atten= 2%, Lag= 1.0 min
Primary = 0.12 cfs @ 12.11 hrs, Volume= 0.006 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 92.90' @ 12.11 hrs Surf.Area= 104 sf Storage= 52 cf

Plug-Flow detention time= 31.2 min calculated for 0.006 af (84% of inflow)
Center-of-Mass det. time= 12.6 min (762.9 - 750.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	94 cf	**6.62'W x 15.73'L x 2.69'H Field A** 281 cf Overall - 44 cf Embedded = 236 cf x 40.0% Voids
#2A	92.19'	42 cf	**ACF R-Tank HD 1.0** x 10 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 2 Rows of 5 Chambers
		137 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.11 hrs HW=92.90' TW=92.97' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Summary for Pond OCS: outlet control structure

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 0.11" for 1-inch event
Inflow = 0.12 cfs @ 12.11 hrs, Volume= 0.006 af
Outflow = 0.12 cfs @ 12.11 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.11 hrs, Volume= 0.006 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 92.97' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	93.30'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	93.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	92.80'	**4.0" Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=0.12 cfs @ 12.11 hrs HW=92.97' TW=0.00' (Dynamic Tailwater)
- **1=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Orifice Controls 0.12 cfs @ 1.40 fps)

Time span=3.00-15.00 hrs, dt=0.01 hrs, 1201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: parking and front Runoff Area=16,346 sf 68.52% Impervious Runoff Depth>1.58"
Tc=6.0 min CN=90 Runoff=0.87 cfs 0.049 af

Subcatchment2S: Roof and back Runoff Area=10,536 sf 78.33% Impervious Runoff Depth>1.83"
Tc=6.0 min CN=93 Runoff=0.62 cfs 0.037 af

Subcatchment5S: Remaining undeveloped Runoff Area=24,285 sf 0.00% Impervious Runoff Depth>1.74"
Flow Length=90' Slope=0.0300 '/' Tc=6.5 min CN=92 Runoff=1.36 cfs 0.081 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=1.98 cfs 0.123 af
Outflow=1.98 cfs 0.123 af

Pond 1P: R Tanks Peak Elev=92.91' Storage=1,884 cf Inflow=0.87 cfs 0.049 af
12.0" Round Culvert n=0.013 L=80.0' S=0.0000 '/' Outflow=0.05 cfs 0.006 af

Pond 2P: R Tanks Peak Elev=93.41' Storage=82 cf Inflow=0.62 cfs 0.043 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0000 '/' Outflow=0.63 cfs 0.042 af

Pond OCS: outlet control structure Peak Elev=93.34' Inflow=0.63 cfs 0.042 af
Outflow=0.63 cfs 0.042 af

Total Runoff Area = 1.175 ac Runoff Volume = 0.167 af Average Runoff Depth = 1.71"
61.98% Pervious = 0.728 ac 38.02% Impervious = 0.447 ac

Summary for Subcatchment 1S: parking and front

Runoff = 0.87 cfs @ 12.09 hrs, Volume= 0.049 af, Depth> 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
11,200	98	Paved parking & roofs
5,146	74	>75% Grass cover, Good, HSG C
16,346	90	Weighted Average
5,146		31.48% Pervious Area
11,200		68.52% Impervious Area

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

Summary for Subcatchment 2S: Roof and back

Runoff = 0.62 cfs @ 12.09 hrs, Volume= 0.037 af, Depth> 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
8,253	98	Unconnected roofs, HSG C
2,283	74	>75% Grass cover, Good, HSG C
10,536	93	Weighted Average
2,283		21.67% Pervious Area
8,253		78.33% Impervious Area
8,253		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Remaining undeveloped

Runoff = 1.36 cfs @ 12.09 hrs, Volume= 0.081 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.00"

	Area (sf)	CN	Description
*	24,285	92	wooded wetland
	24,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	20	0.0300	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
1.3	70	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.5	90	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

Inflow Area = 1.175 ac, 38.02% Impervious, Inflow Depth > 1.26" for 2-Year event
Inflow = 1.98 cfs @ 12.09 hrs, Volume= 0.123 af
Outflow = 1.98 cfs @ 12.09 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2

Summary for Pond 1P: R Tanks

Inflow Area = 0.375 ac, 68.52% Impervious, Inflow Depth > 1.58" for 2-Year event
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 0.049 af
Outflow = 0.05 cfs @ 14.56 hrs, Volume= 0.006 af, Atten= 94%, Lag= 148.4 min
Primary = 0.05 cfs @ 14.56 hrs, Volume= 0.007 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 92.91' @ 14.22 hrs Surf.Area= 2,703 sf Storage= 1,884 cf

Plug-Flow detention time= 243.7 min calculated for 0.006 af (13% of inflow)
Center-of-Mass det. time= 118.6 min (850.6 - 732.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	1,687 cf	**21.06'W x 128.33'L x 2.69'H Field A** 7,280 cf Overall - 3,062 cf Embedded = 4,218 cf x 40.0% Voids
#2A	92.19'	2,909 cf	**ACF R-Tank HD 1.0** x 689 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 13 Rows of 53 Chambers
		4,596 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 14.56 hrs HW=92.91' TW=92.85' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 0.08 cfs @ 0.65 fps)

Summary for Pond 2P: R Tanks

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 0.84" for 2-Year event
Inflow = 0.62 cfs @ 12.09 hrs, Volume= 0.043 af
Outflow = 0.63 cfs @ 12.16 hrs, Volume= 0.042 af, Atten= 0%, Lag= 4.5 min
Primary = 0.63 cfs @ 12.16 hrs, Volume= 0.042 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.41' @ 12.09 hrs Surf.Area= 104 sf Storage= 82 cf

Plug-Flow detention time= 12.0 min calculated for 0.042 af (97% of inflow)
Center-of-Mass det. time= 8.0 min (748.9 - 741.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	94 cf	**6.62'W x 15.73'L x 2.69'H Field A** 281 cf Overall - 44 cf Embedded = 236 cf x 40.0% Voids
#2A	92.19'	42 cf	**ACF R-Tank HD 1.0** x 10 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 2 Rows of 5 Chambers
		137 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.16 hrs HW=93.27' TW=93.34' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Summary for Pond OCS: outlet control structure

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 0.82" for 2-Year event
Inflow = 0.63 cfs @ 12.16 hrs, Volume= 0.042 af
Outflow = 0.63 cfs @ 12.16 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.16 hrs, Volume= 0.042 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.34' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	93.30'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	93.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	92.80'	**4.0" Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=0.63 cfs @ 12.16 hrs HW=93.34' TW=0.00' (Dynamic Tailwater)
- **1=Sharp-Crested Rectangular Weir**(Weir Controls 0.11 cfs @ 0.66 fps)
- **2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.69 fps)
- **3=Orifice/Grate** (Orifice Controls 0.51 cfs @ 2.95 fps)

Time span=3.00-15.00 hrs, dt=0.01 hrs, 1201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: parking and front Runoff Area=16,346 sf 68.52% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=90 Runoff=1.53 cfs 0.091 af

Subcatchment2S: Roof and back Runoff Area=10,536 sf 78.33% Impervious Runoff Depth>3.22"
Tc=6.0 min CN=93 Runoff=1.04 cfs 0.065 af

Subcatchment5S: Remaining undeveloped Runoff Area=24,285 sf 0.00% Impervious Runoff Depth>3.12"
Flow Length=90' Slope=0.0300 '/' Tc=6.5 min CN=92 Runoff=2.32 cfs 0.145 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=3.37 cfs 0.259 af
Outflow=3.37 cfs 0.259 af

Pond 1P: R Tanks Peak Elev=93.38' Storage=2,951 cf Inflow=1.53 cfs 0.091 af
12.0" Round Culvert n=0.013 L=80.0' S=0.0000 '/' Outflow=0.60 cfs 0.034 af

Pond 2P: R Tanks Peak Elev=93.54' Storage=90 cf Inflow=1.04 cfs 0.116 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0000 '/' Outflow=1.04 cfs 0.114 af

Pond OCS: outlet control structure Peak Elev=93.41' Inflow=1.04 cfs 0.114 af
Outflow=1.04 cfs 0.114 af

Total Runoff Area = 1.175 ac Runoff Volume = 0.301 af Average Runoff Depth = 3.07"
61.98% Pervious = 0.728 ac 38.02% Impervious = 0.447 ac

Summary for Subcatchment 1S: parking and front

Runoff = 1.53 cfs @ 12.09 hrs, Volume= 0.091 af, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
11,200	98	Paved parking & roofs
5,146	74	>75% Grass cover, Good, HSG C
16,346	90	Weighted Average
5,146		31.48% Pervious Area
11,200		68.52% Impervious Area

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

Summary for Subcatchment 2S: Roof and back

Runoff = 1.04 cfs @ 12.08 hrs, Volume= 0.065 af, Depth> 3.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
8,253	98	Unconnected roofs, HSG C
2,283	74	>75% Grass cover, Good, HSG C
10,536	93	Weighted Average
2,283		21.67% Pervious Area
8,253		78.33% Impervious Area
8,253		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Remaining undeveloped

Runoff = 2.32 cfs @ 12.09 hrs, Volume= 0.145 af, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	24,285	92	wooded wetland
	24,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	20	0.0300	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
1.3	70	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.5	90	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

Inflow Area = 1.175 ac, 38.02% Impervious, Inflow Depth > 2.65" for 10-Year event
Inflow = 3.37 cfs @ 12.09 hrs, Volume= 0.259 af
Outflow = 3.37 cfs @ 12.09 hrs, Volume= 0.259 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2

Summary for Pond 1P: R Tanks

Inflow Area = 0.375 ac, 68.52% Impervious, Inflow Depth > 2.92" for 10-Year event
Inflow = 1.53 cfs @ 12.09 hrs, Volume= 0.091 af
Outflow = 0.60 cfs @ 12.50 hrs, Volume= 0.034 af, Atten= 61%, Lag= 24.9 min
Primary = 0.60 cfs @ 12.50 hrs, Volume= 0.051 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.38' @ 12.54 hrs Surf.Area= 2,703 sf Storage= 2,951 cf

Plug-Flow detention time= 154.0 min calculated for 0.034 af (37% of inflow)
Center-of-Mass det. time= 83.9 min (804.1 - 720.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	1,687 cf	**21.06'W x 128.33'L x 2.69'H Field A** 7,280 cf Overall - 3,062 cf Embedded = 4,218 cf x 40.0% Voids
#2A	92.19'	2,909 cf	**ACF R-Tank HD 1.0** x 689 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 13 Rows of 53 Chambers
		4,596 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.50 hrs HW=93.38' TW=93.33' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 0.39 cfs @ 0.85 fps)

Summary for Pond 2P: R Tanks

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 2.25" for 10-Year event
Inflow = 1.04 cfs @ 12.08 hrs, Volume= 0.116 af
Outflow = 1.04 cfs @ 12.09 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.3 min
Primary = 1.04 cfs @ 12.09 hrs, Volume= 0.114 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.54' @ 12.09 hrs Surf.Area= 104 sf Storage= 90 cf

Plug-Flow detention time= 6.4 min calculated for 0.114 af (98% of inflow)
Center-of-Mass det. time= 4.2 min (752.3 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	94 cf	**6.62'W x 15.73'L x 2.69'H Field A** 281 cf Overall - 44 cf Embedded = 236 cf x 40.0% Voids
#2A	92.19'	42 cf	**ACF R-Tank HD 1.0** x 10 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 2 Rows of 5 Chambers
		137 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.04 cfs @ 12.09 hrs HW=93.54' TW=93.41' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.04 cfs @ 1.39 fps)

Summary for Pond OCS: outlet control structure

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 2.23" for 10-Year event
Inflow = 1.04 cfs @ 12.09 hrs, Volume= 0.114 af
Outflow = 1.04 cfs @ 12.09 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
Primary = 1.04 cfs @ 12.09 hrs, Volume= 0.114 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.41' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	93.30'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	93.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	92.80'	**4.0" Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=1.04 cfs @ 12.09 hrs HW=93.41' TW=0.00' (Dynamic Tailwater)
- **1=Sharp-Crested Rectangular Weir**(Weir Controls 0.46 cfs @ 1.07 fps)
- **2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 1.12 fps)
- **3=Orifice/Grate** (Orifice Controls 0.56 cfs @ 3.20 fps)

Time span=3.00-15.00 hrs, dt=0.01 hrs, 1201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: parking and front Runoff Area=16,346 sf 68.52% Impervious Runoff Depth>3.57"
Tc=6.0 min CN=90 Runoff=1.84 cfs 0.112 af

Subcatchment2S: Roof and back Runoff Area=10,536 sf 78.33% Impervious Runoff Depth>3.88"
Tc=6.0 min CN=93 Runoff=1.24 cfs 0.078 af

Subcatchment5S: Remaining undeveloped Runoff Area=24,285 sf 0.00% Impervious Runoff Depth>3.78"
Flow Length=90' Slope=0.0300 '/' Tc=6.5 min CN=92 Runoff=2.77 cfs 0.175 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=4.01 cfs 0.307 af
Outflow=4.01 cfs 0.307 af

Pond 1P: R Tanks Peak Elev=93.54' Storage=3,299 cf Inflow=1.84 cfs 0.112 af
12.0" Round Culvert n=0.013 L=80.0' S=0.0000 '/' Outflow=0.56 cfs 0.054 af

Pond 2P: R Tanks Peak Elev=93.61' Storage=93 cf Inflow=1.24 cfs 0.133 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0000 '/' Outflow=1.24 cfs 0.131 af

Pond OCS: outlet control structure Peak Elev=93.43' Inflow=1.24 cfs 0.131 af
Outflow=1.24 cfs 0.131 af

Total Runoff Area = 1.175 ac Runoff Volume = 0.365 af Average Runoff Depth = 3.73"
61.98% Pervious = 0.728 ac 38.02% Impervious = 0.447 ac

Summary for Subcatchment 1S: parking and front

Runoff = 1.84 cfs @ 12.08 hrs, Volume= 0.112 af, Depth> 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
11,200	98	Paved parking & roofs
5,146	74	>75% Grass cover, Good, HSG C
16,346	90	Weighted Average
5,146		31.48% Pervious Area
11,200		68.52% Impervious Area

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

Summary for Subcatchment 2S: Roof and back

Runoff = 1.24 cfs @ 12.08 hrs, Volume= 0.078 af, Depth> 3.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
8,253	98	Unconnected roofs, HSG C
2,283	74	>75% Grass cover, Good, HSG C
10,536	93	Weighted Average
2,283		21.67% Pervious Area
8,253		78.33% Impervious Area
8,253		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Remaining undeveloped

Runoff = 2.77 cfs @ 12.09 hrs, Volume= 0.175 af, Depth> 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	24,285	92	wooded wetland
	24,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	20	0.0300	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
1.3	70	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.5	90	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

Inflow Area = 1.175 ac, 38.02% Impervious, Inflow Depth > 3.13" for 25-Year event
Inflow = 4.01 cfs @ 12.09 hrs, Volume= 0.307 af
Outflow = 4.01 cfs @ 12.09 hrs, Volume= 0.307 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2

Summary for Pond 1P: R Tanks

Inflow Area = 0.375 ac, 68.52% Impervious, Inflow Depth > 3.57" for 25-Year event
Inflow = 1.84 cfs @ 12.08 hrs, Volume= 0.112 af
Outflow = 0.56 cfs @ 12.96 hrs, Volume= 0.054 af, Atten= 70%, Lag= 52.6 min
Primary = 0.56 cfs @ 12.96 hrs, Volume= 0.054 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.54' @ 12.42 hrs Surf.Area= 2,703 sf Storage= 3,299 cf

Plug-Flow detention time= 129.9 min calculated for 0.054 af (49% of inflow)
Center-of-Mass det. time= 73.6 min (789.8 - 716.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	1,687 cf	**21.06'W x 128.33'L x 2.69'H Field A** 7,280 cf Overall - 3,062 cf Embedded = 4,218 cf x 40.0% Voids
#2A	92.19'	2,909 cf	**ACF R-Tank HD 1.0** x 689 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 13 Rows of 53 Chambers
		4,596 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.70 cfs @ 12.96 hrs HW=93.37' TW=93.20' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 0.70 cfs @ 1.58 fps)

Summary for Pond 2P: R Tanks

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 2.58" for 25-Year event
Inflow = 1.24 cfs @ 12.08 hrs, Volume= 0.133 af
Outflow = 1.24 cfs @ 12.09 hrs, Volume= 0.131 af, Atten= 0%, Lag= 0.3 min
Primary = 1.24 cfs @ 12.09 hrs, Volume= 0.131 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.61' @ 12.09 hrs Surf.Area= 104 sf Storage= 93 cf

Plug-Flow detention time= 6.1 min calculated for 0.131 af (99% of inflow)
Center-of-Mass det. time= 4.0 min (744.4 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	94 cf	**6.62'W x 15.73'L x 2.69'H Field A** 281 cf Overall - 44 cf Embedded = 236 cf x 40.0% Voids
#2A	92.19'	42 cf	**ACF R-Tank HD 1.0** x 10 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 2 Rows of 5 Chambers
		137 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.24 cfs @ 12.09 hrs HW=93.61' TW=93.43' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.24 cfs @ 1.59 fps)

Summary for Pond OCS: outlet control structure

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 2.55" for 25-Year event
Inflow = 1.24 cfs @ 12.09 hrs, Volume= 0.131 af
Outflow = 1.24 cfs @ 12.09 hrs, Volume= 0.131 af, Atten= 0%, Lag= 0.0 min
Primary = 1.24 cfs @ 12.09 hrs, Volume= 0.131 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.43' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	93.30'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	93.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	92.80'	**4.0" Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=1.24 cfs @ 12.09 hrs HW=93.43' TW=0.00' (Dynamic Tailwater)
- **1=Sharp-Crested Rectangular Weir**(Weir Controls 0.63 cfs @ 1.19 fps)
- **2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.24 fps)
- **3=Orifice/Grate** (Orifice Controls 0.57 cfs @ 3.29 fps)

Time span=3.00-15.00 hrs, dt=0.01 hrs, 1201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: parking and front Runoff Area=16,346 sf 68.52% Impervious Runoff Depth>4.56"
Tc=6.0 min CN=90 Runoff=2.30 cfs 0.142 af

Subcatchment2S: Roof and back Runoff Area=10,536 sf 78.33% Impervious Runoff Depth>4.88"
Tc=6.0 min CN=93 Runoff=1.54 cfs 0.098 af

Subcatchment5S: Remaining undeveloped Runoff Area=24,285 sf 0.00% Impervious Runoff Depth>4.77"
Flow Length=90' Slope=0.0300 '/' Tc=6.5 min CN=92 Runoff=3.44 cfs 0.222 af

Reach 1R: ANALYSISPOINT A: wetland Inflow=4.98 cfs 0.414 af
Outflow=4.98 cfs 0.414 af

Pond 1P: R Tanks Peak Elev=93.86' Storage=3,758 cf Inflow=2.30 cfs 0.142 af
12.0" Round Culvert n=0.013 L=80.0' S=0.0000 '/' Outflow=1.29 cfs 0.085 af

Pond 2P: R Tanks Peak Elev=93.90' Storage=106 cf Inflow=2.20 cfs 0.194 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0000 '/' Outflow=2.02 cfs 0.192 af

Pond OCS: outlet control structure Peak Elev=93.52' Inflow=2.02 cfs 0.192 af
Outflow=2.02 cfs 0.192 af

Total Runoff Area = 1.175 ac Runoff Volume = 0.463 af Average Runoff Depth = 4.73"
61.98% Pervious = 0.728 ac 38.02% Impervious = 0.447 ac

Summary for Subcatchment 1S: parking and front

Runoff = 2.30 cfs @ 12.08 hrs, Volume= 0.142 af, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
11,200	98	Paved parking & roofs
5,146	74	>75% Grass cover, Good, HSG C
16,346	90	Weighted Average
5,146		31.48% Pervious Area
11,200		68.52% Impervious Area

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

Summary for Subcatchment 2S: Roof and back

Runoff = 1.54 cfs @ 12.08 hrs, Volume= 0.098 af, Depth> 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
8,253	98	Unconnected roofs, HSG C
2,283	74	>75% Grass cover, Good, HSG C
10,536	93	Weighted Average
2,283		21.67% Pervious Area
8,253		78.33% Impervious Area
8,253		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Remaining undeveloped

Runoff = 3.44 cfs @ 12.09 hrs, Volume= 0.222 af, Depth> 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	24,285	92	wooded wetland
	24,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	20	0.0300	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
1.3	70	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.5	90	Total			

Summary for Reach 1R: ANALYSIS POINT A: wetland

Inflow Area = 1.175 ac, 38.02% Impervious, Inflow Depth > 4.23" for 100-Year event
Inflow = 4.98 cfs @ 12.09 hrs, Volume= 0.414 af
Outflow = 4.98 cfs @ 12.09 hrs, Volume= 0.414 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2

Summary for Pond 1P: R Tanks

Inflow Area = 0.375 ac, 68.52% Impervious, Inflow Depth > 4.56" for 100-Year event
Inflow = 2.30 cfs @ 12.08 hrs, Volume= 0.142 af
Outflow = 1.29 cfs @ 12.19 hrs, Volume= 0.085 af, Atten= 44%, Lag= 6.3 min
Primary = 1.30 cfs @ 12.19 hrs, Volume= 0.096 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.86' @ 12.21 hrs Surf.Area= 2,703 sf Storage= 3,758 cf

Plug-Flow detention time= 116.5 min calculated for 0.085 af (59% of inflow)
Center-of-Mass det. time= 70.3 min (781.4 - 711.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	1,687 cf	**21.06'W x 128.33'L x 2.69'H Field A** 7,280 cf Overall - 3,062 cf Embedded = 4,218 cf x 40.0% Voids
#2A	92.19'	2,909 cf	**ACF R-Tank HD 1.0** x 689 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 13 Rows of 53 Chambers
		4,596 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.19 hrs HW=93.85' TW=93.87' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Summary for Pond 2P: R Tanks

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 3.78" for 100-Year event
Inflow = 2.20 cfs @ 12.19 hrs, Volume= 0.194 af
Outflow = 2.02 cfs @ 12.22 hrs, Volume= 0.192 af, Atten= 8%, Lag= 1.7 min
Primary = 2.02 cfs @ 12.22 hrs, Volume= 0.192 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.90' @ 12.20 hrs Surf.Area= 104 sf Storage= 106 cf

Plug-Flow detention time= 4.4 min calculated for 0.192 af (99% of inflow)
Center-of-Mass det. time= 3.0 min (746.2 - 743.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.94'	94 cf	**6.62'W x 15.73'L x 2.69'H Field A** 281 cf Overall - 44 cf Embedded = 236 cf x 40.0% Voids
#2A	92.19'	42 cf	**ACF R-Tank HD 1.0** x 10 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 2 Rows of 5 Chambers
		137 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	92.63'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.63' / 92.63' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.83 cfs @ 12.22 hrs HW=93.89' TW=93.52' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.83 cfs @ 2.34 fps)

Summary for Pond OCS: outlet control structure

Inflow Area = 0.617 ac, 72.36% Impervious, Inflow Depth > 3.74" for 100-Year event
Inflow = 2.02 cfs @ 12.22 hrs, Volume= 0.192 af
Outflow = 2.02 cfs @ 12.22 hrs, Volume= 0.192 af, Atten= 0%, Lag= 0.0 min
Primary = 2.02 cfs @ 12.22 hrs, Volume= 0.192 af

Routing by Dyn-Stor-Ind method, Time Span= 3.00-15.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 93.52' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	93.30'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	93.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	92.80'	**4.0" Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=2.02 cfs @ 12.22 hrs HW=93.52' TW=0.00' (Dynamic Tailwater)
- **1=Sharp-Crested Rectangular Weir**(Weir Controls 1.30 cfs @ 1.52 fps)
- **2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.58 fps)
- **3=Orifice/Grate** (Orifice Controls 0.62 cfs @ 3.57 fps)